The Effects of Mathictionary to the Learners' Mathematical Vocabulary

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Abstract

This study aimed to evaluate the effectiveness of the Mathematics Dictionary: Mathictionary in enhancing the mathematical vocabulary skills of Grade 6 learners at San Miguel Elementary School for the school year 2024-2025. Specifically, the research sought to assess learners' mathematical vocabulary before and after the implementation of Mathictionary, a self-made supplementary learning material, and to measure its overall impact on the learners' vocabulary proficiency. Using a quasi-experimental research design, the study involved thirty-five purposively selected learners, who were identified as having the lowest scores in mathematics among a group of fifty-one participants. A pre-test was conducted to assess their mathematical vocabulary skills, followed by a post-test after utilizing Mathictionary. The results revealed a significant improvement in the learners' vocabulary scores, with the post-test mean (83.00%) substantially higher than the pre-test mean (49.23%), indicating a shift from low to high proficiency in mathematical vocabulary. These findings suggest that Mathictionary is an effective tool for enhancing mathematical vocabulary skills. The study recommends the broader implementation of Mathictionary in schools and further investigation into its potential to foster critical thinking through higher-order thinking questions. This research provides valuable insights for educators and curriculum developers seeking to improve mathematical literacy and vocabulary among learners.

Keywords: Mathictionary; Mathematics Dictionary; Mathematical Vocabulary; Mathematical Skills; Enhance; Grade 6 Learners

1. INTRODUCTION

In the Philippine curriculum, mathematics is regarded as one of the most challenging subjects in school, and teachers find teaching it challenging. Despite learners' abilities in computation, they will find it more difficult to apply their mathematical skills if they cannot understand the technical terms used in the instructions and word problems.

Harris and Petersen (2019) stated that children need to understand what they are being asked to do to be successful at doing math. However, they cannot perform the skills well if they do not know the language. Moreover, mathematics is particularly prone to misinterpretation due to the differences and inconsistencies of many mathematical phrases in English. Vocabulary proficiency is an essential requirement to acquire and understand mathematical concepts.

Mathematical language facilitates communication within mathematics by offering standard terms and symbols, creating a common understanding of mathematical topics among educators and learners. In addition, mathematics is regarded as one of the most fundamental topics in the Philippine educational system and has numerous benefits.

Learners must cultivate an extensive vocabulary in mathematics. It enables individuals to express their ideas, thoughts, and conclusions clearly and succinctly. Furthermore, the effect of mathematical vocabulary on learners' proficiency, understanding, and growth in mathematics aids in bridging the gap between everyday discourse and mathematical language. Learners can build connections between different mathematical concepts and use them in various problem-solving contexts due to this strengthened capacity to understand and analyze mathematical problems.

Comprehending and communicating mathematical concepts effectively can be challenging without a strong grasp of these mathematical terms. A Math Dictionary is a valuable tool for children seeking mathematical terms, words, or definitions, as it helps them understand, appreciate, and benefit from the value of mathematics. Therefore, the authors saw the potential of developing a Mathematics Dictionary: Mathictionary as a tool to enhance Grade 6 learners' understanding and performance in mathematics. Dictionaries can help learners improve their vocabulary because it can be used to find the meaning of certain words and phrases.

1.1 Background of the Study

The Department of Education (DepEd) is set to launch a nationwide campaign to initiate a cooperative effort to advance improved arithmetic and numeracy performance in classrooms.

As reported in the 2019 Southeast Asia Primary Learning Metrics (SEA-PLM) statistics, only 10% of Filipino pupils in Grade 5 had sufficient reading skills to transfer to high school, and 27% could only recognize a single word. In terms of writing and math literacy, many Filipino students ranked lowest. Chi, C. (2023)

Mathematical vocabulary is one of the hardest things for learners to master, which can be a major barrier to understanding the subject. Although mathematics is a visual language of symbols and numbers, it may be conveyed and described in written and spoken words. To succeed in mathematics, Grade 6 learners need to be able to identify, understand, and use the required language.

Since mathematics courses are taught in English, learners should be familiar with the terminologies used in mathematical word problems to prevent misunderstandings.

The action research initiative took place at San Miguel Elementary School in Pila Laguna, where a single Grade 6 class with fifty-one (51) learners was used. The focal point of this endeavor was to address the prevalent issue of numerous learners encountering difficulties in grasping mathematical concepts, primarily stemming from a deficiency in comprehending fundamental mathematical terminology.

This research sought to investigate the root causes of these challenges and implement targeted interventions to enhance Grade 6 learners' understanding and proficiency in mathematics, fostering a more

conducive learning environment within the school community. Therefore, San Miguel Elementary School was chosen for this study, as it allows for thorough and perceptive data collection that aligns with the research objectives.

Teaching learners to comprehend unfamiliar words can be challenging, particularly when they come up in class conversations. Teachers are responsible for guiding learners through a methodical approach so they can learn without reluctance and enjoy the process. Through a math dictionary, Grade 6 learners from San Miguel Elementary School can identify terminologies and use them to convert problems into understandable mathematical terms. Teachers can help learners become accustomed to using math dictionaries efficiently.

In general, young learners can better prepare for what they may experience in the classroom through a math dictionary. Learners can become more acquainted with unfamiliar terms before they are discussed during lessons by accessing a complete list of mathematical terminology and definitions. They will be able to follow the teacher's instructions more readily, which might boost their confidence and interest in what they are studying. They will be able to comprehend the concepts more effectively and have a more solid grasp of the subject matter, making learning a more enjoyable experience.

1.2 Statement of the Problem

This study aimed to determine if using the Mathictionary may help Grade 6 learners at San Miguel Elementary School improve their vocabulary in mathematics. In line with this aim, the study intended to address the following questions:

1. What is the level of grade 6 learners' vocabulary skills in mathematics before using the Mathematics Dictionary: Mathictionary?

2. What is the level of grade 6 learners' vocabulary skills in mathematics after using the Mathematics Dictionary: Mathictionary?

3. Is there a significant difference between the grade 6 learners' vocabulary skills before and after using the Mathematics Dictionary: Mathictionary?

1.3 Objectives of the Study

This study aimed the following:

1. To determine the grade 6 learners' vocabulary skills in mathematics before using Mathictionary.

2. To determine the grade 6 learners' vocabulary skills in mathematics after using Mathictionary.

3. To determine the effectiveness of using Mathematics Dictionary: Mathictionary in enhancing the grade 6 learners' vocabulary in mathematics.

4. To utilize the Mathictionary among the Grade 6 learners as a supplementary learning material.

1.4 Significance of the Study

This research aimed to enhance the math vocabulary of the Grade Six (6) learners at San Miguel Elementary School using Math Dictionary: Mathictionary. The result of this research will be of significant to the following:

Policy. Allowing Grade 6 learners the flexibility to choose their learning paths and easy access to educational resources should be the main goal of the policy. Additionally, it should underscore the significance of clear communication and lifelong learning in mathematics education. A strong foundation in mathematical terminology should also be the goal of the policy, which must additionally uphold important educational values like diversity, involvement, and critical thinking.

Society. The Mathematics Dictionary: Mathictionary can be used by people of all ages to learn and apply mathematical concepts. Math dictionaries are not only for learners; adults can use them to refresh their knowledge or acquire new terms from their professions or daily lives.

Theory. A new theory might change educational tool support by enhancing learning experiences, fostering deeper comprehension, and catering to varied learners. It has the potential to shine a light on good teaching approaches, promote further studies, and benefit learners and educators by creating a strong foundation in mathematics.

1.5 Hypothesis

There was no significant difference in grade six (6) learners' Math vocabulary skills before and after utilizing the Mathematics Dictionary: Mathictionary at San Miguel Elementary School located in Barangay San Miguel Pila, Laguna.

1.6 Scope and Limitations

The study was primarily focused on determining the effectiveness of using Mathematics Dictionary: Mathictionary to enhance the mathematical vocabulary of the Grade 6 learners at San Miguel Elementary School in Brgy. San Miguel Pila, Laguna.

The authors gathered information from internet-based sources, administered an examination to determine the number of respondents to the study, and examined the current level of vocabulary proficiency among sixth-grade learners. The authors used a pre-test followed by the implementation of weekly intervention booklet activities along with the learners' access to the Mathematics Dictionary: Mathictionary and a post-test to evaluate the Grade 6 learners from San Miguel Elementary School S.Y. 2023 – 2024 respondents.

1.7 Definition of Terms

The terms indicated are operationally defined to provide a standard frame of reference and facilitate understanding of the concept.

Dictionary. A book that lists words in alphabetical order and defines them or provides an alternative word. It provides users immediate access to word meanings, spellings, pronunciations, and applications, making it a valuable resource for language comprehension and communication.

Mathictionary. A student-friendly math dictionary that defines and organizes mathematical terms alphabetically and provides clear, illustrated examples in simple terms. This tool enhances the learning and use of mathematical vocabulary across various mathematical areas, making it a valuable resource for educators and Grade 6 learners.

Mathematical Vocabulary. Refers to the words and expressions used to convey mathematical concepts. These terms serve as the building blocks of mathematical language, allowing mathematical concepts, relationships, and ideas to be expressed.

Misconception. A more profound lack of knowledge of mathematical concepts results in an incorrect application. This deficiency emerges when individuals are incapable of understanding the underlying principles and complexities of mathematical concepts, leading to incorrect or misdirected attempts to apply them.

Enhancement. It states “improvement” to show the progress of learners' mathematical vocabulary, instilling mathematical terminologies in their long-term memory that will undoubtedly assist them throughout their education.

Grade Six (6) Learners. The learners who are enrolled in the sixth year of primary school. This is also essential for Grade 6 learners to develop fundamental competencies, particularly enhancing their mathematical vocabulary, to succeed in a math class.

2. REVIEW OF RELATED LITERATURE AND STUDIES

This chapter presents the literature and the findings of other studies to which the current study is related or bears resemblance. These pieces of literature deal with theories, concepts, and principles that give the authors enough background to understand the study.

Vocabulary Skills in Mathematics

As reported, the National Achievement Test (NAT), a large-scale evaluation, shows that Filipino learners' performance "gravitates towards the low ability levels," particularly in science, math, and English, according to Education Secretary Leonor Briones. The Department of Education (2019) claims that learners' poor reading comprehension is the cause of this problem.

On the other hand, Salem (2023) states, we feel more assured in our capacity to solve mathematical problems when familiar with math terminology. Students who are proficient in math are better able to tackle challenging arithmetic problems and comprehend the reasoning behind mathematical procedures. A person with faith in his skills is likelier to participate in learning and take pride in his achievements.

The relationship between language and comprehension is especially important for students. Learners who have a thorough understanding of math-related language are better prepared to tackle complex arithmetic challenges. This expertise not only improves their problem-solving abilities but also develops their understanding of the fundamental principles that govern mathematical operations.

Finally, developing a strong mathematical vocabulary not only promotes academic performance but also fosters an attitude that values determination and celebrates personal accomplishments in the face of challenges. Thus, investing time in improving mathematical language skills can foster a more helpful learning environment in which students feel competent and willing to explore the broad field of mathematics.

According to Salem's (2023) study, mastering math vocabulary makes us less confused with solving mathematical issues. Math-competent learners are more equipped to take on difficult problems and understand the logic underlying mathematical operations. When we believe in our abilities, we are more likely to engage in the learning process and take pride in our accomplishments.

In essence, the combination of strong mathematical vocabulary, confidence in one's abilities, and a proactive attitude to learning results in a positive feedback loop that improves both comprehension and performance in mathematics. This cycle not only enhances specific talents but also promotes a deeper appreciation for the subject as a whole. As learners acquire confidence and experience, they are better prepared to meet new problems, resulting in continuous improvement in their mathematical ability.

In Bulos's words (2021), mathematics vocabulary refers to the specific terms and expressions used in mathematical discourse. It encompasses a broad vocabulary spectrum, from fundamental mathematical operations to intricate ideas and procedures. According to him, language in mathematics is an essential component of mathematical discourse and serves as an instrument for teaching, comprehending, and applying ideas. Its scope, from basic operations to more complicated concepts and methods, reflects the complexity and depth of mathematics as a field. By gaining a good command of mathematics vocabulary, students develop the ability to engage with mathematical content effectively, generating tremendous respect for the topic and its real-world applications. Moreover, Bulos asserts that children's mathematical development, comprehension, and proficiency are significantly impacted by mathematical terminology.

This is because the language employed in mathematics serves as a medium of communication and a fundamental component for comprehending complex topics. When children are introduced to specific mathematical concepts early in their learning process, they can better grasp these terms' underlying principles and operations.

As a result, educators must prioritize teaching mathematical language alongside traditional problem-solving skills to foster a better understanding and respect for mathematics in students. This allows them to establish a better basis for pupils' future success in more complex mathematical disciplines.

To achieve success in mathematics, one must become proficient in mathematical vocabulary. While previous studies have generated a variety of fraction vocabulary evaluations at various levels of education, none of them have mainly looked at fraction vocabulary (Lin & Powel, 2023)

Students must understand fraction terminology to grasp critical concepts necessary for more complex mathematical reasoning, such as parts of a whole, ratios, and proportions. Furthermore, increasing students'

knowledge of fraction-related words might increase their confidence and competence in approaching mathematical issues.

Furthermore, based on the study of Garden, P. (2021), Early grades are the ideal time for vocabulary development due to the period's brain growth. Reflecting on this, the early grades represent a critical phase for vocabulary development, as this period is characterized by significant brain growth. During these formative years, children exhibit heightened receptiveness to acquiring new words and concepts. Thus, it is an opportune time to enhance their language skills and cultivate a lifelong appreciation for reading and effective communication.

When children are exposed to new words through discussions, books, and educational activities, their brains are ready to absorb and integrate them into their developing language skills. In addition to improving their communication skills, exposure to various words also fosters cognitive growth, improving understanding and critical thinking.

Devoting time and resources to fostering vocabulary development in early schooling is crucial because it takes advantage of this special opportunity for development and instruction. Parents and teachers may greatly enhance a child's overall intellectual and expressive abilities by fostering rich language environments and promoting the discovery of new words.

However, Ünal et al. (2021) argued that the development of mathematical vocabulary may contribute to further learning in mathematics.

A strong foundation in math and language is necessary to comprehend math concepts and improve arithmetic abilities. If a learner is unfamiliar with a vocabulary term, it often hinders their capacity to absorb and make meaning of their activities. Since math is a building-block process, it is possible and often does for a student not to fully understand a single topic. This can lead to misconceptions or a lack of understanding of the following skills.

Understanding math topics and honing arithmetic skills require a solid foundation in math vocabulary. A learner’s ability to absorb and make sense of their actions is frequently hampered if unfamiliar with a vocabulary term. Since math is essentially a building-block process, it is possible—and frequently does—for a learner to not fully grasp a particular topic, which can result in a misconception or a lack of knowledge of the subsequent abilities. To go to higher levels, learners need to possess those fundamental elements of construction, Chiaro, C. (2020).

In line with Bergman, R. (2024), academic vocabulary is just as important to academic success as raw math skills. Learners must become fluent in mathematical vocabulary to attain a complete grasp of the subject matter. The necessary stages toward proficiency are developing a vocabulary that spans from "addend" to "y-axis," comprehending those words, and then being able to use and apply them to new scenarios.

A key component of academic achievement in mathematics is mastering mathematical terminology. As children advance through the phases of identifying, comprehending, and using this terminology, they build a solid basis for future mathematical success. In the end, having fluency in mathematical language enables students to understand difficult ideas and interact with mathematical problems in a meaningful way.

Math terminology is essential for our young learners to understand since it is like the glue holding the world of numbers together. It has been observed that pupils acquainted with mathematical language tend to be more competent in explaining their ideas and making sense of problems. Contrary to this, pupils may get lost in a sea of numbers if they are unfamiliar with mathematical terms like "addition," "subtraction," or "multiplication." However, if we provide learners with a strong vocabulary foundation, they can confidently make connections and solve problems as they go through mathematics concepts, Lori (2024).

An extensive vocabulary helps learners express themselves numerically rather than memorizing many phrases. Learners can better express their techniques and reasoning when familiar with the relevant mathematical vocabulary.

Instead of learning a lot of phrases, students with a large vocabulary can better communicate themselves mathematically. Learners can communicate their methods and reasoning more effectively when they are fluent in the appropriate mathematical terminology.

In addition to helping students understand the language of mathematics, an extensive vocabulary motivates them to use what they have learned in real-world contexts. Having the appropriate vocabulary enables children to collaborate with others, explain their reasoning, and hone their critical thinking abilities as they go through different mathematical ideas. We can boost students' confidence and give them the ability to approach problem-solving with assurance by cultivating a rich mathematical vocabulary, which will ultimately help them succeed in mathematics overall.

Steven Barcenes's (2019) study states that developing a solid grasp of mathematical terminology is crucial to learners' accomplishment and growth in their mathematical abilities. Identifying areas in which learners show deficiency is crucial to guaranteeing improvements in math proficiency. Performing more analysis on problem regions could aid in developing future interventions for important math topics, including vocabulary in mathematics.

For some individuals, words from math and vocabulary may not seem to belong in the same sentence. As Smith, A. (2022) explained, a more in-depth understanding of mathematical terminology has been associated with stronger problem-solving skills and a mental grasp of the subject matter.

Moreover, learners need to have a fundamental grasp of the language of mathematics, which consists of terms and symbols. This is necessary because learners can answer mathematical inquiries by comprehending the significance of each term and mathematical symbol. Not surprisingly, learners develop the perspective that mathematics is extremely difficult to solve. This mindset stems from learners' negative initial judgments, which lead to reduced mathematics learning outcomes (Fitriana & Aprilia, 2022).

Delaney Raupp's (May 2020) study indicates that vocabulary is an effective tool for improving pupils' mathematics performance. Learners whose math instruction is primarily explanation-based must learn how to express their mathematical knowledge effectively. According to every instructor surveyed, vocabulary is a crucial ability that students must acquire to understand the material being taught.

Teachers must give language training equal weight to more conventional approaches to teaching arithmetic. Strategies that can significantly improve comprehension include using mathematical language in explanations, integrating vocabulary into everyday activities, and introducing important words. This study

overall shows the need for a comprehensive approach to mathematics education that acknowledges the connection between language and numeracy.

According to George and Jonah's (2023) investigation, building a strong vocabulary can be especially helpful for learners with trouble studying mathematics. By becoming familiar with essential phrases and concepts, these learners can overcome their inability to comprehend mathematical problems and build confidence. Furthermore, a strong command of mathematical terminology can help students communicate and work with instructors and fellow learners more effectively, improving their understanding of mathematics even more.

Additionally, pupils who possess a strong grasp of mathematical vocabulary are better equipped to express their ideas and queries to classmates and teachers. In a collaborative learning setting, where students frequently exchange ideas and discuss approaches to problem-solving, effective communication is essential. Students are better able to explain their ideas, ask questions about difficult ideas, and give helpful criticism to one another when they use clear language.

In their meta-analysis of math language/vocabulary and ability in the preschool period, Turan and De Smedt (2022) point out that multiple definitions of math vocabulary have been employed. Math vocabulary encompasses the knowledge and appropriate application of number words (e.g., one, two), quantitative words (e.g., more, less), comparative phrases (e.g., smaller than, greater than), words on spatial relations (e.g., above, beneath), abbreviations (e.g., min for minutes), and symbols (e.g.,+ and =). Quantitative and spatial terms that are generally more approximate (e.g., more, most, similar, few, before, near) are included in the limited sense. The difference is important from a developmental and functional standpoint.

Furthermore, the research on the relationship between math vocabulary and early numeracy is generally consistent, indicating a unique role beyond general vocabulary (Turan & De Smedt, 2022). In addition, they state that "these studies provide converging evidence for a clear link between mathematical language and mathematical ability. "

Therefore, their research has revealed a compelling and consistent link between math vocabulary and early numeracy skills, underscoring the distinct and important role that math-specific language plays in a child's mathematical development. This relationship suggests that a firm grasp of mathematical terms and concepts is not merely an extension of general vocabulary but a foundational element that can significantly enhance a child's ability to understand and engage with early mathematical concepts and practices.

Litkowski et al. (2020) used factor analysis to investigate the relationships between spatial ability, math language, and math ability skills. They discovered that the most substantial relationship was between math, language, and math skills.

Similar to language, mathematical vocabulary is an early-emerging skill that serves as the basis for subsequent academic, social, and cognitive success (Bruce and Bell, 2022).

Mathematical vocabulary is an essential foundation for learning, much like language itself. A strong grasp of mathematical terms and concepts enables learners to engage more effectively in math-related tasks and discussions. This skill supports their understanding of mathematical principles and enhances their cognitive abilities and social interactions. As learners become familiar with the mathematical vocabulary, they are better

equipped to tackle more complex subjects, paving the way for future success in academic and everyday contexts. Therefore, a solid understanding of mathematical language is vital for a well-rounded education.

Moreover, according to Vanluydt et al. (2021), mathematics vocabulary related to proportional reasoning, such as double and three more, aided elementary school students in comprehending these concepts beyond their general vocabulary knowledge.

Problems of Learning Mathematics

As Kunwar and Sharma (2020) specified, misleading concepts and terms lead to failure in learning mathematics and create a negative attitude toward the subject. Further discussion about their case states that erroneous presumptions and notions discourage learners from acquiring mathematical knowledge, fail, and foster a negative attitude toward learning the subject.

The negative outlook may limit a student's confidence in their skills and willingness to take on mathematical problems in the future, which can have long-term consequences. It emphasizes the value of precise and unambiguous communication in mathematics instruction, and teachers need to address and elucidate any potentially confusing ideas immediately. By doing this, we can contribute to developing a more encouraging learning atmosphere that inspires kids to enjoy mathematics rather than avoid it.

According to the investigations conducted by Jamaludin, N. H., and Maat, S. M. (2020), the learners' lack of understanding of the fundamentals of mathematics makes it more likely for them to employ incorrect methods, which would lead to mistakes and misunderstandings when trying to solve mathematical problems.

Students may approach mathematical tasks using inappropriate techniques or strategies due to this lack of fundamental understanding. Students may struggle to understand when to use addition, subtraction, multiplication, and division or how to handle numbers properly if they lack a firm understanding of these fundamental concepts. As a result, people could unintentionally make mistakes that impact their efforts to solve problems immediately and feed a larger cycle of miscommunication. This may cause individuals to lose faith in their mathematical skills and completely shun mathematics. Furthermore, students who have trouble grasping mathematical ideas sometimes fail to see important connections between concepts, making it difficult to graduate to more complex subjects.

The assertion above suggests that learners are expected to have an adequate basis in mathematical concepts to support their productive learning. This foundational knowledge is essential, as it enables students to engage with and excel in their learning processes, ultimately supporting their ability to grasp more complex ideas and apply their skills effectively.

According to findings published by R. D. Rahmawati, Mardiyana, and Triyant (2019), misconceptions are essential when learning mathematics. It is imperative to promptly correct learners' misconceptions regarding the subject and its correlation with their understanding.

However, based on Kunwar's (2021) study, many factors about the curriculum, teachers, and students may lead to difficulties with mathematics learning. Students' negative attitudes about the subject can affect their learning of mathematics, as they fear failing.

Teachers are concerned about their expertise, experience, and ability to apply suitable pedagogical approaches, tools, and strategies. These concerns revolve around several key factors, including their level of expertise, years of experience, and skill in implementing practical pedagogical approaches. Additionally, teachers must utilize appropriate tools and strategies to enhance the learning experience and foster student engagement.

Referring back, professional development training for teachers can help solve such issues. Similarly, learners can overcome associated challenges with additional help and the proper intervention (Kunwar & Sharma, 2020).

Essentially, the interaction between student assistance and teacher preparation emphasizes the significance of an all-encompassing approach to education. Funding both learner interventions and educator development can achieve a more effective educational system that meets every student's various requirements and enables them to succeed academically and personally.

According to the published study by Jonah, Nice, and George, Nchelem Rosemary, PhD (2023), Mathematics can be challenging to understand when it comes to problem-solving, even though it is sometimes seen as a relatively easy discipline. Mathematical language frequently employs specialized terminology and symbols that not everyone knows. In addition, how mathematical problems are presented and answered demands a unique set of abilities and logical reasoning, which might be difficult for some individuals to grasp.

Furthermore, students frequently misunderstand the meanings of mathematical terminology in English. This can affect pupils' challenges in comprehending the ideas being taught. (Galandaru Swalaganata & Muniri Muniri, 2020).

Students may encounter significant challenges due to this misconception, which may affect their capacity to learn complex concepts being taught. Students may struggle to interact with more complex ideas, such as algebraic expressions, geometry, or statistical analysis if they have trouble grasping the basic terminology. As a result, their general comprehension of mathematics is weakened, frequently leading to frustration and a lack of confidence in their skills.

However, based on Joseph Ugochukwu's study (2020), students perform poorly on internal and external math exams due to a lack of comprehension of mathematical terminology. Math teachers and other related stakeholders are becoming concerned about pupils' consistently low performance on internal and external math exams. According to recent research studies in mathematics education, one reason for poor performance is a lack of comprehension of the mathematical language necessary to convert word problems into mathematical form.

The difficulties are most noticeable when students are given word problems that ask them to convert spoken explanations into mathematical expressions or equations. Many students find completing these translations intimidating if they do not have a firm understanding of the pertinent terms and ideas, which can cause them to become frustrated and lose interest in the subject. In addition to affecting their performance right now, this obstacle may have long-term effects on their confidence in arithmetic and their decision to pursue further study.

Kaitera and Harmoninen (2022) define Mathematics problem-solving as the process of using mathematical skills and expertise to examine and resolve practical issues.

In addition, as stated by George and Enefu (2019), the importance of problem-solving in school Mathematics continues to be crucial and has not reduced in its importance for the teaching and learning process. The reason for this is that it is the most convenient. approach to learning Mathematics, especially when learners are involved in the task of solving math challenges.

Methods of Teaching Mathematical Vocabulary

The ability to assess students' understanding, adapt teaching strategies to meet various learning needs, and provide constructive feedback are all part of this. Teachers skilled in various teaching philosophies can create a more accepting and supportive learning environment in the classroom where kids can thrive and succeed academically in mathematics.

In accordance with Vanessa Valley's study (2019), daily classroom implementation of math word problems significantly increased the use and understanding of English math vocabulary.

Exposing kids to math word problems regularly is intended to enhance their general problem-solving skills and their ability to comprehend and apply mathematical terminology. According to the study, kids who regularly do this gain a deeper understanding of crucial terms and are more prepared to transition from understanding language on their own to applying it in difficult mathematical scenarios.

In the learning process, the teacher's job is to guide the pupils to think, and express their thoughts, concepts, or ideas, and critically evaluate the knowledge they have prepared themselves (Darling-Hammond, et al., 2020).

Relevance of Mathematics Dictionary

As cited by West and Richmond (2019), Mathematical ideas are intricate and require a great deal of abstract thought to comprehend. Learners must be familiar with the specific math vocabulary to comprehend it.

Comprehension also requires a firm grasp of particular mathematical terminology. Specific meanings are associated with terms and symbols essential to the learning process. Students unfamiliar with this particular language may find it challenging to understand the subtleties of the subjects they are studying.

Consequently, teachers must ensure that students have the language skills to understand and appropriately interact with mathematical concepts. By encouraging the growth of language and abstract thought, we may assist children in laying a strong foundation for their mathematical journey.

Essential arithmetic terminology that pupils need to be familiar with includes vocabulary words like "fraction," "integer," and "polygon." Without this information, anyone would find it difficult to comprehend even the most basic math problems.

Similarly, Sharma (2020) discovered that most learners understand mathematical concepts well but have difficulty expressing them accurately.

Therefore, teachers may need to employ techniques that strengthen students' conceptual knowledge and improve their ability to confidently and clearly communicate their mathematical thinking. By addressing this gap, teachers can help close the gap between articulation and comprehension, ultimately resulting in deeper learning results for pupils.

As stated by Shakespear M. Chiphambo's study (2019), when a mathematics dictionary is incorporated into the learning environment, learners are compelled to pay attention, which benefits and enhances their mathematical proficiency both now and in the future. Employing a mathematics dictionary in the learning environment further assists learners in developing their information-seeking skills, improving their ability to learn independently.

Employing a mathematics dictionary in the learning environment further assists learners in developing their information-seeking skills, improving their ability to learn independently.

In the words of Mateusz Brodowicz (2024), dictionaries have many benefits for students' language development when used in the classroom, which is why educators often encourage dictionary use as a teaching tool.

Additionally, dictionaries are essential tools that let students investigate linguistic elements like parts of speech and etymology, which enhances their language use even more. Teachers frequently stress how important dictionary skills are since they enable pupils to explore new words and sentences successfully. By integrating dictionary usage into their classes, teachers can foster an engaged learning environment where students are inspired to explore, question, and develop their language skills.

Moreover, according to Young AF and Patterson LG (2019), Students become more focused when equipped with mathematical terminology and vocabulary, which are crucial for comprehending geometric concepts. Incorporating a math dictionary into the lecture also fosters the ability to seek knowledge, which improves independent learning. By incorporating a mathematics dictionary into the lecture, misconceptions and alternative conceptions that arise from a lack of appropriate geometrical vocabulary are addressed. However, by incorporating a mathematics dictionary into the class, students are forced to pay attention, which enriches and improves their mathematical performance both now and in the future.

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In education, tangible and interactive tools are being recognized for their ability to assist various aspects of the learning process (González-González et al., 2019)

Furthermore, the Mathematics dictionary is a helpful tool for students to improve their learning. The topic of polygons from geometry was selected to test how well the dictionary helps students perform better and gain confidence. (YEE, C. 2021).

Apart from this, dictionaries are essential resources that reflect and influence a society's language, culture, and perceptions in addition to providing definitions for words. (Abduraxmonova & Alimardonova, 2024)

2.1 Synthesis of the Study

The aforementioned collection of national and international studies provided data that strengthens the researchers' findings and highlights the significance of vocabulary in learning mathematics to support the researchers' conclusion that there is an existing problem regarding learners' mathematical vocabulary. Therefore, as a means for enhancing learners' vocabulary in mathematics, the researchers recognized the potential of developing and utilizing Mathictionary, a Mathematics dictionary. A dictionary can help improve and develop learners' familiarity with words and definitions. Moreover, a mathematics dictionary can be a supplementary learning material that helps learners improve, develop their mathematical vocabulary, and avoid misconceptions.

Studies show the importance of mathematics vocabulary in enhancing a student's learning and performance in the subject matter. Deficiency in core ability, such as reading comprehension, becomes the cause for poor performance at the National Achievement Test (NAT), which is manifested in areas such as science, mathematics, and English (DepEd, 2019). It starts with achieving a sound and good mastery of subject-specific vocabulary.

The mathematical vocabulary of learners supports their ability to understand and apply complicated concepts. According to Salem (2023) and Bulos (2021), the knowledge of math-related terminology enhances one's capacity for problem-solving, boosts self-esteem, and encourages an active approach toward learning. In a similar vein, language acquisition helps pupils interact with mathematical ideas efficiently, encouraging critical thinking and cognitive development (Garden, 2021). Early exposure to these concepts during the formative years takes advantage of brain growth and builds a strong basis for success in the future.

Beyond understanding, mathematical vocabulary is essential. It serves as a conduit for cooperation and communication, which is critical in learning environments where concepts and approaches to problem-solving are shared (George & Jonah, 2023). Speaking math fluently not only leads to academic success but also fosters optimism and tenacity in the face of adversity.

However, there are still barriers to the study of mathematics. Progress is often hindered by misconceptions, unfavorable attitudes, and a lack of basic skills (Kunwar & Sharma, 2020). Teachers' professional knowledge, educational strategies, and utilization of useful resources all significantly contribute to alleviating these challenges. It is possible to avoid misconceptions and build a more supportive learning environment by prioritizing the precise and unambiguous delivery of mathematical concepts.

Research highlights the close relationship between math vocabulary and general numeracy. For instance, Turan and De Smedt (2022) argue that mathematical language has a unique influence on early numeracy skills and offers more than just generic words. Similarly, Litkowski et al. (2020) and Vanluydt et al. (2021) demonstrate how words related to concepts like proportional reasoning support comprehension. This core knowledge is required to interact with more complicated subjects and real-life applications.

To improve outcomes, educators must integrate vocabulary instruction with traditional mathematical teaching strategies. Activities that introduce and reinforce math-specific terms, coupled with professional development for teachers, can create a supportive and effective learning environment. Ultimately, fostering a rich mathematical vocabulary not only enhances students' academic success but also empowers them to approach mathematics with confidence and curiosity, laying the groundwork for lifelong learning.

Moreover, the Math dictionary is a learning material requisite for pedagogical and topic interests to make mathematics learning effective and engaging. One of the most important tools for improving the pedagogical approach to teaching mathematics is using the Math dictionary. It supports different ways of learning and assisting students in understanding difficult topics by providing definitions, explanations, and examples of mathematical terminology and ideas.

In summary, the Math Dictionary, called Mathictionary, was a suggested tool intended to improve Grade Six learners' mathematical knowledge and performance by expanding their mathematical vocabulary. The authors hoped that this initiative would create a more conducive learning environment and foster a deeper appreciation for the value of mathematics among Grade Six learners.

2.2 Theoretical Framework

This study is based on Generative Learning Theory. American educational psychologist Merlin C. Wittrock founded generative learning theory by proposing that new concepts must be merged with previous mental schema. Merlin Wittrock, a cognitive psychologist, was an integral member of the group of experts that modified the Taxonomy of Educational Objectives over five years. According to Wittrock, learning occurs when learners create connections between stimuli and previously learned material in their memory through a process known as "generation." (Farrell, L. (2019). The prior memories in our brains provide the basis for learning by generative learning. Our knowledge base grows as new information is taken in and retained in our long-term memory.

In this case, the Mathictionary can offer a setting where Grade 6 learners can practice generative learning techniques, including summarizing, organizing, and elaborating. By utilizing the Mathictionary to look up mathematics-related terms, Grade 6 learners can activate pre-existing schemata and harness them to make sense of new information. Furthermore, they can modify and enhance their schemata for mathematical concepts as they take part in elaboration and organizing, building a stronger mental model for subsequent learning.

The theoretical basis for the research was further supported by schema theory, which outlines the mental frameworks individuals develop to represent and arrange the information they have acquired. Schemata, commonly referred to as "the building blocks of cognition," represent an individual's simplified perspective of reality based on experience and past knowledge. These allow us to recall data, modify our behavior, concentrate on important information, or attempt to forecast the most likely events. (Rumelhart, 2023)

In the context of the Mathictionary, developing a comprehensive dictionary of mathematical terms can help Grade 6 learners classify and organize new knowledge, improving their comprehension and memorization of concepts related to mathematics. Through the utilization of the Mathictionary, learners can build more precise and nuanced schemata for mathematical concepts, a resource that provides an organized and structured way to learn mathematical vocabulary.

In general, the coordination of the theories of generative learning and schema demonstrates that Mathictionary may have an advantageous impact on learners, particularly in the sixth grade. Utilizing Mathictionary can help Grade 6 learners enhance their mathematical vocabulary.

The ADDIE Model is a systematic approach instructional designers use to develop effective educational and training programs. Analysis, Design, Development, Implementation, and Evaluation are the five phases of this methodical process, which is abbreviated ADDIE. The ADDIE Model guarantees that every facet of a learning program is meticulously planned, carried out, and evaluated.

Through the process, instructional designers can ensure that nothing has been overlooked by following the roadmap provided by the ADDIE Model. This methodical approach facilitates the development of more impactful learning encounters and permits ongoing enhancement through assessment and feedback.

2.3 Conceptual Framework

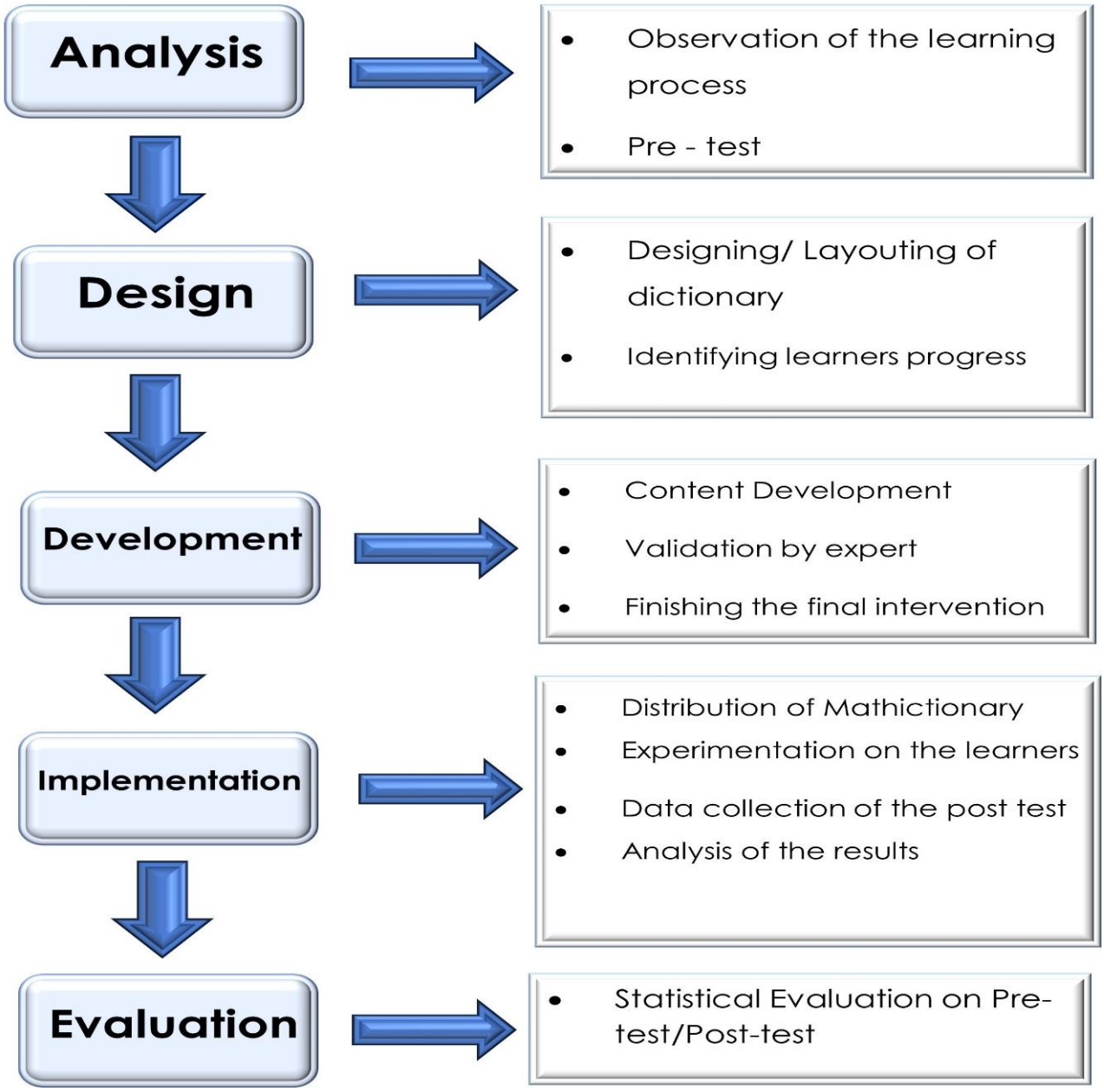

FIGURE 1. RESEARCH PARADIGM

The line indicates the creation of a mathematics dictionary: Mathictionary to enhance the math vocabulary of grade six San Miguel Elementary School learners, S.Y. 2023- 2024.

Analysis. Shows the learning process of the Grade 6 learners through observation and, afterward, the administration of a pre-test that contains 50 items. The authors determined the vocabulary level in mathematics of the Grade 6 learners at San Miguel Elementary School in Pila, Laguna. Subsequently, the pre-test result served as the basis for selecting the thirty-five (35) learners who served as the study participants.

Design. Describes the process of creating the Math dictionary, including planning the design and layout and choosing the appropriate style and design that is suitable for the target participants, considering how the learners will be more motivated and engaged in the Mathictionary, for which the authors provided student-friendly descriptions and illustrations, as well as how it will assist learners in expanding their vocabulary in mathematics.

Development. It shows the process of selecting the content indicated in the Mathematics dictionary: Mathictionary. Considering the previous lesson, since they were in Grades 1–6, they should recall the mathematical vocabulary that will be instilled in their minds for the long term. Afterward, the authors asked for the help of the expert to validate the dictionary and address any errors that needed to be fixed.

Implementation. It shows the distribution of Mathictionary, which was used by the selected 35 learners in Grade 6 - Magalang. Afterward, the authors let the learners read and comprehend the contents of the Mathictionary for one week. Following the distribution of Mathictionary, the researchers administered 50-item test questionnaires for the post-test. After the experimentation on 35 selected learners in Grade 6 – Magalang, the authors collected all the learners' data based on the results of their post-test. Using the Mathictionary, the authors recognized the significant change in the learners' vocabulary when they were in mathematics.

Evaluation. This shows an expert statistician interpreting the Grade 6 learners' pre-test and post-test scores, comparing their mathematical vocabulary skills before and after using the Mathematics Dictionary: Mathictionary.

3. RESEARCH METHODOLOGY

This study employed a quasi-experimental research method to thoroughly investigate an intervention designed to improve learners' mathematical vocabulary. Apart This research aims to provide insights into how effective the Mathematics Dictionary: Mathictionary is in enhancing the vocabulary skills of Grade Six learners in Mathematics ultimately contributing to their overall learning experience in the subject.

The main purpose of a quasi-experimental design is to examine cause-and-effect relationships between variables in real-world contexts. In the context of our thesis on Mathictionary: A Math Dictionary, this approach could be applied to investigate how the use of the Mathictionary affects students' understanding of mathematical concepts. Researchers could use this method to explore the impact of the Mathictionary tool on learning outcomes, test hypotheses regarding its effectiveness, and assess how it influences students' engagement with math. Since traditional experimental methods may not be feasible in educational settings, quasi-experimental design allows us to analyze these effects while considering practical limitations and ethical considerations, such as ensuring fair access to the tool for all students.

The authors administered a pre-test to gather information and assess the learners' vocabulary level in mathematics, employed weekly intervention booklet activities, and a post-test to see if there were significant changes in Grade 6 – Magalang learners' vocabulary level after using the Mathematics Dictionary: Mathictionary at San Miguel Elementary School.

3.1 Research Locale

This study was conducted at San Miguel Elementary School in Brgy. San Miguel Pila, Laguna on S.Y. 2024 – 2025.

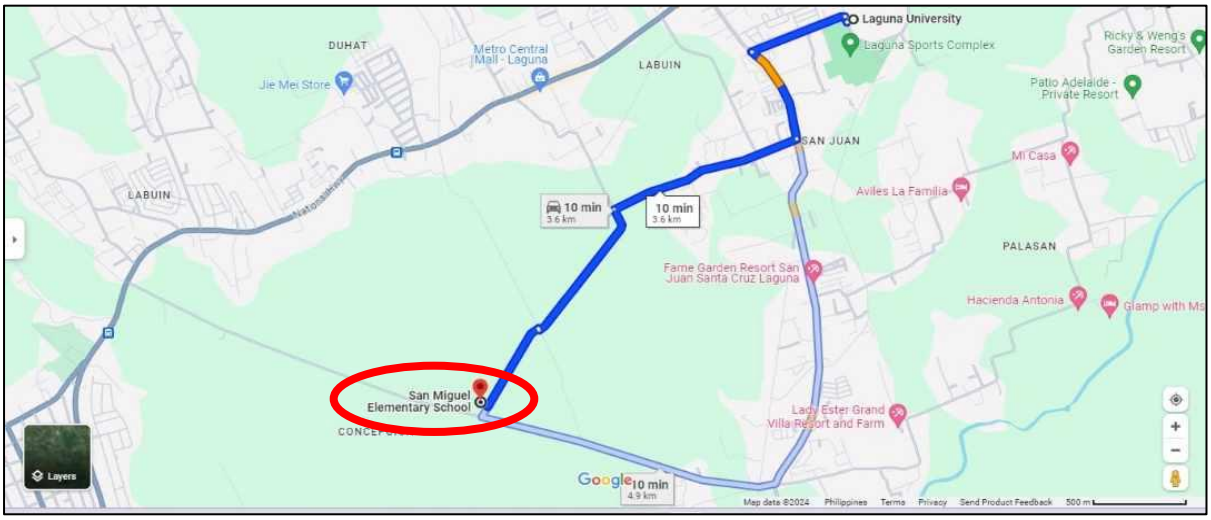

FIGURE 2. VICINITY MAP OF SAN MIGUEL ELEMENTARY SCHOOL

San Miguel Elementary School, also known as SMES, was founded in 1983. It is a DepEd public school located at Brgy. San Miguel Pila, Laguna. Most learners enroll in this school for various reasons, including many nearby residents. The school is also equipped with professional teachers with the necessary competencies and standards to contribute to and provide high-quality education to San Miguel Elementary School learners.

3.2 Sampling Technique

This study utilized a purposive sampling method to ascertain the suitable sample size required for determining the Mathematics Dictionary: Mathictionary efficacy in enhancing sixth-grade learners' vocabulary. Using a non-random selection technique called purposive sampling, researchers can deliberately select participants based on attributes or standards pertinent to the study's objectives.

The study specifically focused on the Grade 6-Magalang class of 51 sixth-graders at San Miguel Elementary School. Each of 51 students took a pre-test to gauge their competency, proficiency, and current understanding of the mathematical vocabulary.

Therefore, after thoroughly analyzing the test data, the authors chose the 35 students with the lowest pre-test scores because they were perceived to have the most tremendous potential to gain from focused vocabulary development using Mathictionary. This selection process was based on the participants' evident need for increased skills in mathematical terminology, guaranteeing that the study will adequately address the difficulties encountered by learners at lower proficiency levels.

To obtain significant data regarding the efficacy of Mathictionary as a supplementary learning material to enhance sixth-grade learners' mathematical vocabulary, the authors employed purposive sampling to generate a targeted and pertinent population. This strategy raises the possibility of notable gains and promotes an enhanced understanding of how particular interventions might help struggling students advance academically.

3.3 Research Instrument

Mathictionary is a mathematical dictionary that can enhance the mathematical vocabulary skills of Grade 6 learners. The study will incorporate a pre-test and post-test methodology to measure improvements in mathematical vocabulary. The pre-test and post-test will consist of 50 multiple-choice questions focusing on crucial mathematical terms relevant to the Grade 6 curriculum. These questions have been validated by the school head and master teachers from San Miguel Elementary School and Labuin Elementary School, ensuring their reliability and relevance through review by three master teachers.

The Mathematics Dictionary: Mathictionary is supplementary learning material with design features and engaging visuals created using the Canva platform. It was carefully designed to suit learners, and educators thoroughly reviewed all entries to ensure they aligned with Grade 6 learning objectives.

Initially, a pre-test will be administered to gauge their vocabulary skills, this initial assessment was designed to help identify the Grade 6 – Magalang learners of their current understanding of Mathematical terminology. Following the pre-test, the authors provided access to the Mathematics Dictionary: Mathictionary

as supplementary learning material. This valuable supplementary resource will support their learning by enhancing their vocabulary skills of mathematical concepts and terminology.

To enhance the learning experience, the authors provided the thirty-five (35) Grade 6 Magalang learners access to the Mathictionary, a supplementary learning material and a resource designed to enrich their understanding of mathematical concepts. The authors also introduced a series of engaging weekly booklet activities in tandem with this resource. Each booklet contained 30 carefully crafted questions that included multiple-choice and identification question formats, encouraging students to apply their knowledge and reinforcing their mathematical vocabulary skills in a structured manner.

The authors systematically organized and divided the letters from the Mathematics Dictionary: Mathictionary to facilitate the weekly activities. The allocation of letters is as follows: letters A – F correspond to week 1, G – L to week 2, M – S to week 3, and T – Z to week 4. This organized approach fosters a progressive learning environment, allowing the learners to develop their understanding logically and cohesively.

After a designated period of utilizing the Mathematics Dictionary: Mathictionary as supplementary learning material and implementing weekly interventions for Grade 6—Magalang learners at San Miguel Elementary School, a post-test comprising fifty (50) items is administered to assess and evaluate any enhancement in the learners' Mathematical vocabulary skills.

The process of data collection and analysis will employ statistical methods, specifically paired t-tests. This approach allows the authors to determine significant differences between the pre-test and post-test scores. This structured approach aims to effectively evaluate Mathictionary's role in enhancing mathematical vocabulary among Grade 6 learners. Through this evaluation, the authors seek to gain valuable insights into how this supplementary learning material contributes to the learner's understanding and enhancement of their Mathematical vocabulary skills.

3.4 Data Gathering Procedure

The authors prepared a letter for approval to conduct the study at San Miguel Elementary School in San Miguel Pila, Laguna, through Mrs. Alma SM. Tomacruz, School Head. The authors then constructed a questionnaire validated by experts through Mr. Alvin M. Lumidao, Master Teacher II, and Mrs. Alma SM. Tomacruz, School Head from San Miguel Elementary School, and Mrs. Jonalyn SM. Veridiano, a Teacher III in Labuin Elementary School.

Afterwards, the authors administered a pre-test to determine the level of mathematical vocabulary of the Grade 6 learners. The authors explained to the respondents the importance of their response to the study and asked them to answer honestly.

Upon the respondents' completion of the questionnaire, the authors gathered and reviewed the responses to select the 35 learners with the lowest scores as their respondents for their study. The authors also used the Raosoft application. Through this application, the researchers included all 51 Grade 6—Magalang learners and got the result of thirty-five (35) Grade 6 learners as their respondents in this study.

The authors collaborated with an expert statistician to choose the most appropriate statistical methods and accurately interpret the data. This partnership not only ensured a rigorous interpretation of the data but also provided valuable insights into the findings. Leveraging the results from this comprehensive analysis, the authors were able to draw meaningful conclusions and craft well-informed recommendations for the study.

3.5 Statistical Treatment of Data

To answer the problem of the research study, the data were subjected to the following statistical treatment:

Mean

The authors used the mean to calculate the mean of the scores in the pre-test and post-test to determine the mathematical vocabulary of Grade 6 learners before and after using Mathematics Dictionary: Mathictionary, a supplementary learning material, and to evaluate the pre-test and post-test results. This approach allowed the authors to effectively evaluate the outcomes of the assessments and gain insights into the impact of the intervention.

T-test

The authors used a T-test to determine the relationship and the difference between the pre-test and post-test, comparing them to determine if they differed statistically strongly. This method was beneficial when dealing with small sample sizes.

The authors used a t-test to compare the average scores of two groups before and after the intervention to determine if there was a significant change in learners' mathematical vocabulary.

The authors used purposive sampling to determine the sample size needed for the study. Purposive sampling is a technique used to select a specific group of individuals or units for analysis. Participants are chosen “on purpose,” not randomly, by administering a pre-test that contains 50-item test questionnaires about mathematical vocabulary among 51 Grade 6 Magalang learners. Therefore, the authors agreed to choose the 35 learners who scored lowest in the administered pre-test.

4. PRESENTATION, ANALYSIS, AND INTERPRETATION OF DATA

This chapter presents the data gathered from the respondents, the outcomes of the statistical analysis, and the interpretation of findings. These are presented in tables with corresponding interpretations. The study's conclusions and recommendations were derived from data analysis and interpretation.

Table 1.

MEAN LEVEL OF GRADE 6 LEARNERS' VOCABULARY SKILLS BEFORE USING MATHICTIONARY

Criteria	N	Mean	Standard Deviation	Percentage Score	Interpretation
Vocabulary Skills	35	14.77	4.44	49.23%	Low

**27-30 – Very High, 21-26 – High, 15-20 – Moderate, 8-14 – Low, 0-7 – Very Low*

Table 1 shows the descriptive analysis of the pre-test scores of Grade 6 – Magalang learners before using the intervention supplementary material, Mathictionary, a self-made booklet. This covers the average scores of Grade 6 learners before using the intervention.

The results of mean vocabulary skill score of the students before the use of Mathictionary was **14.77,** with a standard deviation of **4.44,** indicating moderate variability in scores among the students. The percentage score of **49.23%** places the students' vocabulary skills in the **"Low"** category. This indicates that before using Mathictionary, the learners faced challenges in understanding and applying mathematical vocabulary.

Therefore, this states that before using Mathictionary, the students exhibited weak vocabulary skills, with most scores falling into the "Low" category. This suggests the need for a targeted intervention to improve their mathematical vocabulary.

To some extent, the results from these findings correspond to Bergman, R. (2024), who states that academic vocabulary is just as important to academic success as raw math skills. To thoroughly understand the subject, students must master mathematical vocabulary. To become proficient, one must first build a vocabulary that includes words from "addend" to "y-axis," understand those words, and then be able to use and apply those words to new circumstances.

These findings also align with Bulos's (2021) assertion that mathematical terminology significantly impacts learners' mathematical development, comprehension, and proficiency. Furthermore, the results strengthen the connection to the study of Delaney Raupp (May 2020), indicating that vocabulary is an effective tool for improving pupils' mathematics performance. Learners whose math instruction is primarily explanation-based must learn how to express their mathematical knowledge effectively. According to every instructor surveyed, vocabulary is a crucial ability that students must acquire to understand the material being taught.

To further examine the results, this aligns with the findings of Xu et al. (2022), which highlight several challenges that may hinder students' understanding of mathematical vocabulary. These challenges include: (1) language barriers, (2) inadequate prior knowledge, (3) abstract concepts, (4) complex notation, and (5) limited opportunities for practice.

Table 2.

MEAN LEVEL OF GRADE 6 LEARNERS' VOCABULARY SKILLS AFTER USING MATHICTIONARY

Criteria	N	Mean	Standard Deviation	Percentage Score	Interpretation
Vocabulary Skills	35	33.20	6.37	83.00%	High

**27-30 – Very High, 21-26 – High, 15-20 – Moderate, 8-14 – Low, 0-7 – Very Low*

Table 2 shows the descriptive analysis of the post-test scores of Grade 6 – Magalang learners after using the intervention supplementary material Mathictionary, a self-made booklet. This covers the average scores of Grade 6 learners after using the intervention.

The mean vocabulary skill score of the students after the use of Mathictionary reveals that it increased to **33.20,** with a standard deviation of **6.37,** reflecting greater variability in scores. The percentage score of **83.00%** places the students' vocabulary skills in the **"High"** category, indicating significant improvement compared to the pre-test results. This suggests that Mathictionary effectively enhanced the students' understanding of mathematical vocabulary.

After using Mathictionary, there was a significant improvement in the students' vocabulary skills, with most scores now in the "High" category. This demonstrates the effectiveness of Mathictionary as a tool for strengthening mathematical vocabulary.

The mean score between the two tests shows a significant improvement in learners' scores after using Mathictionary. On average, Grade 6 learners scored much higher in the post-test compared to the pre-test.

The average score increase suggests that Mathictionary effectively enhanced Grade 6 learners' mathematical vocabulary. The standard deviation and percentage score also show increased variability in scores after using Mathictionary, suggesting a wider range of performance among learners.

Overall, these findings strongly support the investigation conducted by George and Jonah (2023), which emphasizes the importance of building a strong vocabulary for learners who struggle with mathematics. By becoming familiar with essential phrases and concepts, these learners can improve their comprehension of mathematical problems and boost their confidence. Additionally, a solid understanding of mathematical terminology enables students to communicate and collaborate more effectively with instructors and peers, further enhancing their understanding of mathematics.

Steven Barcenes's study from 2019 is also in line with these findings, which highlights the vital role that a strong understanding of mathematical terminology plays in the success and development of learners' mathematical skills. He emphasizes that recognizing specific areas where students face challenges is essential for enhancing their math proficiency. By conducting in-depth analyses of these problematic areas, educators can gain valuable insights that will inform the design of targeted interventions. These interventions could focus on crucial math topics, particularly the vocabulary used in mathematics, ultimately fostering a more robust foundation for student learning in this subject.

The findings discussed are further illuminated by Oden's study (2021), which reveals that the effectiveness of educational instruction wanes significantly when instructional resources are either underutilized or completely absent during lecture sessions. This decline in teaching efficacy emphasizes the pivotal role that instructional materials play in the educational landscape. Far more than mere supplementary tools, these resources serve to actively engage students, fostering an environment conducive to independent inquiry and self-directed learning. Their presence not only enhances comprehension but also inspires students to take initiative in their educational journeys.

Table 3.

SIGNIFICANT DIFFERENCE IN GRADE 6 LEARNERS' VOCABULARY SKILLS BEFORE AND AFTER USING MATHICTIONARY

Criteria	***N***	***Mean***	***t***	***Significance Level***	***Critical Value***	***Interpretation***
Pre – Test Vocabulary Skills	35	14.77	-12.91	0.05	2.032	Significant
Post – Test Vocabulary Skills	35	33.20				

Table 3 shows the significant difference in the students' mean vocabulary skill scores before and after using Mathictionary. The paired t-test analysis revealed a **t-value of -12.91,** which exceeds the critical value of **2.032** at a **0.05 significance level.** This confirms that the increase in vocabulary skills from the pre-test (mean = 14.77) to the post-test (mean = 33.20) is statistically significant. The small p-value (< 0.05) strongly supports rejecting the null hypothesis of no difference.

The negative t-value indicates that post-test scores were significantly higher than pre-test scores, demonstrating the effectiveness of Mathictionary in improving students' mathematical vocabulary.

After using Mathictionary, vocabulary skills improved statistically significantly. This highlights Mathictionary's role in enhancing the learners' ability to understand and use mathematical vocabulary effectively.

Overall, the implementation of Mathictionary positively and significantly impacted the vocabulary skills of Grade 6 learners in mathematics. The pre-test results revealed a "Low" level of vocabulary skills, showing the need for an intervention. After using Mathictionary, the learners' skills improved significantly, as shown by the increase in post-test scores and the paired t-test results. This study emphasizes the importance of innovative tools like Mathictionary in fostering academic improvement and better comprehension of mathematical concepts.

Therefore, this supports a 2019 study by Shakespear Maliketi Chiphambo, which concluded that adding a mathematics dictionary to the classroom improves learners' information-seeking, mathematical aptitude, and capacity for autonomous learning. This is evidenced by the likelihood that learners will pay attention and dwell on the material.

Up to a point, this effectively highlights the key benefits observed from utilizing the Mathematics Dictionary: Mathictionary, such as enhancing learners' ability to seek information, enhancing their mathematical vocabulary skills, and fostering their capacity for independent learning. This also demonstrates how the Mathematics Dictionary: Mathictionary serves as a resource and supplementary learning material and engages learners more effectively with the material. This engagement increases the likelihood that learners will pay attention to and deeply understand the content being taught. Overall, the results and findings emphasize the positive influence of the mathematics dictionary on learners' educational experiences.

In addition, these findings strengthen Mateusz Brodowicz’s (June 2024) study, which states that dictionaries have many benefits for students' language development when used in the classroom, which is why educators often encourage dictionary use as a teaching tool. This is also in line with Young AF and Patterson

LG's study in 2019 highlighted that misconceptions and alternative conceptions that arise from a lack of appropriate geometrical vocabulary are addressed by incorporating a mathematics dictionary into the lecture. However, by incorporating a mathematics dictionary into the class, students are forced to pay attention, which enriches and improves their mathematical performance both now and in the future.

5. SUMMARY OF FINDINGS, CONCLUSIONS, AND RECOMMENDATIONS

This chapter recapitulates the study's entire contents. It comprises the study's summary, conclusions, and recommendations based on the data gathered. This study examined and provided ideas to better understand the Mathictionary: Enhancing Math Vocabulary of Grade Six Learners.

5.1 Summary of Findings

The conducted study has proven that the utilization of the Mathictionary was effective. Specifically, these are the salient findings:

1. The lowest mean score on the pre-test of Grade 6 students' vocabulary level before using Mathictionary demonstrated that the students had difficulty comprehending and using mathematical terminology before using Mathictionary.

2. The post-test on the vocabulary level of the Grade 6 learners after using the Mathematics Dictionary: Mathictionary showed significant improvement in the scores and had the highest mean.

3. The mathematical vocabulary of Grade 6 learners of San Miguel Elementary School showed a significant difference before and after using the Mathematics Dictionary: Mathictionary.

5.2 Conclusion

Based on the findings, the following conclusions were drawn:

The null hypothesis, which posited that there is no significant difference between the Grade 6 learners' math vocabulary levels before and following the use of the Mathematics Dictionary: Mathictionary, was conclusively rejected based on the empirical evidence gathered during the study. The data collected revealed an apparent enhancement in the learners' mathematical vocabulary as a direct result of utilizing this supplementary resource.

In general, the study suggests that incorporating specialized tools like the Mathematics Dictionary: Mathictionary in the curriculum can serve as a vital intervention for improving learners' vocabulary in mathematics. By enhancing their vocabulary skills, learners can engage more profoundly with mathematical concepts, which ultimately contributes to their overall academic success in the subject. This finding underscores the importance of equipping students with adequate resources that foster their understanding and usage of mathematical language, thereby empowering them to excel in their mathematical learning journey.

5.3 Recommendations

Based on the findings and conclusions, the following recommendations were offered:

1. The results may lead to new theories for improving learners' mathematical vocabulary using the Mathematics Dictionary: Mathictionary. These theories could provide useful insight for educators, researchers, and curriculum developers, defining the future path of vocabulary enhancement strategies in mathematics education.

2. Grade 6 learners may use supplementary material such as a Mathematics Dictionary: Mathictionary to improve their mathematics vocabulary.

3. The school may establish a program for implementing and using the Mathematics Dictionary: Mathictionary to enhance the learners' mathematics vocabulary.

4. Society must consider implementing a Mathematics Dictionary: Mathictionary to enhance learners' mathematical vocabulary by making it available at educational institutions and to promote mathematical literacy in the community.

5. Future researchers can continue to enhance the MATHICTIONARY: Mathematics Dictionary, targeting critical thinking skills to improve and expand the vocabulary by providing higher-order thinking skills (HOTS) questions.

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