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Exploring cross-curriculum numeracy understanding and implementation in Santa Angela teachers

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ABSTRACT

Numeracy literacy is a key component in achieving the 4th Sustainable Development Goal and is part of Indonesia's National Graduate Competency Standards, as outlined in Permendikbudristek No. 5 of 2022. However, data from the National Education Report Card over three years consistently shows that numeracy achievements lag reading literacy. Numeracy, a critical 21st-century skill, extends beyond mathematics, supporting students' ability to think critically and engage productively in a data-driven world. The Merdeka Curriculum highlights the significance of developing numeracy as a foundational competency across subjects. This study explores non-mathematics teachers' understanding and implementation of cross-curricular numeracy at Saint Angela Primary School. A mixed-methods approach was used, combining quantitative analysis of teacher responses to the questionnaire and thematic analysis of qualitative data on their views and experiences. Findings reveal that while most teachers have a solid understanding of numeracy and have attempted integration into lessons, the frequency of implementation remains low. Challenges include limited training, insufficient resources, and time constraints in lesson planning. This study underscores the need for enhanced teacher support and professional development to promote effective numeracy integration, with broader implications for curriculum design in primary education.

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ABSTRAK

Literasi numerasi merupakan komponen kunci dalam pencapaian Tujuan Pembangunan Berkelanjutan (TPB) ke-4 dan menjadi bagian dari Standar Kompetensi Lulusan Nasional Indonesia sebagaimana diatur dalam Permendikbudristek No. 5 Tahun 2022. Namun, data dari Rapor Pendidikan Nasional selama tiga tahun berturut-turut menunjukkan bahwa capaian numerasi secara konsisten lebih rendah dibandingkan capaian literasi membaca. Numerasi, sebagai keterampilan penting abad ke-21, tidak hanya relevan dalam pelajaran matematika, tetapi juga mendukung kemampuan siswa untuk berpikir kritis dan berkontribusi secara produktif dalam dunia yang dipenuhi data. Kurikulum Merdeka menekankan pentingnya pengembangan numerasi sebagai kompetensi dasar lintas mata pelajaran. Penelitian ini mengeksplorasi pemahaman dan implementasi numerasi lintas kurikulum oleh guru nonmatematika di SD Santa Angela. Pendekatan metode campuran digunakan dengan analisis kuantitatif terhadap respons kuesioner guru serta analisis tematik terhadap data kualitatif terkait pandangan dan pengalaman mereka. Hasil penelitian menunjukkan bahwa meskipun sebagian besar guru memiliki pemahaman yang baik tentang numerasi dan telah mencoba mengintegrasikannya dalam pembelajaran, frekuensi penerapannya masih rendah. Tantangan utama meliputi kurangnya pelatihan, keterbatasan sumber daya, dan waktu untuk perencanaan pembelajaran. Penelitian ini menekankan pentingnya dukungan tambahan dan pengembangan profesional bagi guru untuk mendorong integrasi numerasi yang efektif, serta implikasinya terhadap pengembangan kurikulum di sekolah dasar.

Kata Kunci: *integrasi lintas kurikulum; kurikulum Merdeka; literasi numerasi*

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INTRODUCTION

In the UN General Assembly in September 2015, both developed and developing countries declared the Sustainable Development Goals (SDGs), which are global and national commitments to achieve people's welfare, covering 17 global goals and targets by 2030. The fourth goal is quality education, ensuring that all have access to inclusive, equitable, and quality education. The focus lies on improving the quality of education, empowering teachers, and providing lifelong educational opportunities (Unterhalter, 2019). In this case, teacher competence and efforts are one of the important things to achieve the goals of the SDGs (Hadiapurwa et al., 2024).

The Indonesian government concentrates on improving reading and numeracy literacy skills to achieve the fourth target of the SDGs. This is evidenced by making literacy and numeracy the National Graduate Competency Standard, which is regulated in Peraturan Menteri Pendidikan, Kebudayaan, Riset, dan Teknologi Nomor 5 Tahun 2022, Article 5 Paragraph 2 Point c, which emphasizes the importance of developing literacy and numeracy in students to prepare them to step into the next level of education. Then, the sixth article, g and h outlines the Graduate Competency Standards (SKL) related to literacy and numeracy by detailing that students are expected to show skills and interest in reading and finding information from texts, respond well to their reading, and be able to express their personal experiences and feelings in writing. In addition, it is also expected that students can show the ability to think logically by using concepts, facts, methods, and mathematics to solve existing problems, both related to themselves and the surrounding environment. Along with the SKL, the Computer-Based National Assessment (ANBK) has replaced the National Exam in Indonesia in recent years. Based on Peraturan Menteri Pendidikan, Kebudayaan, Riset, dan Teknologi Nomor 17 Tahun 2021, ANBK includes Minimum Competency Assessment (AKM), character surveys, and learning environment surveys. The main focus of AKM is on literacy and numeracy competencies. This National Assessment focuses on three main aspects: literacy, numeracy, and character building (Asweni et al., 2024).

The results of the National Assessment are processed and reported in the form of an Education Report for each educational unit. In addition to the Education Report Card for education units, the government also makes a National Education Report Card. Based on data from the National Education Report Card for three years, namely in 2021, 2022, and 2023, the results of numeracy skills are consistently lower than those of reading literacy achievements, although it has increased significantly yearly. This happens at all levels of education, from elementary school to high school. Therefore, more efforts are still needed to improve the numeracy competence of students. For example, the following **Figure 1** and **Figure 2** are the results of national reading and numeracy literacy achievements in 2023.

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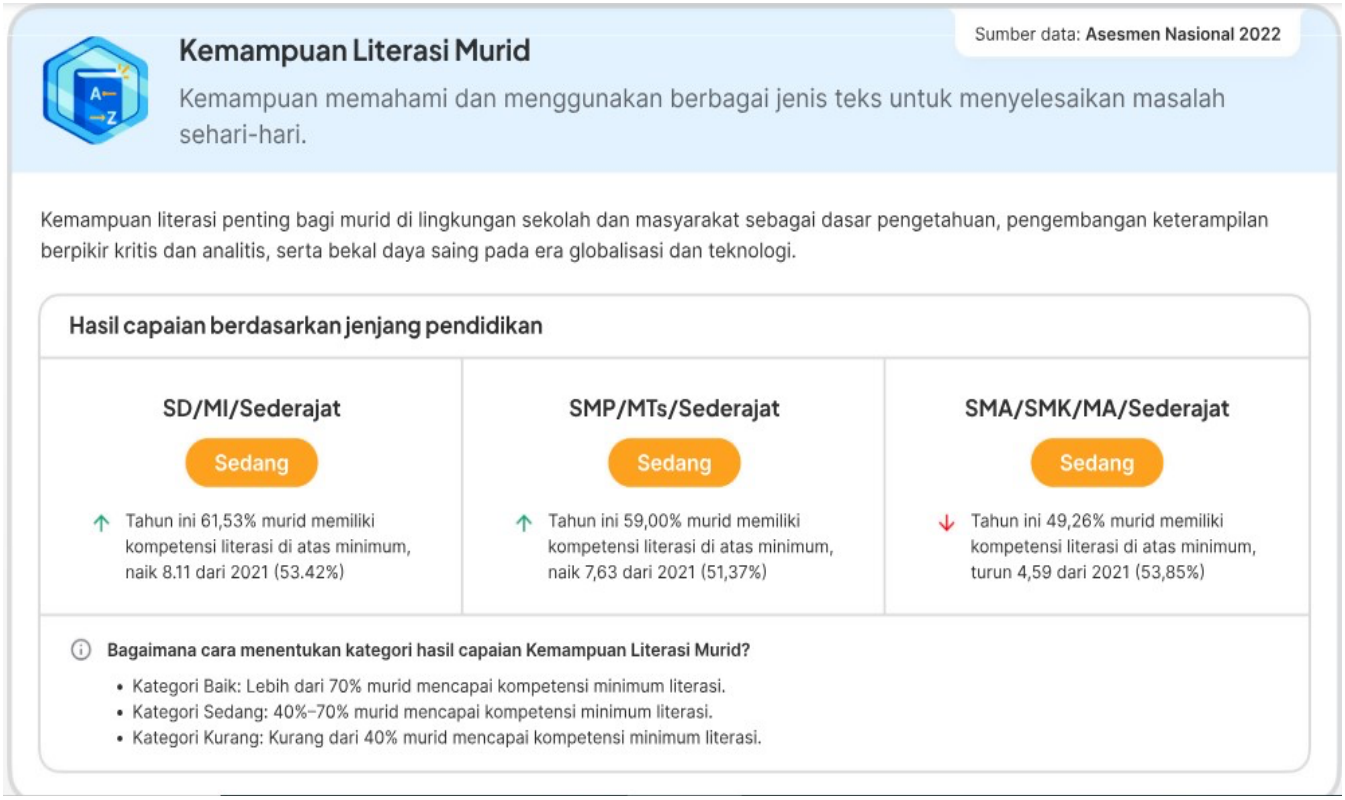

Figure 1. Students Literacy Ability Nationally
Source: Rapor Pendidikan Indonesia 2023

Figure 2. Numeracy Ability of Students Nationally
Source: Rapor Pendidikan Indonesia 2023

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The National Education Report shows that many students struggle to achieve numeracy competence, so more focused efforts are needed to improve their skills. Good numeracy skills will help students complete academic tasks, understand complex reading materials, and think critically. Improving numeracy competencies directly impacts improving the quality of education as a step in preparing students to face challenges in the 21st century (Jusmirad et al., 2023; Rahmasari, 2022).

On the other hand, understanding the term "numeracy" among *education stakeholders*, especially educators or teachers, is also still limited. Most teachers view "numeracy" as only related to mathematics, so the development of numeracy competencies can only be carried out in Mathematics subjects or become the duties and responsibilities of Mathematics teachers. Numeracy means understanding and using numbers and mathematical concepts in daily life. It includes basic skills such as counting, measuring, and interpreting quantitative data, essential for informational and adequate decision-making in various situations (Appulembang et al., 2023; Noerbella, 2022). In education, numeracy is not only limited to mastery of mathematics but also includes the ability to analyze and understand the information presented in numbers, graphs, and tables (Lestari et al., 2023; Mulyati & Watini, 2022). Thus, numeracy is a fundamental skill that every individual must possess. Mastery of numeracy supports academic success and prepares students to contribute productively in an increasingly complex and data-driven society.

Therefore, improving numeracy competence is not enough if only done in mathematics subjects; it must be integrated with various non-mathematical disciplines, often referred to as cross-curriculum numeracy. This cross-curriculum numeracy must begin at the basic education level. In elementary school, cross-curriculum numeracy is essential because it provides a solid foundation for students to develop critical thinking skills and numeracy abilities necessary in daily life. The integration of numeracy in various subjects allows students to see the relevance of mathematics in a broader context, thereby improving their understanding of mathematical concepts and their applications. One of the main reasons cross-curriculum numeracy is important is to prepare students for the challenges of the 21st century. Numeracy skills are required in math lessons and science, technology, languages, and even art. By integrating numeracy into various disciplines, students can develop skills that are more holistic and relevant to the needs of today's society (Lestari et al., 2023). In addition, cross-curriculum numeracy also contributes to increasing students' motivation and interest in learning. Learning that relates the concept of numeracy to everyday situations or themes that interest students can increase their involvement in the learning process (Warsidah et al., 2022).

The Kurikulum Merdeka implemented in Indonesia emphasizes the importance of developing literacy and numeracy as essential competencies that students must master. The Kurikulum Merdeka allows teachers to design more contextual and relevant learning for students' daily lives. Within this framework, teachers are expected to be able to integrate numeracy into various subjects so that students can see the relevance and practical application of numeracy skills in daily life (Asmara & Herwin, 2023). The Kurikulum Merdeka also encourages using more innovative and interactive learning methods, such as project-based and collaborative learning approaches, that can increase student involvement in numeracy learning (Sartini & Mulyono, 2022). In this context, students learn theory and apply their numeracy skills in real-life situations, which helps them understand the importance of numeracy in daily life (Karsiwan et al., 2023). This aligns with Jean Piaget's theory of cognitive development that children of primary school age, who are between 6 and 12 years old, are in the *concrete operational stage* (Husnaeni, 2022; Nuryati & Darsinah, 2021). Students can perform mental operations involving grouping, sequencing, and measurement in the concrete operational stage. They can understand basic mathematical concepts like addition and subtraction and solve problems involving real objects (Fajrin & Maemonah, 2020; Nuryati & Darsinah, 2021). In addition, students at this stage begin to understand the cause-and-effect relationship and can classify objects based on specific characteristics. They can organize information and create

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categories, an important foundation for developing critical thinking skills (Amanaturrakhmah & Samsudin, 2022; Magdalena et al., 2023). Thus, a learning approach integrating numeracy into various subjects can help students relate mathematical concepts to their daily experiences.In general, the Kurikulum Merdeka strives to create a learning environment that supports the development of numeracy competencies by involving parents and the community. Support from the surrounding environment is essential to reinforce learning in school and help students relate numeracy skills to their daily lives (Fathimah et al., 2024; Ihsan, 2022).

SD Santa Angela is an educational unit that implements the Kurikulum Merdeka. The results of the achievement of numeracy competencies of SD Santa Angela Bandung students obtained from the National Assessment data in 2023 have decreased in several indicators. Although it was stated overall that "Most students have reached the minimum level of competence for numeracy skills" and experienced an increase in scores of 10 from the previous year's score, and are included in the "Good" achievement However, it still requires continuous efforts to improve numeracy competence so that all students can possess numeracy competence. The results of the achievement of numeracy competencies at SD Santa Angela in the 2024 Education Report are shown in **Figure 3**.

No	Indikator	Capaian	Skor Rapor 2024	Definisi Capaian	Perubahan Skor dari Tahun Lalu	Skor Rapor 2023	Peringkat di Kab/Kota	Peringkat secara Nasional	Sumber Data
A.2	**Kemampuan numerasi**	Baik (100% peserta didik sudah mencapai kompetensi minimum)	100	Sebagian besar peserta didik telah mencapai batas kompetensi minimum untuk numerasi	Naik **10,00**	90	Peringkat atas (1-20%)	Peringkat atas (1-20%)	Asesmen Nasional 2023
	Proporsi peserta didik dengan kemampuan numerasi di atas kompetensi minimum	Di atas	53,33%	Peserta didik mampu bernalar untuk menyelesaikan masalah kompleks serta non-rutin berdasarkan konsep matematika yang dimilikinya.	Naik **46,66%**	6,67%			
	Proporsi peserta didik dengan kemampuan numerasi mencapai kompetensi minimum	Mencapai	46,67%	Peserta didik mampu mengaplikasikan konsep matematik yang dimiliki dalam konteks yang lebih beragam.	Turun **36,66%**	83,33%			
	Proporsi peserta didik dengan kemampuan numerasi di bawah kompetensi minimum	Di bawah	0,00%	Peserta didik memiliki kemampuan dasar matematika: komputasi dasar dalam bentuk persamaan langsung, konsep dasar terkait geometri dan statistika, serta menyelesaikan masalah matematika sederhana yang rutin.	Turun **6,67%**	6,67%			
	Proporsi peserta didik dengan kemampuan numerasi jauh di bawah kompetensi minimum	Jauh di bawah	0,00%	Peserta didik hanya memiliki kemampuan dasar matematika yang terbatas: penguasaan konsep yang parsial dan keterampilan komputasi yang terbatas.	Turun **3,33%**	3,33%			

Figure 3. Santa Angela Elementary School Numeracy Ability
Source: Rapor Pendidikan SD Santa Angela 2024

Based on the numeracy competency achievement results above, students' ability to apply mathematical concepts in more diverse contexts decreased by 36.66%. This raises the prediction that numeracy was not integrated into various non-mathematics subjects before the 2023 ANBK was implemented. Therefore, strengthening numeracy in non-mathematics subjects is needed so students can apply numeracy in diverse contexts (Getenet, 2022).

There are several previous studies related to this research. For example, the research describes the importance of strategies for strengthening literacy and numeracy for students in the context of the Kurikulum Merdeka Belajar. This study emphasizes the need for cooperation between various parties, including the government, schools, teachers, principals, students, and parents, in improving students' literacy and numeracy skills. This research also shows that strategies to improve literacy and numeracy can be carried out through quality programs initiated by the government, such as the school numeracy literacy movement and minimum competency assessments (Feriyanto, 2022). The other research focuses on the role of teachers in literacy learning in elementary schools to realize the Independent Learning program and emphasizes the importance of literacy in developing students' moral culture and abilities. This study only describes the six types of literacy that need to be taught in elementary schools

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and strategies for strengthening numeracy in general (Marlina & Khoiriyah, 2022). Meanwhile, other research shows that teachers' ability to develop numeracy literacy-based learning designs is still relatively low. The numerical literacy-based learning design studied includes the development of a *Rencana Pelaksanaan Pembelajaran* (RPP) that is integrated with reading and numeracy literacy skills, especially in subjects relevant to literacy and numeracy, such as Mathematics, Indonesian, Science, and Social Sciences (Hadi & Zaidah, 2023).

This research is novel compared to some previous studies that were explained earlier. This research does not focus on strengthening numeracy as an implementation of the Kurikulum Merdeka policy in general, such as the school numeracy literacy movement and minimum competency assessment. Instead, it focuses on the understanding and practice of non-mathematics teachers in integrating numeracy into the learning of various non-mathematics subjects (not only Indonesian, Science, and Social Studies). In addition, this study does not examine the learning design or RPP that is integrated with reading and numeracy literacy skills but identifies the ability of non-mathematics teachers in designing and learning that is integrated with numeracy.

This study aims to identify non-mathematics teachers' understanding of numeracy at Saint Angela Elementary School and to see the extent to which cross-curriculum numeracy was applied in Saint Angela Primary School. In addition, this study identifies teachers' ability to identify non-mathematical learning outcomes that have the potential to integrate numeracy and their ability to design numeracy integration into their subjects.

LITERATURE REVIEW

Numeracy Literacy

The 1959 Crowther (Ministry of Education) report was the first to use numeracy in the UK. The Cockcroft Report 1982 defined numeracy as numeracy involving numbers and the ability to do math to handle everyday numeracy needs. In 2008, an education expert, Peter Westwood, stated that numeracy is the ability to process, communicate, and interpret numerical data in various mathematical contexts. In contrast, according to PISA 2021, mathematical literacy is a person's ability to think mathematically and use mathematics in real-world situations (Nurgabyl et al., 2023).

According to the Directorate of Elementary Schools of the Ministry of Education and Culture of the Republic of Indonesia, the ability to use basic mathematical symbols and numbers is called numeracy literacy, to solve practical problems in various everyday contexts, analyze information in the form of graphs, tables, and charts, and use the results of analysis to predict and make decisions. This helps us understand a world full of numbers and data and reason systematically and critically when solving problems and making decisions in different contexts. Using mathematical numbers and symbols can help solve problems and make decisions or actions to be taken. Meanwhile, presenting information through graphs, tables, and charts can help people understand information more quickly (Diva et al., 2022).

Mathematical competence is not the same as numerical ability. They have identical knowledge and abilities but differ in how these knowledge and skills are empowered. Numeracy skills are not acquired by just learning mathematics. Numeracy includes applying mathematical ideas and principles in everyday situations, where problems are often unstructured, relate to non-mathematical factors, and have many ways to solve problems or even no way. They learn to divide whole numbers by other integers. For example, students are typically trained to write a quotient with a remainder and then express the quotient in decimal form. A precise quotient (with decimals) is often unnecessary because rounding is often done. Mathematically, rounding down applies if the decimal value is less than 5, rounding up occurs if the decimal value is greater than 5, and rounding up or down occurs if the decimal value is equal to 5.

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However, in real life, this rule does not always apply. In this example, If 40 people can be transported in a minibus that can accommodate 12 people, then the minibus required to accommodate everyone is 3.333333, which is absurd, so it is rounded to 3. However, four minibusses should have been booked because one person can only occupy one seat. In other words, numeracy requires mathematical knowledge taught in schools. However, learning mathematics does not constantly improve numeracy skills (Sudarti, 2022).

The basic principles of numeracy literacy are: 1) It is contextual, following the geographical and socio-cultural situation, and so on; 2) Aligns with the math topics taught in school; 3) Interdependence and improves other elements of literacy. The scope of numeracy literacy is shown in the following **Figure 4**.

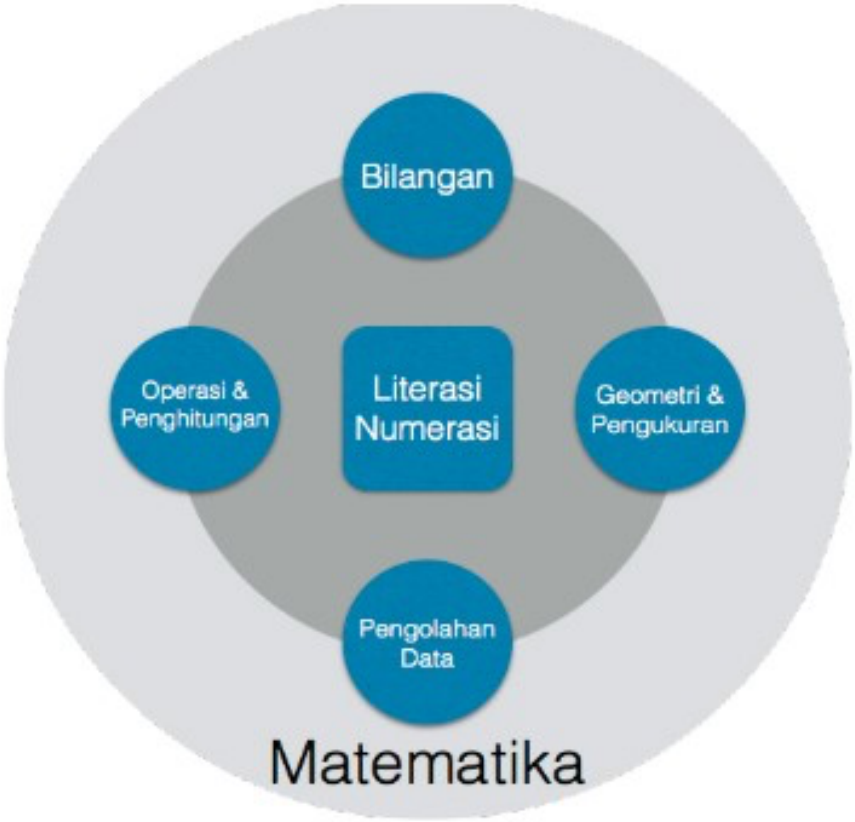

Figure 4. Structure of Numeracy Literacy
Source: Materi Pendukung Literasi Numerasi 2017

Mathematics is part of numeracy literacy. The ability to process numbers is helpful in everyday life, related to understanding societal problems, professional expertise, and entertainment (such as understanding sports scores), and plays a role in human culture and knowledge. From this explanation, it can be seen that the ability to master numbers is not only limited to mathematics lessons but also intersects with other literacy skills, such as civic and cultural literacy.

Numeracy literacy is part of mathematics. Thus, the components of numeracy literacy are taken from the scope of mathematics in the curriculum, as seen in the following **Table 1**.

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Table 1. Components of Numeracy Literacy Its Scope

No.	Component	Scope
1	Estimation and calculation using integers	Numbers
2	Use of decimal numbers, percentiles, fractions, and comparisons	Numbers
3	Identify and use relationships and patterns	Numbers and Algebra
4	Applications of spatial reasoning	Geometry and Measurement
5	Using measurements	Geometry and Measurement
6	Interpreting statistical data	Data Processing

Source: Materi Pendukung Literasi Numerasi 2017

Numeracy literacy is developed not only in schools but also in the family and community environment. Some indicators need to be considered when implementing numeracy literacy in various environments. The following **Table 2** shows numeracy literacy indicators in schools.

Table 2. Numeracy Literacy Indicators in Schools

Class Base	School Culture Base	Community Base
1. Number of mathematics and non-mathematics teacher training; 2. The number of problem-based mathematics learning and project-based mathematics learning; 3. The amount of non-mathematics learning involving elements of numeracy literacy; 4. Students' math scores; and **5.** Mathematics scores in PISA/TIMSS/INAP.	1. Number and variety of numeracy literacy books; 2. Frequency of borrowing numeracy literacy books; 3. The number of information presented in the form of a numeracy presentation; 4. Access online sites related to numeracy literacy; 5. Number of numeracy literacy month activities; 6. Allocation of funds for numeracy literacy; 7. The existence of a school literacy team; and 8. There is a school policy regarding numeracy literacy.	1. The number of public spaces in the school environment for numeracy literacy; 2. The number of parent involvement in the school literacy team; and 3. The number of sharing sessions by the public regarding numeracy literacy.

Source: Materi Pendukung Literasi Numerasi 2017

Numeracy literacy indicators in the family are as follows 1) The number and variety of numeracy literacy reading materials owned by each family; 2) Increase the frequency of use of numeracy literacy reading materials; and 3) Increase the frequency of opportunities for children to apply numeracy in daily life (opportunity, not chance).

Numeracy literacy indicators in the community follow 1) The number and variety of numeracy literacy reading materials owned by public facilities; 2) Increase the frequency of use of numeracy literacy reading materials; 3) Improving the ability to use numeracy data in decision-making that has an impact on the community (example: in the use of village budgets); and 4) The number of information presented in the form of a numeracy presentation (e.g., a graph of the frequency of borrowing books in the library).

Based on these indicators, the government has created a National Literacy Movement program, including the numeracy literacy movement. The numeracy literacy movement includes the numeracy literacy movement in schools, families, and communities. Furthermore, several things related to the numeracy

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literacy movement in schools will be explained only because the most related to the research to be carried out will be explained.

Targets of the numeracy literacy movement in schools are seen in **Table 3**.

Table 3. Targets of the Numeracy Literacy Movement in Schools

Class Base	School Culture Base	Community Base
1. Increasing teacher training for both mathematics and non-mathematics; 2. Increased use of numeracy in learning; 3. An increase in math learning methods that focus on problem-solving and projects; 4. Increasing the application of numeracy literacy in non-mathematics learning; and **5.** Increasing mathematical achievement in the Pisa/TIMSS/INAP test.	1. Increasing the number and variety of numeracy literacy reading materials; 2. Increasing the frequency of borrowing numeracy literacy reading materials; 3. Increasing the number of numeracy literacy activities in schools; 4. An increase in the number of information presentations in the form of numeracy presentations (e.g., graphs of the frequency of borrowing books in the library); 5. There is a school policy regarding numeracy literacy; 6. Increasing access to online sites related to numeracy literacy; 7. The availability of funds allocation for numeracy literacy; and 8. The availability of a school literacy team.	1. An increase in the number of facilities and infrastructure that support numeracy literacy in schools and 2. The increasing involvement of parents and the community in developing numeracy literacy in schools.

Source: Materi Pendukung Literasi Numerasi 2017

To support the development of numeracy literacy for each student, the School Numeracy Literacy Movement focuses on implementing cross-curricular numeracy literacy, a consistent and comprehensive method for applying numeracy in all school subjects. To realize this strategy, several things need to be done: increasing the capacity of facilitators, increasing the type and number of quality learning resources, increasing public engagement, increasing the scope of learning participants, and improving governance. Strengthening the capacity of facilitators is carried out by providing training for mathematics and non-mathematics teachers and staff, as well as educating prospective teachers.

1. Training mathematics teachers in applying problem-based learning methods and project-based learning involving problems that arise daily. Mathematics teachers are also trained to select, create, and modify everyday problems that can be used in classroom learning and for learning assessment. In addition, teachers are also equipped to give assignments or homework that can involve family members in numeracy literacy
2. Non-mathematics teachers should be trained in using mathematics to enrich the presentation of information in the subjects they are taught, for example, by using data displayed in tables, charts, or graphs. In this way, learners can see how to use mathematical concepts and skills within other fields of study that can help them understand concepts within that field of study. At the same time, students have the opportunity to apply mathematical concepts and skills outside of math learning hours. The following **Table 4** is an example of cross-curriculum numeracy for several non-mathematics subjects.

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Table 4. Examples of Cross-Curriculum Numeracy

Subject	Example
Science	Estimate the growth of living things and express predictions by making a chart.
Social Science	Make a graph of personal water use and compare it with water availability in various regions of Indonesia.
Language	Comparing Maths terms that have different meanings in everyday life
History	Using bar charts to compare food supplies in World War II
Fine Art	Estimate the space needed to draw with the right proportions.
Physical Education Sports and Health	Calculating calories burnt for a specific physical activity

Source: Materi Pendukung Literasi Numerasi 2017

3. The information presented during staff skills training is usually just text, but it can be enriched now with numerical elements. Library workers, for example, can use pie charts, tables, and graphs to show the number of book borrowers each month by gender, genre, and so on.
4. Teacher education: providing prospective teachers with knowledge and numeracy literacy skills.

Several steps are taken to improve the quality and variety of learning resources:

1. Provides various types of books related to numeracy, including fiction, nonfiction, and references.
2. One Teacher One Book initiative, especially for mathematics teachers, to produce books related to numeracy.

In addition, efforts to expand the availability of learning materials and involve more students are carried out through:

1. Develop supporting facilities by using the school environment to learn numeracy and create an attractive environment for numeracy. One example can be seen in the illustration **Figure 5** below.

Figure 5. School as a Numeracy Learning Medium
Source: Materi Pendukung Literasi Numerasi 2017

2. Pustekkom (Information and Communication Technology Centre) provides access to information and online learning resources regarding numeracy literacy.

The numeracy literacy movement in schools is insufficient to be carried out only in the school environment. However, it is also necessary to increase public involvement through the following ways:

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1. Holding sharing sessions by inviting the general public to introduce how they use mathematics in their work and daily life.
2. Carry out the Numeracy Literacy Month event with the following steps:
   a. Inviting parents and the community to participate in numeracy literacy activities with children, as well as making numeracy aids or games to be used at home;
   b. Featuring inter-disciplinary collaborative projects involving numeracy as a key element, which students have worked on as part of Project-Based Learning;
   c. Showing various books that focus on numeracy literacy.

Improving management and regulation is no less important in supporting the numeracy literacy movement in schools. These reinforcements include:

1. Budgets should be provided to support actors, diversify learning resources, provide facilities, and facilitate numeracy literacy activities.
2. Forming a School Literacy Team consisting of principals, supervisors, teachers, and student-parent representatives to supervise school literacy activities.
3. The establishment of school policies that emphasize the importance of numeracy literacy, the definition of numeracy literacy, and the involvement of all teachers and staff in numeracy literacy.
4. Strengthen the relationship between parents and teachers to build cooperation in numeracy literacy.
5. Provide space in schools to display information related to numeracy literacy, such as bulletin boards.

Integrated Curriculum Organizing

Curriculum design and development are related to the organization of the curriculum. Curriculum organization is the selection, determination, and mapping of the content of the scope of material contained in the curriculum objectives. In addition, curriculum organization is also related to mapping learning activities and assignments that align with curriculum goals. Taba (1962) explained that if the curriculum is interpreted as a learning planner, then the content and planning of learning must be organized so that the content and experience achieve the learning objectives. He also mentioned that organizing the curriculum is a challenging and complex stage. Therefore, it takes caution and strong consideration in selecting and mapping each content and learning experience following the goals and support of curriculum inputs (Ibad, 2024).

The curriculum is organized in a very diverse way. In her book Developing the Curriculum, Oliva (1992) recommends several approaches and varieties of organizing the curriculum for each level of education that is adapted to the past, present, and future (Coşkun-Yaşar & Aslan, 2021). The curriculum designer and developer's insight and theory influence the development of what is needed and recommended to students. Some of the forms of curriculum organization can be different at each level.

Curriculum organization is commonly known in curriculum development as the core curriculum, subject-centered matter, broad-field curriculum, connected curriculum, and integrated curriculum (Ghani & Triono, 2024). Alberty (in Oliva, 1992) classifies five types of curriculum organization, namely 1) single subject subjects; 2) two or more interrelated subjects; 3) two or more integrated subjects; 4) *block of time*; 5) learning activities that are built cooperatively between teachers and students with the principles of freedom and specialization.

In addition to the classification of curriculum organization mentioned by Alberty above, regarding the organization of a curriculum that integrates two or more subjects, one of the theories of integration law refers to Fogarty, who is of the view that the main priority in designing an integrated curriculum is a curriculum that is integrated, coherent, and authentic. He mentioned 10 models that can be used and adopted by curriculum developers and teachers to organize multidimensional and interrelated skills and insights.

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These ten models are grouped into three categories of discipline integration or subject areas, namely 1) a group of one subject; 2) across a variety of subjects, namely sequence, shared, webbed, threaded, and integrated models; 3) Inside the mind of the learner, that is, immersed and networked.

1. The cellular model is analogous to a periscope, whose integration model focuses on one direction of disciplines studied separately with their respective standards. For example, Indonesian subjects, Literature, Mathematics, Biology, etc.
2. The connected model is analogous to an opera glass, where the integration focus is the interconnection of a scientific field or subject. For example, teachers associate the concepts of grammatical, lexical, and effective sentences with the topic of descriptive texts, narratives, and expositions in Indonesian subjects. Then, the study of the text is taught in a certain period or a specific topic
3. The nested model is analogous to a 3D lens, where multi-dimensional abilities are integrated into a single topic or unit of learning. This model focuses on various abilities in one specific science formulated in the competency standard. For example, in social studies lessons, various abilities or competencies are developed from geography, history, economics, and sociology knowledge that are specially arranged to form certain materials or topics. The essential competencies of social studies also include social issues formulated with a cross-disciplinary and multidisciplinary approach.
4. The sequenced model is analogous to glasses, where internal content in various topics is related. Each topic or unit of study is structured and rearranged, continuing between related subjects. For example, Indonesian teachers teach non-fiction narrative texts through biographies of independence figures, and history teachers teach the roles of independence figures in Indonesian independence history.
5. The shared model is analogous to binoculars, looking at similar concepts and skills in two disciplines. This model organizes similar ideas, concepts, and skills but is placed in two different subject perspectives. For example, in Indonesian and Mathematics lessons, teachers teach information by sorting it into tables, graphs, or diagrams, where graphs and diagrams are from a mathematical perspective and non-verbal information descriptions are from a language perspective.
6. The webbed model is analogous to a telescope, with a wide range of views related to subjects in a single theme. This model is often known as a thematic approach, where various subjects are integrated into a significant theme. For example, in the theme "Diriku," related subjects include Indonesian, Mathematics, Religion, Sports education, and Health.
7. Threaded models are analogous to magnifying glasses, where broad concepts are magnified through a meta-curricular approach. For example, teachers teach the ability to predict. In the Indonesian subject, students learn information prediction; in Mathematics, they predict opportunities; and in Social Sciences, they predict the impact of social issues. The ability to predict is assembled in three subject contexts of the three subjects.
8. The integrated model is analogous to a kaleidoscope, where new patterns and designs use the essential elements of each subject. This is similar to *the shared model.* For example, teachers in social studies, Indonesian language, and arts look for similar content patterns and approaches in each subject.
9. Immersive models are analogous to microscopes, allowing content exploration to be filtered through the lens of expertise and specialization. Each individual can integrate all the data and channel ideas from each field and subject discipline of interest. For example, students can choose a field of expertise concentration according to their specialization in various cross-courses.

The networked model is analogous to a prism, which is a view that creates a multi-dimensional and multi-directional focus. This model integrates all learning resources, including inputs and novelties that have not been explored and defined. For example, a learning technology expert adopts social media applications as a reference in learning activities and media even though they are still new. 21st-century

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learning is learning that prepares students to have the ability to think creatively, critically, and innovatively and master technology (Haryanto et al., 2024). Then, it integrates various social media concepts, learning development, learning content, student development and characteristics, and various other concepts. In this study, the researcher adopted the nested model as a reference in infusing the numeracy content. This model is also known as the nested model because there are a variety of abilities in social studies subjects, namely knowledge, skills, attitudes, values, and practices of citizens (Bank, 1990).

Pedagogic Competence of Teachers in Numeracy

According to Standard Nasional Pendidikan, Pasal 28 ayat (3), butler stated that: "Pedagogic competence is the ability of teachers to manage student learning which includes understanding students, learning design and implementation, evaluation of learning outcomes, and student development to actualize the various potentials they have." According to Peraturan Menteri Pendidikan Nasional Nomor 16 Tahun 2007 tentang Standar Kualifikasi Akademik dan Kompetensi Guru, Pedagogic competency standards include several indicators, namely 1) mastering the characteristics of students; 2) mastering learning theories and learning principles; 3) developing the curriculum; 4) educational learning; 5) utilizing ICT; 6) developing the potential of students; 7) communication with students; 8) conducting assessments and evaluations; 9) using the results of assessment and evaluation; and 10) taking reflective action.

According to Shulman (1987), pedagogical content knowledge (PCK) is the ability to understand how to organize and represent a topic, material, or problem in learning to accommodate students' differences in ability and interest. Knowledge of pedagogical content includes not only knowledge of how to teach and what is taught in schools to students but also knowledge of students, both from cognitive and affective aspects, as well as knowledge of the social, cultural, and political conditions of the student's learning environment. Knowledge of pedagogical content can make learning effective because this knowledge includes how to convey learning materials, interact with students, and reflect on instructions during learning (Radite & Sulistyawati, 2023).

Meanwhile, Undang-Undang Republik Indonesia Nomor 14 Tahun 2005 Tentang Guru dan Dosen defines knowledge of mathematical content (numeracy) or professional knowledge as the ability to master concepts, principles, and their relationships in mathematics (numeracy) in depth. Knowledge of mathematical content (numeracy) can also be interpreted as the number of mathematical knowledge organizations owned by teachers, including conceptual knowledge, procedural knowledge, and the interconnectedness of each concept.

The combination of numeracy content knowledge and pedagogical content knowledge makes numeracy pedagogical content knowledge unique because, in addition to understanding science, philosophy, and mathematical dimensions, it must also be able to integrate it into learning activities so that learning goals are achieved (Astuti & Jailani, 2020; Novikasari, 2020). Numeracy pedagogical content knowledge is a competency that is indispensable for teachers in designing and implementing numeracy across curricula. Without this, teachers will have difficulty determining the appropriate learning strategy and the numeracy content to be integrated.

Implementation of Education Policy

The term implementation in the Great Dictionary of Indonesian (KBBI) means implementation or application. Implementation is usually associated with an activity to achieve a specific goal. Webster's dictionary briefly formulates that to implement means to provide the means for carrying out, to give practical effect. This definition means that implementing something must be accompanied by supporting means that will later have an impact or consequences on something (Yuliah, 2020).

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Policy is a translation of policy, which is sourced from English. The word policy can also be interpreted as a plan for an activity that contains goals that will be proposed and decided by the government, political parties, and others. Etymologically, the word policy comes from the Greek word "*polis*" which means city. Policy is a decision made for an institution or state apparatus responsible for the executive, legislative, and judicial fields. Policies are made to carry out the country's objectives. The policy here is that the government makes decisions through deliberations with several institutions (executive, legislative, and judicial) so the community can move forward. Therefore, policies are taken that can be decided and provide a way of life in society (Azza et al., 2021).

Policy implementation is a dynamic process where policy implementers carry out an activity or activity so that, in the end, they will get a result following the policy's goals or objectives. Wahab (2008) stated that policy implementation encompasses actions by public or private individual groups directed to achieve objectives outlined in prior decisions. Winarno said that policy implementation aims to achieve specific goals with certain means and in a specific time order. Mufiz said that policy implementation is carried out to implement a policy. It can be concluded that policy implementation is the process of implementing, implementing, and pursuing policy decisions and the alternatives that have been decided to obtain a result following a policy's goals or objectives. Policy implementation aims to set a direction to realize policy objectives (Yuliah, 2020).

Several theories and models of education policy implementation exist, including those of Brian W. Hogwood and Lewis A. Gunn, Van Meter, Van Horn, Daniel Mazmanian, and Paul A. Sabatier.

1. Policy implementation theory with the Down approach (Brian W. Hogwood dan Lewis A. Gunn)
   There are several conditions for the policy to be implemented perfectly, namely 1) the external conditions faced by the implementing agency or agency will not cause severe disturbances and obstacles; 2) the availability of sufficient time and resources for the implementation of the program; 3) the combination of necessary resources are available; 4) the policy to be implemented is based on a reliable causality relationship; 5) causality relationships are direct and have few links; 6) interdependence relationships must be few; 7) deep understanding and agreement on goals; 8) tasks are detailed and placed in the correct order; 9) communication and perfect coordination, and; 10) those who have authority and power can demand and obtain perfect obedience.
2. A model of the policy implementation process (Van Meter dan Van Horn)
   Van Meter and Van Horn (1975) stated that a policy must affirm specific standards and goals that policy implementers must achieve. Policy performance is an assessment of the achievement of these standards and targets. More simply, performance is the degree of accomplishment. Van Meter and Van Horn (1975) then attempted to create the following policy typology 1) the number of changes that will be produced; and 2) the scope or scope of agreement on the objectives among the parties involved in the implementation process. Six variables can increase clarity between policy and implementation performance, namely 1) policy standards and objectives; 2) communication between organizations and activity measurement; 3) organizational characteristics of communication between organizations; 4) social, economic, and political conditions; 5) resources; and 6) the attitude or character of the implementer.
3. A framework for implementation analysis (Daniel Mazmanian dan Sabatier)
   An important role of the analysis of the implementation of state policy is to identify the variables that affect the achievement of formal goals in the implementation process. The variables in question can be classified into three broad categories, namely 1) whether the problem will be tackled to be controlled; 2) the ability of the policy decision to structure the implementation process appropriately; and 3) the direct influence of various political variables on the balance of support for the goals contained in the policy decision.

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4. Theories and models developed by George C. Edwards III
   There are four crucial factors or variables in implementing public policies: communication, resources, disposition or attitude, and bureaucratic structure.

As explained by Hasbullah (2015), four (4) approaches can be used to implement education policies, namely (Yuliah, 2020).

1. Structural approach
   This is one of the top-down approaches. It views that every policy, including education, must be designed, implemented, and evaluated structurally. This approach also emphasizes the importance of command and supervision according to stages or levels in the structure of each organization. This approach is hierarchical-organized, so it is relevant for implementation situations where a multi-level implementing organization with a high pattern of policy change is needed.
2. Procedural and managerial approaches
   This approach was developed to address the weaknesses of the structural approach. This approach seeks to develop relevant processes and procedures, as well as managerial procedures and management techniques.
3. Behavioral approach
   This approach lays the foundation for all orientations of policy implementation activities on human behavior as implementers rather than on the organization, as in the previous two approaches. This approach assumes that reasonable policy implementation efforts are if human behavior and all attitudes must also be considered and influenced so that the policy implementation process can occur well.
4. Political approach
   This approach looks more at political or power factors that can facilitate or hinder the policy implementation process. The political approach always considers monitoring follower and opposition groups and their dynamics. In this approach, it is possible to use coercion from the dominant group.

According to Charles O Jones in Gaffar, policy implementation has three main stages: organization, interpretation, and application (Azza et al., 2021).

1. Organization is the formation or rearrangement of existing resources, units, and methods to carry out planned programs.
2. Interpretation is socialization activities and policy briefings so that the planned programs are accurate and can be accepted and implemented.
3. Application related to routine equipment for services, payments, or others adjusted to the goals or program equipment will later become a benchmark for the policy's success.

METODE

This study uses a mixed-method approach. The mixed method is a research approach combining qualitative and quantitative elements in a single study. This approach aims to provide a more comprehensive understanding of the phenomenon being studied by leveraging the strengths of each method. According to Onwuegbuzie et al., mixed-method research is a research design that uses qualitative and quantitative data collection and analysis techniques in parallel or sequential phases (Anguera et al., 2020). This approach allows researchers to explore the complexity of social phenomena more profoundly and broadly (Azer et al., 2022).

The subject of this study is a non-mathematics teacher at SD Santa Angela Bandung. Participants are selected purposively, namely, teachers who teach non-mathematics subjects. The number of participants

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in this study is 22, consisting of teachers who teach Indonesian, Science and Technology, Pancasila Education, Fine Arts, Music Arts, English, Religion, Informatics, and other subjects. This study aims to get an overview of these teachers' understanding of numeracy and how they apply numeracy integration in their learning.

The main instrument used in this study is a questionnaire distributed to teachers of non-mathematics subjects. The questionnaire contains.

1. Closed questions are designed to measure non-math teachers' understanding of the meaning of counting and how often they integrate numeracy into their lessons. The answers from this section will be analyzed quantitatively to produce the percentage of teachers who already understand numeracy and the percentage of teachers who have integrated numeracy into their subjects. This data will be presented in the form of tables and graphs.
2. Open-ended questions that ask teachers to explain in detail what they understand about the meaning of numeracy and their experience integrating numeracy into learning. This answer will be analyzed qualitatively, namely through thematic analysis. This process involves grouping similar responses and identifying patterns or trends in the teacher's narrative.

To ensure the validity and reliability of the instrument, the questionnaire used in this study was trialed with a small number of teachers before being used more widely. Input from the trial was used to refine the questions so they were easy to understand and followed the research objectives. In addition, qualitative data was reconfirmed by the triangulation method by comparing the analysis results with observation notes or brief interviews conducted with several teachers as verification.

RESULTS AND DISCUSSION

Santa Angela Elementary School Non-Mathematics Teacher's Understanding of Numeracy

Understanding the meaning of numeracy is the first step for non-math teachers in applying numeracy throughout the curriculum.

Data on their understanding of numeracy were obtained by questionnaires to 22 non-mathematics teachers at Santa Angela Elementary School, as shown in **Figure 6**.

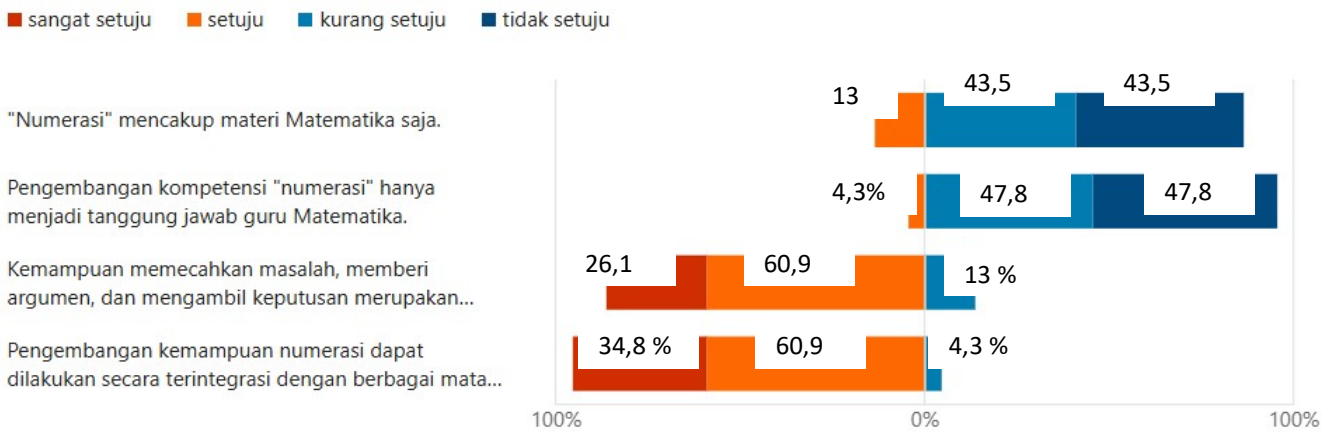

Figure 6. Saint Angela Non-Mathematics Teacher's Understanding of Numeracy
Source: Researcher Questionnaire Response 2024

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As many as 87% of non-math teachers at SD Santa Angela already understand that the scope of numeracy is not only limited to math material but also includes the ability to solve problems, make arguments, and make decisions. They also understand that the development of numeracy skills can be integrated with various non-mathematics subjects. This is believed to be the case by 95.7% of teachers. In other words, they realize that not only Mathematics teachers are responsible for developing students' numeracy competencies, but all teachers. However, the study results show that there are still teachers who do not understand the meaning of numeracy, so they still argue that the development of numeracy competencies cannot be carried out across subjects but only in learning Mathematics. The results of this study were confirmed through the respondents' qualitative answers. Through the thematic analysis carried out, there are three types of answers given, namely: the first group of teachers argues that numeracy is only limited to the ability to calculate in mathematics; the second group is of the view that numeracy is related to the concept of numbers or counting used in daily life; and the last group has a view of numeracy in a broader or complex context following the meaning of numeracy explained by the Directorate of Elementary Schools of the Ministry of Education and Culture of the Republic of Indonesia. Namely, numeracy is the ability to use basic mathematical symbols and numbers, called numeracy literacy, to solve practical problems in various daily contexts, analyze information in the form of graphs, tables, and charts, and use the results of the analysis to predict and make decisions (Gusteti, 2023).

Based on the data obtained, some teachers still think that numeracy is the same as mathematics. Meanwhile, mathematical competence is not the same as numerical ability. They have identical knowledge and abilities but differ in how these knowledge and skills are empowered. Numeracy skills are not acquired by just learning mathematics. Numeracy includes applying mathematical ideas and principles in everyday situations, where problems are often unstructured, relate to non-mathematical factors, and have many ways to solve problems or even no way to solve them (Mutaf-Yıldız et al., 2020). Then, teachers also need to understand that numeracy reinforcement is carried out in mathematics and non-mathematics subjects. This is called cross-curriculum numeracy as part of the National Literacy Movement. By understanding the meaning of numeracy and the strategy of the national literacy movement through cross-curriculum numeracy, non-mathematics teachers can be more aware of their role in strengthening students' numeracy competencies through the subjects they teach. This understanding can be related to the meaning of numeracy, who needs to participate in developing numeracy competencies, and how to develop numeracy competencies.

Implementation of Cross-Curriculum Numeracy at SD Santa Angela

Based on a more comprehensive understanding of numeracy, the strengthening or developing of students' numeracy competencies needs to be carried out throughout the curriculum, not only in Mathematics learning (Sitopu et al., 2024). It involves other education stakeholders, such as students' parents and the community. It can be said that strengthening numeracy competence is carried out not only in the classroom or school environment but also in the home environment and the community around students. For example, when students go shopping, watch the news, travel, and so on.

This study found that most Santa Angela Elementary school teachers have at least integrated numeracy into their non-mathematics subjects. However, they did not realize that numeracy was being applied across the curriculum then. The frequency of integration of this numeracy is still very varied. Some teachers have often done numeracy integration, some still do it sometimes, some rarely, and some have never done it. **Figure 7** is the numeracy integration frequency data obtained during the two years of learning.

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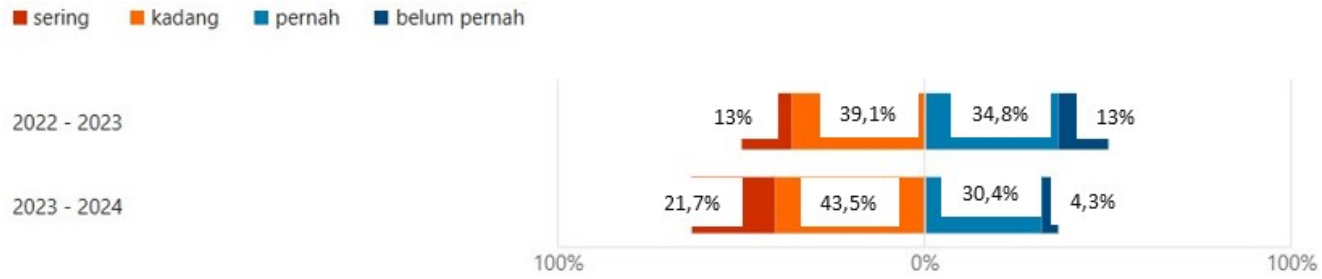

Figure 7. The Frequency of Integrating Numeracy at Santa Angela Elementary School
Source: Researcher Questionnaire Response 2024

In the 2022-2023 school year, as many as 86.9% of non-mathematics teachers already have experience integrating numeracy, while in the 2023-2024 school year, 95.6% of non-mathematics teachers have integrated numeracy. This is due to an increase in the number of teachers who frequently and sometimes integrate numeracy into their non-mathematics learning, while the number of teachers who have never integrated numeracy is decreasing. The data in the chart shows that in 2023-2024, there will be an increase of 8.7% in the number of teachers who are increasingly integrating numeracy compared to the previous school year. An increase of 4.4% occurred in the percentage of teachers who sometimes integrate numeracy into non-mathematics learning. Meanwhile, the percentage of teachers who have and have never integrated numeracy decreased in the 2023-2024 school year. The percentage for the "never" category decreased by 4.4% and for the "never" category by 8.7%. These data indicate an increase in the understanding of non-mathematics teachers at SD Santa Angela towards numeracy and awareness of the implementation of numeracy across the curriculum to strengthen the numeracy competence of their students. **Table 5** supports this by explaining the following examples of numeracy integration experiences.

Table 5. Examples of A Numeracy Integration Experience

Subject	Forms of Numeracy Integration
Science	☞ Calculating the scale of the map ☞ Counting the length of time, foreign nations colonized Indonesia ☞ In Project-Based Learning about hatching chicken eggs, calculating the amount of chicken feed needed by several chicks, weighing chicken feed, and calculating the time it takes for chicken eggs to hatch ☞ Counting the calories on my plate
Religious Education and Ethics	☞ Students are assigned to create a table of self-development activities within a week. In the table, students calculate the duration they need to do activities, especially in self-development or talents.
Indonesian Language	☞ Giving time limits in doing assignments/exercises (knowing the time) and teachers use timers on smart boards. ☞ Provides a minimum limit on the words that must be used in creating sentences ☞ Searching for information from infographics, creating comparative sentences, and making conclusions from a text ☞ When studying poetry, I ask students to count the lines in each stanza and the number of stanzas in a poem. They were also asked to analyze how the writer used rhyme and rhythm in the poem.
Pancasila Education	☞ Limiting time in doing assignments/exercises ☞ Calculate the likelihood of this happening using logic and percentages ☞ Providing story questions to train problem-solving skills, especially related to the practice of Pancasila values; discussing the problem of determining the theme and

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Subject	Forms of Numeracy Integration
	concept of work; and applying how to argue with common sense without anyone having to fight each other.
Art	☞ To make toys from used cardboard, they have to measure the length and width of the used cardboard to make a pattern for the toy to be made. After that, they also estimate the number and size of ribbon lengths or other accessories needed to complete the toys from the cardboard. ☞ The concept of comparison/ratio in drawing objects so that the image is proportional/in harmony with the real object.
Sundanese	☞ Students calculate the duration of the "Kaulinan Barudak" activity in the field.
Physical Education Sports and Health	☞ Students are assigned to calculate the score or points obtained in a match to win or enter the next round.
Informatics	☞ Students take data or samples from the surrounding environment (number of books, height, weight, etc.), then group and sort the objects or objects and relate them to everyday experiences.
English	☞ Learn to read Roman numerals and write them down in English or vice versa. ☞ Measuring the weight of fruits with a scale ☞ Calculate and convert temperature in degrees centigrade to degrees Fahrenheit or vice versa
Music Art	☞ In the art of music, there are notes/notes with a sound value, both in frequency and duration of time/beat. Students analyze so that the notation can be sounded into a song.
Counseling Guidance	☞ Calculate the duration of time it takes to create a daily schedule
Interdisciplinary Collaboration Project	☞ Students compile a report using tables/graphs/diagrams according to group agreement in the form of power points, then present.

Source: Researcher Questionnaire Response 2024

Integrating numeracy in non-mathematics learning is a manifestation of one of the strategies of the numeracy literacy movement initiated by the government, namely cross-curriculum numeracy. Increasing the application of numeracy literacy in non-mathematics learning is one of the indicators of the classroom-based school numeracy literacy movement. In addition to strengthening numeracy skills, implementing numeracy across the curriculum also strengthens understanding or ability in related non-mathematics subjects. The implementation of cross-curriculum numeracy is one of the efforts that significantly supports the success of the National Literacy Movement and the achievement of sustainable development goals to produce a generation of the nation with 21st-century competencies (Gilbert, 2019).

The implementation of numeracy across curricula is organized using an integrated curriculum. The integration model used is the nested model. The nested model is analogous to a 3D lens, where multidimensional abilities are integrated into a single topic or unit of learning. This model focuses on various abilities in one specific science formulated in the competency standard (Meher & Panda, 2021). In this context, numeracy competencies are integrated into the topics of various non-mathematics subjects.

Teachers' Competency to Design Cross-Curriculum Numeracy Learning

This study identifies the pedagogical content knowledge of non-mathematics teachers to see the opportunities and obstacles for teachers in implementing cross-curriculum numeracy more optimally. The data obtained related to teachers' ability to identify learning outcomes (CP) of non-mathematics subjects is illustrated in the following diagram shown in **Figure 8**.

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Figure 8. The Ability of Teachers To Identify Learning Outcomes (CP) Of Non-Mathematics Subjects
Source: Researcher Questionnaire Response 2024

The diagram above shows that as many as 86.9% of non-mathematics teachers have identified learning outcomes that numeracy can integrate. As many as 13% of teachers have been unable to do so. However, not all teachers who have been able to identify CP can automatically generate inspiration about numeracy that can be integrated into the CP. This can be seen in the percentage of teachers who can be considered to have this ability, which is 78.2%, lower than the percentage of teachers who can identify CP. Still, 21.7% of teachers do not know about numeracy that can be integrated into their subject CP. This group likely consists of teachers who have also been unable to identify CP.

There are several obstacles conveyed by respondents in implementing numeracy across curricula, both from respondents who are experienced and inexperienced in implementing it. Teachers' lack of understanding of the meaning of numeracy and how to integrate it into non-mathematical learning (lack of literacy), teachers only focus on the non-mathematical subject matter they are taught, teachers have not been able to identify CPs that have the opportunity to be integrated by numeracy, and limited time in preparing for numeracy learning across curricular are examples of obstacles on the part of teachers. Meanwhile, the obstacles from students are usually related to mastery of the basic concepts of the subject concerned, such as students not very skilled in basic mathematical calculation operations (addition, subtraction, multiplication, and division), students not yet skilled in reading and writing (especially for phase A students), students do not understand the rules of sports competitions and others. Sometimes, some students feel confused when participating in learning activities integrated with numeracy because they think they are not learning Mathematics at that time. These obstacles are natural and challenging in implementing cross-curriculum numeracy at SD Santa Angela. Therefore, teachers need further support to understand better the meaning of numeracy and how to implement it across the curriculum in their non-mathematics learning. Support can be in the form of Forum Group Discussion (FGD) in the school learning community, pelatihan mandiri on the Platform Merdeka Mengajar (PMM) related to the topic of numeracy and integrated learning, workshops on designing numeracy activities across curricula, evaluation and monitoring of its implementation, and various other forms of support.

To design numeracy activities across curricula, teachers need to have pedagogic competence and professional competence related to the learning process to be implemented. As explained above, pedagogic competence, according to the Regulation of the Minister of National Education Number 16 of 2007 concerning Academic Qualification Standards and Teacher Competencies, includes 1) mastering the characteristics of students; 2) mastering learning theories and learning principles; 3) developing the curriculum; 4) educational learning; 5) utilizing ICT; 6) developing the potential of students; 7) communication with students; 8) conducting assessments and evaluations; 9) using the results of assessment and evaluation; and 10) taking reflective action. The primary pedagogic competence that a teacher needs is the competence to develop a curriculum, especially the micro-curriculum (learning). Teachers must be skilled in designing and implementing learning.

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This research is related to the pedagogic competence of teachers in designing numeracy learning across curricula. In the early stages, teachers need to have the ability to identify learning outcomes in non-mathematics subjects that can be integrated by numeracy. Teachers also need to understand numeracy competencies or content that can be integrated. These abilities are included in Pedagogical Content Knowledge (PCK). Knowledge of pedagogical content can make learning effective because this knowledge includes how to convey learning materials, interact with students, and reflect on instructions during learning (Radite & Sulistyawati, 2023). Pedagogical content knowledge in cross-curriculum numeracy includes numeracy and non-mathematical pedagogical content knowledge. Numeracy pedagogical content knowledge is a competency that is indispensable for teachers in designing and implementing numeracy across curricula.

CONCLUSION

The study revealed that most non-math teachers at Santa Angela Elementary School have understood the meaning of numeracy. As many as 87% of teachers realize that numeracy is not limited to math lessons but also includes the ability to solve problems, make arguments, and make decisions. However, this understanding has not been thoroughly followed by a consistent frequency of numeracy integration across subjects. Although there has been an increase in the frequency of numeracy integration from the 2022-2023 to 2023-2024 school year, with 95.6% of teachers having tried to implement numeracy, variations in the consistency of the implementation are still visible. Some teachers often integrate numeracy, while others do it sporadically, and some have never integrated it.

Based on the data obtained, most teachers at SD Santa Angela have been able to identify non-mathematics learning outcomes that have the opportunity to integrate numeracy. However, they have difficulty generating inspiration in designing numeracy learning across curricula. Therefore, this study emphasizes the importance of improving numeracy competence, not only through Mathematics lessons but also through all subjects. Continuous support from schools is needed so that the implementation of cross-curriculum numeracy can be carried out effectively and sustainably, following the expectations implied in the Kurikulum Merdeka that is being implemented. Increasing students' numeracy competence will positively impact students, educational units, and the state.

AUTHOR'S NOTE

The author states that there is no conflict of interest regarding the publication of this article and emphasizes that the data and content are free from plagiarism. In addition, this article has also been conferred at the *International Conference on Education and Regional Development* (5th ICERD).

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