

Mathematics Learning Using the Traditional Papuan Media Approach “Omtim (Sago Leaf Veins)”

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Abstract

Learning mathematics may seem boring and difficult for some, but for many, it's a knowledge that can provide solutions and significantly assist people in achieving their dreams. For example, becoming proficient in mathematics can help others gradually develop a love for learning mathematics. Mathematics is a highly abstract subject, so it's true that some people are somewhat allergic and fearful of the word, as it seems to them a threat that disrupts their lives, with numbers and formulas that are so difficult to absorb. However, it's important to realize that understanding mathematics is actually quite fascinating, as it can be done through very simple and inexpensive tools. One such tool is "OMTIM," or "Sago Vein Leaf" in Indonesian. Sago Vein Leaf is a naturally occurring plant whose fruit is often used as a staple food by the people of Papua and surrounding areas. Sago fruit can be processed into a traditional Papuan dish called "PAPEDA." Research has shown that using sago leaf veins can help students understand number operations, including addition (+), subtraction (-), multiplication (), and division (÷). The results indicate that using sago leaf veins makes it easier for students to understand and operate based on the rules, functions, and formulas of number operations.*

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1. INTRODUCTION

Education is one of the main pillars in national development as regulated in Article 31 of the 1945 Constitution, where every citizen has the right to education. Law Number 20 of 2003 concerning the National Education System emphasizes that education aims to enlighten the nation's life and develop Indonesian people who are faithful, pious to God Almighty, and have noble morals. However, the reality on the ground shows that access to and quality of education still face various challenges. Educational inequality in Indonesia occurs in various regions, especially in Remote, Underdeveloped, and Disadvantaged (3T) areas. Factors such as lack of facilities, a shortage of teaching staff, and disparities in access to learning resources are the main obstacles that hinder the achievement of equitable quality education. In the teaching aspect, conventional approaches that only focus on lecture methods are often ineffective in facilitating student understanding, especially in mathematics subjects. This leads to low student interest and motivation in learning. Therefore, innovations in learning that are relevant to local conditions are needed to increase student engagement and understanding of the material.

Pegunungan Bintang, a district located in the Papua province of Papua, is a region with very challenging geographical conditions. This region consists of towering mountains with limited transportation access, which impacts the development of educational infrastructure. According to data from the Ministry of Education, Culture, Research, and Technology, this area is categorized as underdeveloped with a low literacy rate compared to other regions in Indonesia.

Educational facilities in Pegunungan Bintang are generally still minimal. Many elementary schools lack classrooms, textbooks, and learning media. Furthermore, the uneven distribution of teaching staff results in many schools lacking qualified teachers. In the context of mathematics learning, this challenge is even more pronounced, as mathematics is often considered difficult and boring by students.

On the other hand, the Bintang Mountains community possesses rich and unique local wisdom, including natural resources such as sago leaves. Commonly used in the community's daily lives, sago leaves can be utilized as an innovative learning medium to introduce mathematical concepts in a relevant and contextual way for students in the region. The use of sago leaf veins in elementary school learning about number operations is expected to be an innovative solution to improve student understanding. This approach not only overcomes the limitations of learning media but also integrates local culture into the teaching and learning process, so students feel more connected to the material they are learning.

Mathematics is often considered a difficult subject for elementary school students, especially when it comes to abstract concepts like number operations. Third-grade students are in the concrete operational stage according to Piaget's cognitive development theory (1952). This suggests that students understand concepts more easily when presented using concrete media. However, in many elementary schools, mathematics learning still tends to be theoretical without adequate media. This results in low student interest and learning outcomes.

The media (sago leaf veins) is a simple, readily available, and easily demonstrated learning tool at the Okngam Inpres Elementary School. This media also helps students grasp the concept of number operations more concretely, thus facilitating comprehension and increasing their enthusiasm for learning. Sago leaf veins are called *Omtim* in the Ngalum language, a tribe in the Pegunungan Bintang Regency, Papua.

LEARNING THEORY

a. Understanding the Process

According to Sudjana (2005:67), the use of appropriate media can improve students' understanding of the concepts being taught. Process research is a study that focuses on how learning occurs, including methods, media, and interactions between teachers and students. In this context, the use of sago leaf veins media is analyzed to see how it affects students' learning process in understanding number operations. According to Arikunto (2010:45), in educational research, learning media plays a role as a tool that makes it easier for students to understand the material. Process research also observes how students respond to the learning methods applied by teachers. If concrete media such as sago leaf veins are used, the learning process can be more interesting and effective because students can directly manipulate the objects used in calculations.

b. Understanding Learning

According to Gagné (1985:27), effective learning occurs when students experience a series of conditions that include attention, expectations, and information processing, including the use of appropriate learning media. Learning is a change that occurs in a person's capacity that can last for a long time and is not simply the result of a growth process. This change occurs because of experience and interaction with the environment. Slameto (2010:54) explains that student learning success is influenced by various factors, including internal factors such as interest and motivation as well as external factors such as the environment and the learning media used. Learning is a process of effort made by someone to obtain changes in behavior, knowledge, skills, and attitudes through experience and practice. In this study, the use of sago leaf veins media aims to provide a more concrete learning experience so that students can more easily understand number operations. Piaget (1970:89) revealed that children's cognitive development occurs in certain stages, where elementary school-aged children are at the concrete operational stage, which means they find it easier to understand mathematical concepts if given concrete media such as visual aids and manipulatives. In his theory of cognitive development, children learn by constructing their own knowledge through

interactions with their environment. Therefore, using natural materials, such as sago leaf veins, is appropriate for elementary school students, as they understand mathematical concepts more easily through tangible objects they can see and touch.

c. Understanding Learning

Joyce and Weil (2000:102) state that effective learning models must be designed to increase student engagement in the learning process, including by using media that can facilitate deeper exploration of concepts. Learning is a process of interaction between students and teachers and learning resources in a particular environment. Learning is not just about delivering material, but also involves strategies, methods, and media used to achieve learning objectives. Dimiyati and Mudjiono (2006:75) explain that learning media is one of the important factors that can increase the effectiveness of the teaching and learning process, especially in helping students understand abstract concepts through concrete experiences. Learning is an activity carried out by teachers systematically to help students achieve certain competencies. In the context of this study, the use of sago leaf veins media in learning aims to improve students' understanding of number operations in a more concrete and enjoyable way. Bruner (1966:45) emphasizes that effective learning occurs when students can build knowledge through the process of discovery and interaction with their environment. In the theory of experiential learning (*learning by doing*), Children understand concepts more easily if they directly experience the learning process through manipulating real objects. Therefore, sago leaf veins are an effective tool for teaching number operations because students can see, touch, and group them according to the mathematical concepts they are learning.

d. Learning Basics

According to Prasojo (2016), learning mathematics requires a strong understanding of basic concepts. The process of learning mathematics involves experiential understanding of the properties of a collection of objects. The foundation of learning includes principles and theories that support the teaching and learning process. Some relevant theories include the following.

a. Behaviorism

This theory emphasizes the importance of stimulus and response in learning. Teachers can provide examples of how sago leaf veins are used and then ask students to imitate them.

b. Cognitivism

This theory emphasizes on how information is processed by the brain. Students will more easily understand the concept of number operations if they see real-life representations through concrete media.

c. Constructivism

This theory prioritizes experiential learning. The use of sago leaf veins allows students to explore their own understanding of number operations.

d. Understanding the Learning Process

The learning process is the entirety of activities carried out systematically to achieve learning objectives. In this context, teachers must design appropriate strategies, such as using sago leaf veins as a medium, to make learning more effective and appropriate for the understanding level of third-grade elementary school students.

UNDERSTANDING MATHEMATICS

Mathematics is the study of patterns, structures, relationships, and changes that can be expressed in the form of numbers, symbols, and formulas. James & James (1976:123) define number operations as mathematical procedures applied to numbers to obtain certain results, such as addition, subtraction, multiplication, and division. Mathematics is the science of logic regarding forms, arrangements, quantities, and concepts that are interconnected with each other. Ruseffendi (2006:67) states that the use of concrete media in mathematics learning can help students understand abstract concepts better. Mathematics is a symbolic language that functions as a tool for logical and critical thinking in solving problems. Mathematics not only contains numbers and formulas, but also trains systematic and analytical thinking. In

elementary education, number operations include addition, subtraction, multiplication, and division.

a. Addition

Addition is a basic operation that combines two or more numbers to get a result. (sum). Symbol: (+). **Source:** Van de Walle (2007) in "Elementary and Middle School Mathematics" refers to addition as "combining" or "putting together".

Example:

1. If there are 3 strands of sago leaf veins and 5 more strands are added, then the total becomes $3 + 5 = 8$ strands.

Tim wii tapkoton tim elnen mumtepa tim pahiknen



2. If there are 7 sago leaf veins and 4 more are added, the total is $7 + 4 = 11$ leaves.

Tim petnen tapkoton tim laplao mumtepa tim kumnen



3. If there are 10 sago leaf veins and 6 more are added, the total will be $10 + 6 = 16$ leaves.

Tim dangolnen tapkoton bangupnen mumtepa tim hiongmaki



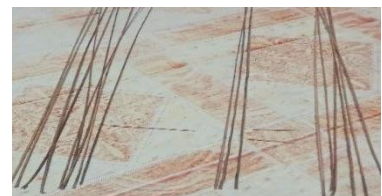
b. Reduction

Subtraction is an operation that calculates the difference between two numbers. in the mother tongue or Operation to find the difference between two numbers or take a portion of a set. Symbol: (-). **Source:** The Mathematics Teacher's Book for Grade III (Ministry of Education and Culture, 2018) defines subtraction as the opposite of addition and the process of separating/reducing.

Example:

1. If there are 9 sago leaf veins and 3 are taken, then the remainder is $9 - 3 = 6$ leaves.

Tim tinen kako tim wii mumtepa tim bangupki



2. If there are 12 sago leaf veins and 5 are taken, then the remaining ones are $12 - 5 = 7$ leaves.

Tim hiongnen kako tim elnen mumtepa tim petnen



3. If there are 15 sago leaf veins and 8 are taken, then the remaining ones are $15 - 8 = 7$ leaves.

Tim hiimaki kako tim pahiknen mumtepa tim petnen



c. Multiplication

Multiplication can be thought of as repeated addition.

Or the repeated addition of the same number. Symbol: (×). **Source:** NCTM (2000) in

"Principles and Standards for School Mathematics" states that basic multiplication is understood as "repeated addition" and "equal groups".

Example:

1. If there are 3 groups of sago leaf veins, each containing 4 leaves, then the total number is $3 \times 4 = 12$ leaves.

Tim ngung wii tok tim laplao mumtepa hiongnen.



2. If there are 5 groups of sago leaf veins, each containing 6 leaves, then the total number is $5 \times 6 = 30$ leaves.

Tim ngung elnen tok tim bangupnen mumtepa tim topa maki wii a



3. If there are 7 groups of sago leaf veins, each containing 3 leaves, then the total number is $7 \times 3 = 21$ leaves.

Kon ngung petnen tok kon wii mumtepa kon petmaki



d. Distribution

Distribution is an operation that divides a number into groups of equal size. Symbol: $(:)$ or (\div) . **Source:** The book "Elementary Mathematics Learning" (Suharsono, 2015) explains division as the opposite of multiplication and the process of "sharing" (equal division) or "grouping".

Example:

1. If there are 12 sago leaf veins divided into 3 groups, then each group will get $12 \div 3 = 4$ leaves.

Kon hiongnen lehongye ngung wii paon mumtepa ngung makia laplao.



2. A student has 18 leaves and wants to divide them into 6 equal groups. Each group will receive $18 \div 6 = 3$ leaves.

Kon dangolnenmaki lehongye ngung bangupnen paon mumtepa ngung makia kon wii.



3. If there are 24 leaves and they are distributed evenly to 8 students, then each student will get $24 \div 8 = 3$ leaves.

Omkon dake laplaoki lehongye omkon pahiknen heon mumtepa ngung makia kon wii.



MATHEMATICS LEARNING PROCESS

The mathematics learning process is an activity designed to help students understand mathematical concepts through various methods and media. Mathematics is abstract, so using concrete tools like sago leaf veins can help students better grasp the basic concepts of number operations.

The mathematics learning process includes several important stages, including:

a. Concept Introduction

The teacher explains number operations using sago leaf veins as a teaching aid.

b. Exploration

Students are given the opportunity to try it themselves by forming numbers or counting using sago leaf veins.

c. Practice and Discussion

Students are given questions based on the use of sago leaf veins as a medium and discuss with classmates to find solutions.

d. Application in Daily Life

Teachers relate number operations material to real situations, for example counting the number of objects around them using the same method.

a. Evaluation and Follow-up Stage

Evaluation is conducted to determine the extent to which students understand the material taught. Some evaluation methods that can be used in mathematics learning are:

a. Written test

The teacher gives number operation questions to measure individual understanding.

b. Observation

The teacher observes how students use sago leaf veins as a medium to solve mathematical problems.

c. Reflection and Discussion

Students are invited to re-explain the concepts they have learned and identify the difficulties they face.

d. Follow-up

If a student is having difficulty, the teacher can provide additional guidance or find another, more appropriate method to explain the concept.

b. Student-Centered Learning

This approach places students at the center of learning. Students are given the opportunity to explore concepts independently with teacher guidance. Using sago leaf veins as a medium allows students to learn through direct experience, making it easier to understand number operations.

c. Authentic Assessment

Rating Authentic assessment is an evaluation method that assesses students' understanding in real-life situations. In learning number operations, assessment can be conducted by asking students to use sago leaf veins to solve addition, subtraction, multiplication, and division problems.

d. Constructivist Learning

The constructivist approach emphasizes that students construct their own understanding based on direct experience. By using concrete media such as sago leaf veins, students can explore and understand the concept of number operations through real-life experiences, making learning more effective and meaningful.

INSTRUCTIONAL MEDIA

Arsyad (2011:89) states that learning media plays a crucial role in increasing the effectiveness of the teaching and learning process by providing students with a more immersive learning experience. Media in the educational context refers to tools, materials, or methods used to help make the learning process more effective and efficient. Learning media is anything that can be used to convey messages in learning, thereby stimulating students' attention, thoughts, and feelings. The use of media aims to bridge the gap between abstract concepts and concrete experiences that can be understood by students. In mathematics learning in elementary schools (SD), media is very important because it can help students understand difficult concepts through direct experience. Media can take the form of concrete objects that can be touched and manipulated. The use of concrete media is very effective for elementary school students who are still in the concrete operational stage according to Piaget's theory, because they find it easier to understand something through direct activities rather than just theory or numbers on the board.

SAGO LEAF VEINS

Sago leaf veins are a concrete form of media that can be used in mathematics learning, particularly in explaining number operations. Sago leaf veins are part of the sago leaf that has been dried until only the fiber remains. These veins are long and can be used as a counting

tool for addition, subtraction, multiplication, and division. The use of sago leaf veins as a learning medium is highly relevant, especially in areas with abundant sago trees, such as Papua and Maluku. Besides being readily available, this medium also supports learning based on local wisdom, allowing students to become more familiar with the tools they use in learning. Furthermore, because of its natural nature and cost-effectiveness, this medium is also environmentally friendly and can be reused. In practice, teachers can ask students to group sago leaf veins to understand the concept of number operations in a more concrete and interactive way.

In the context of learning, these stiff and straight pieces of sago leaf veins are used as mathematical manipulatives, physical objects that students can hold and arrange to understand abstract mathematical concepts.

a. Why Is This Media Effective for Learning?

1. Contextual and Local Wisdom:

For students at Okngam Elementary School, sago palms and their byproducts are part of everyday life. Using omtim makes mathematics relevant and familiar.

2. Concrete and Visual:

Third-grade students are still in the concrete operational stage. They find it easier to understand " $5 + 3$ " by seeing and touching five sticks and then adding three more, rather than simply looking at the numbers on the board.

3. Tactile:

The activity of touching, holding, arranging and counting omtim sticks involves the sense of touch, which strengthens memory and understanding.

4. Cheap and Easy to Get:

The raw materials are abundantly available in the school environment for free, making it sustainable and easy to replicate.

b. Parts of Sago Leaves and Their Uses for Media

To understand this medium well, it is important to know the part of the sago leaf that is used.

The leaf blade is the broad, green, fleshy part of the leaf. Its surface is rough and strong. This part is not used directly as a counting medium. However, the leaf blade must first be removed to obtain the leaf veins. This process of removing the leaf blade is called "cutting" or "peeling."

The Leaf Vein or Leaf Vein (Midrib) is the main part used as a medium. The sago leaf vein is shaped like a long, stiff, and straight stem. It is yellowish white or light brown when dry. Its texture is hard and light, similar to solid Styrofoam. This leaf vein is cut into small pieces (for example, 10-15 cm) to be used as counting units. Each stem represents a number (unit). Example of Use: To explain $4 + 2$, students take 4 omtim stems and 2 omtim stems, then combine them and count the total to 6 omtim stems.

Leaf Ribs: These are smaller supporting structures within the leaf blade itself, extending from the main leaf vein. They are smaller and less robust than the main leaf veins. They are typically not used due to their smaller size, less uniformity, and less strength than the main leaf veins. The focus is on the main leaf veins, which are sturdy and easy for children to handle.

Media Creation Process:

1. Picking Sago Leaves: Picking the fronds of old sago leaves.



2. Separating the Leaf Blades: Remove the broad green leaf blades by cutting or peeling them, leaving only the firm white/cream-colored midribs.



3. Cleaning and Drying: clean the leaf bones and dry them in the sun.
Cutting into Counting Rods: Cutting the dried leaf veins into hundreds of small, uniformly sized rods. These pieces are called ready-to-use optical media.

NUMBER OPERATIONS

Number operations are a fundamental concept in mathematics, encompassing four main operations: addition, subtraction, multiplication, and division. These concepts are used in various aspects of daily life, such as counting money, measuring length, dividing objects, and so on. Therefore, a solid understanding of number operations is crucial for elementary school students as a foundation for more complex mathematics materials at subsequent levels of education. In learning number operations, the use of concrete media such as sago leaf veins can help students better understand the calculation process. For example, in addition, students can group several sago leaf veins to see the result immediately. In subtraction, students can subtract several veins from the existing group and observe the result. For multiplication, students can create several groups with the same number of veins, while in division, they can divide the sago leaf veins into smaller groups evenly.

a. Addition (as a combination)

1. The teacher has 4 sago leaf veins; the class leader gives 3 sago leaf veins. How many sago leaf veins does the teacher have in her hand now? (Students put $4 + 3$ veins together, count all: 7) ($4 + 3 = 7$)



2. On Tomi's table there are 5 sago leaf veins, Tomi's friend added 2 sago leaf veins. How many in total? 7 ($5+2=7$)



3. If 1 child brings 6 leaf veins and his friend brings 4 sago leaf veins, how many of them will there be combined? ($6+4=10$)



b. Reduction (as a deduction/remainder)

1. Rani has 8 leaf veins; she gave 3 veins to her younger sibling. How much is left for Rani? (Students take 3 of the 8 veins, calculate the remainder: 5) ($8-3=5$)



2. There are 9 veins on sago leaves. 5 veins on sago leaves are used for crafts. How many veins on sago leaves are left? 4 ($9-5=4$)



c. Multiplication (as repeated addition)

1. Each child gets 2 leaf veins. If there are 3 children, how many leaf veins are there in total? (Students make 3 groups of 2 veins each, then calculate: $2+2+2 = 2 \times 3 = 6$)



2. One bundle contains 5 sago leaf veins. And there are 4 bundles, How many veins are there in total? ($5+5+5+5 = 5 \times 4 = 20$)



3. Each bag contains 3 sago leaf veins. If there are 5 bags of sago leaf veins, how many are there in total? ($3+3+3+3+3 = 3 \times 5 = 15$)

d. Distribution (as equal distribution)

1. 6 sago leaf veins will be divided equally among 2 children. How many sago leaf veins will there be per child? (Students divide the 6 veins into 2 equal groups: 3 each) ($6:2=3$)



2. There are 9 sago leaf veins, divided equally among 3 friends. How much will each get? Each of them gets 3 sago leaf veins ($9:3=3$)



3. 12 sago leaf veins are given to 4 groups. How many sago leaf veins will each group get? Each group gets 3 ($12:4=3$).



2. RESEARCH METHODS

OBSERVATION

Observations were conducted to observe students' interactions with sago leaf veins as a medium for understanding number operations. Spradley (1980:78) states that participant observation involves direct observation and active participation in the daily lives of the people

being studied to understand their perspectives. He divides observation into participatory and nonparticipator. In this study, participatory observation was used, in which the researcher participates in the learning process to understand the dynamics that occur.

INTERVIEW

Interviews were conducted with the principal, teachers, students, and parents to explore their experiences and opinions regarding the effectiveness of sago leaf vein media in mathematics learning. Patton (1990:55) states that qualitative evaluation methods emphasize in-depth understanding of the individual or group being studied. He states that semi-structured interviews allow researchers to obtain broader and more in-depth answers from participants.

LITERATURE REVIEW

The author cited several previous researchers in addressing this issue and developing it into a scientific article. This is because logical-mathematical intelligence is a skill that society must possess, as the processes and patterns of human life are always influenced by logical and systematic thinking, ensuring that decision-making is not erroneous and appears irresponsible.

3. RESULTS AND DISCUSSION

RESEARCH DESCRIPTION

This research was conducted at Okngam Inpres Elementary School, which is located in Okbemptau District, Bintang Mountains Regency, Papua Mountains Province. Okbemptau District is one of the districts in the central mountainous region of Papua which has the geographical conditions include hills, valleys, and dense forests. SD Inpres Okngam is a public elementary school that serves as an educational center for children in Okngam Village and the surrounding villages. Physically, this school has several characteristics:

1. Building:

It consists of several study rooms (classrooms) of simple construction, usually made of wood and planks. The roof may be made of corrugated iron or other readily available materials.

2. Facility:

Facilities are very limited. They may consist of only classrooms, a simple teacher's office, and an open field for sports activities or ceremonies. The availability of electricity and clean water is a challenge. Water sources may come from rainwater or natural springs around the village.

RESEARCH RESULT

The results of this study were obtained through learning activities using Omtim Sago Leaf Urat media in explaining arithmetic operations to third-grade students of SD INPRES OKNGAM. The study was conducted for 1 month in a full week of meetings, with the aim of determining the extent to which the use of this media can help students understand the concept of arithmetic operations better.

INITIAL LEARNING ACTIVITIES

In the initial stage, the teacher began the lesson by conducting apperception and exploring students' prior knowledge of arithmetic operations. Most students still appeared to have difficulty understanding the concepts of addition and subtraction, especially when dealing with story problems. The teacher then introduced the Omtim Sago Leaf Vein media, a learning aid that utilizes the shape of sago leaf veins as a visual representation to illustrate the process of arithmetic operations. This media is simply made from natural materials easily found around the school.

IMPLEMENTATION OF LEARNING USING OMTIM MEDIA FROM SAGU LEAF VEINS

During the implementation phase, the teacher divided students into several small groups. Each group received a prepared sheet of leaves and used them to practice arithmetic operations concretely. Students were asked to place the "veins of the sago leaf" as symbols for the numbers to be added or subtracted. This activity made students more active, enthusiastic, and directly involved in the learning process. Throughout the activity, students appeared motivated and showed a high level of interest in the learning process. They were able to work well together,

help each other, and confidently express their opinions when the teacher asked questions. The teacher acted as a facilitator, guiding and directing group discussions.

STUDENT LEARNING OUTCOMES

Following the learning activities using sago leaf veins (OMTIM) as a medium, an evaluation was conducted using worksheets and a learning outcome test. The assessment results showed an improvement in students' understanding of arithmetic operations compared to before the media was used. Most students were able to solve the arithmetic operations problems correctly and showed an increase in their average score from their initial to their final score. In addition, the observation results show an increase in student learning activities, such as:

1. Students are more daring to ask the teacher.
2. Students are active in group discussions.
3. Students find it easier to understand the relationship between number symbols and concrete objects.

LEARNING OUTCOMES

a. Addition

Addition is a basic operation that combines two or more numbers to get a result.

Example:

1. If there are 2 strands of sago leaf veins and 5 more strands are added, then the total becomes $2 + 5 = 7$ strands.

Tim kon lao tapkoton tim kon elnen mumtepa tim petnen



2. If there are 4 strands of sago leaf veins and 4 more strands are added, then the total becomes $4 + 4 = 8$ strands.

Tim kon laplao tapkoton tim kon laplao mumtepa tim kon pahiki



3. If there are 10 sago leaf veins and 6 more are added, the total will be $10 + 6 = 16$ leaves.

Tim dangolnen tapkoton bangupnen mumtepa tim hiongmake



b. Reduction

Subtraction is an operation that calculates the difference between two numbers. in the mother tongue

Example:

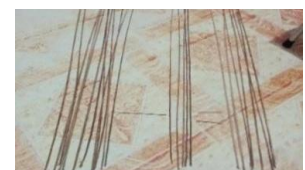
1. If there are 9 sago leaf veins and 3 are taken, then the remainder is $9 - 3 = 6$ leaves.

Tim tinen kako tim wii mumtepa tim bangupnen



2. If there are 12 sago leaf veins and 5 are taken, then the remaining ones are $12 - 5 = 7$ leaves.

Tim hiongmen kako tim elnen mumtepa tim petnen



3. If there are 15 sago leaf veins and 8 are taken, then the remaining ones are $15 - 8 = 7$ leaves.

Tim hiimake kako tim pahiknen mumtepa tim petnen



c. Multiplication

Multiplication can be thought of as repeated addition.

Example:

1. If there are 3 groups of sago leaf veins, each containing 4 leaves, then the total number is $3 \times 4 = 12$ leaves.
Tim ngung wii tok tim laplao mumtepa hiongnen



2. If there are 5 groups of sago leaf veins, each containing 6 leaves, then the total number is $5 \times 6 = 30$ leaves.
Tim ngung elnen tok tim bangupnen mumtepa tim topa maki wiia



3. If there are 7 groups of sago leaf veins, each containing 3 leaves, then the total number is $7 \times 3 = 21$ leaves.
Kon ngung petnen tok kon wii mumtepa kon petmaki



d. Distribution

Division is an operation that divides a number into groups of equal size.

Example:

1. If there are 12 sago leaf veins divided into 3 groups, then each group will get $12 \div 3 = 4$ leaves.
Kon hiongnen lehongye ngung wii paon mumtepa ngung makia laplao.



2. A student has 18 leaves and wants to divide them into 6 equal groups. Each group will receive $18 \div 6 = 3$ leaves.
Kon dangolnenmaki lehongye ngung bangupnen paon mumtepa ngung makia kon wii.



3. If there are 24 leaves and they are distributed evenly to 8 students, then each student will get $24 \div 8 = 3$ leaves.
Omkon dake laplaoki lehongye omkon pahiknen heon mumtepa ngung makia kon wii.



OBSERVATION RESULTS

A. OBSERVED ASPECTS

Day/Date : TUESDAY, SEPTEMBER 9, 2025

Observation Time : 8:00- 9:45 For 2 lesson hours (2 x 35 minutes)

Full Name : LEPIN UOPMABIN

Activity Title : Use of concrete media (sago leaf veins) as an aid understand the operations of addition, subtraction, multiplication and division of whole numbers up to 50.

Relation to the Title: This observation directly tests the effectiveness of natural media (sago leaf veins) which are available and easily obtained in the students' environment as a teaching aid to improve understanding of basic mathematical concepts.

1. Student Involvement: Activeness in using sago leaf vein media during learning.
2. Conceptual Understanding: The ability to explain and solve number operation problems with the help of the media.
3. Impact on Learning Outcomes: Comparison of quick test answers before (pretest) and after (posttest) the use of media. Similar questions consist of 5 addition problems and 5 subtraction problems.

- a. Involvement: Very active. Immediately picks and groups sago leaf veins according to the teacher's instructions. Appears enthusiastic about arranging and counting.
- b. Conceptual Understanding: Can explain that addition is combining two groups of leaf veins, and subtraction is taking a portion. Can solve simple story problems with media.
- c. Learning Outcomes: Pretest: 3/10. Posttest: 8/10. Significant improvement. From frequently misunderstanding the concept of subtraction to understanding it with the help of concrete media.

Day/Date : TUESDAY, SEPTEMBER 9, 2025
 Observation Time : 8:00-09:45 for 2 hours (2 x 35 minutes)
 Full Name : SEPTINUS TEPMUL
 Activity Title : Use of concrete media (sago leaf veins) as a tool help understand the operations of addition, subtraction, multiplication and division of whole numbers up to 50.

Relation to the Title: This observation directly tests the effectiveness of natural media (sago leaf veins) which are available and easily obtained in the students' environment as a teaching aid to improve understanding of basic mathematical concepts.

- a. Involvement: Active, but initially hesitant. After seeing friends, I began to gain confidence in using the media.
- b. Conceptual Understanding: Begins to understand after hands-on practice. Can demonstrate the process $15 + 7$ by joining two groups of leaf veins and counting the total.
- c. Learning Outcomes: Pretest: 4/10. Posttest: 7/10. Improvement. Errors on problems without media (such as $32-15$) decreased after he remembered the simulation using media.

Day/Date : TUESDAY, SEPTEMBER 9, 2025
 Observation Time : 8:00-09:45 for 2 hours (2 x 35 minutes)
 Full Name : ROSALIA UOPMABIN
 Activity Title : Use of concrete media (sago leaf veins) as an aid understand the operations of addition, subtraction, multiplication and division of whole numbers up to 50.

Related to Title : This observation directly tests the effectiveness of natural media (sago leaf veins) which are available and easily obtained in the students' environment as a teaching aid to improve understanding of basic mathematical concepts.

1. Engagement: Moderately active. Prefers to play with leaf veins but can be directed to learn.
2. Conceptual Understanding: Understands addition well, but requires repeated examples for subtraction. When working on $28 - 12$, he is still confused about which one to subtract.
3. Learning Outcomes: Pretest: 2/10. Posttest: 6/10. Moderate improvement. Still requires extra support for abstract concepts without media.
 - a. Involvement: Very focused and diligent. Arranges leaf veins neatly before counting.
 - b. Conceptual Understanding: Very good understanding. Can create own questions using media and explain to friends.
 - c. Learning Outcomes: Pretest: 6/10. Posttest: 10/10. Optimal improvement. The media helped mature his understanding and increase his confidence.
1. Engagement: Less active, often daydreams. Requires a personal approach from the teacher to use media.

2. Conceptual Understanding: Slow to grasp. Only understood when the teacher provided one-on-one support with the media. The concept of "taking" in subtraction became clear after he took the veins of the leaf himself.
3. Learning Outcomes: Pretest: 1/10. Posttest: 5/10. There was an improvement, although still below average. The media managed to capture his attention, albeit late.
 - a. Involvement: Active and cooperative. Enjoys collaborating with peers using media.
 - b. Conceptual Understanding: Easy to understand. Can transition from media to number symbols fairly smoothly. The media strengthens intuitive understanding.
 - c. Learning Outcomes: Pretest: 5/10. Posttest: 9/10. Significant improvement. The media made it more accurate, reducing calculation errors.

Day/Date : TUESDAY, SEPTEMBER 9, 2025
 Observation Time : 8:00-09:45 for 2 hours (2 x 35 minutes)
 Full Name : ALEXS KALAKA
 Activity Title : Use of concrete media (sago leaf veins) as a tool
 Related to Title : This observation directly tests the effectiveness of natural media (sago leaf veins) which are available and easily obtained in the students' environment as a teaching aid to improve understanding of basic mathematical concepts.

1. Involvement: Very enthusiastic and creative. Initiative to create shapes from leaf veins in addition to counting.
2. Conceptual Understanding: The concept of operations is understood. The media serves more as a confirmation and exploration tool. He tries to operate on tens by combining knots (every 10 leaf veins are tied).
3. Learning Outcomes: Pretest: 7/10. Posttest: 10/10. Improvement. The media accommodates her kinesthetic and visual learning styles.

Day/Date : WEDNESDAY, SEPTEMBER 10, 2025
 Observation Time : 8:00-09:45 for 2 hours (2 x 35 minutes)
 Full Name : YUNIAS TEPMUL
 Activity Title : Use of concrete media (sago leaf veins) as a tool to help understand the operations of addition, subtraction, multiplication and division of whole numbers up to 50.
 Related to Title : This observation directly tests the effectiveness of natural media (sago leaf veins) which are available and easily obtained in the students' environment as a teaching aid to improve understanding of basic mathematical concepts.

1. Involvement: Passive at first, becomes active after realizing the leaf veins are easy to count.
2. Conceptual Understanding: Understanding increases. Problems like $40 - 25$ which were initially incorrect, can be solved by taking 4 bundles (40) and opening 2 bundles then taking 5 more.
3. Learning Outcomes: Pretest: 3/10. Posttest: 8/10. Significant improvement. The media helps bridge abstract concepts into reality.

Day/Date : WEDNESDAY, SEPTEMBER 10, 2025
 Observation Time : 8:00-09:45 for 2 hours (2 x 35 minutes)
 Full Name : SICILY TEPMUL
 Activity Title : Using concrete media (sago leaf veins) as a tool to help understand the operations of addition, subtraction, multiplication and division of whole numbers up to 50.
 Related to Title : This observation directly tests the effectiveness of natural media (sago leaf veins) which are available and easily obtained in the

students' environment as a teaching aid to improve understanding of basic mathematical concepts.

1. Involvement: Motorically active (holding, moving), but pays little attention to the teacher's explanation.
2. Conceptual Understanding: Still limited. Able to solve problems using visual aids, but confused when having to write them down numerically.
3. Learning Outcomes: Pretest: 2/10. Posttest: 5/10. Minimal improvement. Needs help associating concrete objects with mathematical symbols.

Day/Date : WEDNESDAY, SEPTEMBER 10, 2025

Observation Time : 8:00-09:45 for 2 hours (2 x 35 minutes)

Full Name : JULY OCTOBER KALAKA

Activity Title : Use of concrete media (sago leaf veins) as a tool to help understand the operations of addition, subtraction, multiplication and division of whole numbers up to 50.

Related to Title : This observation directly tests the effectiveness of natural media (sago leaf veins) which are available and easily obtained in the students' environment as a teaching aid to improve understanding of basic mathematical concepts.

1. Engagement: Calm and obedient. Follows the teacher's instructions well in using media.
2. Conceptual Understanding: Good. The media made him confident in his answers. He was able to explain the steps in a coherent manner.
3. Learning Outcomes: Pretest: 4/10. Posttest: 9/10. Very good improvement. The media became an effective verification tool for him.

Day/Date : WEDNESDAY, SEPTEMBER 10, 2025

Observation Time : 8:00-09:45 for 2 hours (2 x 35 minutes)

Full Name : SIMEON MIMIN

Activity Title : Use of concrete media (sago leaf veins) as a tool to help understand the operations of addition, subtraction, multiplication and division of whole numbers up to 50.

Related to Title : This observation directly tests the effectiveness of natural media (sago leaf veins) which are available and easily obtained in the students' environment as a teaching aid to improve understanding of basic mathematical concepts.

1. Involvement: Spontaneous and enthusiastic. Often comes to the front of the class for demonstrations.
2. Conceptual Understanding: Very good. The media accelerated his understanding. He even helped a friend who was having difficulty.
3. Learning Outcomes: Pretest: 5/10. Posttest: 10/10. Significant improvement. The media suits his kinesthetic nature.

Day/Date : WEDNESDAY, SEPTEMBER 10, 2025

Observation Time : 8:00-09:45 for 2 hours (2 x 35 minutes)

Full Name : BETO UOPMABIN

Activity Title : Use of concrete media (sago leaf veins) as a tool to help understand the operations of addition, subtraction, multiplication and division of whole numbers up to 50.

Related to Title : This observation directly tests the effectiveness of natural media (sago leaf veins) which are available and easily obtained in the students' environment as a teaching aid to improve understanding of basic mathematical concepts.

1. Involvement: Lacks confidence. Only uses media when asked, and even then with hesitation.
2. Conceptual Understanding: Beginning to show progress. When faced with the problem $13 + 18$, he slowly calculated using the leaf veins and got the correct answer.
3. Learning Outcomes: Pretest: 2/10. Posttest: 6/10. Improvement. The media provided a way out of his confusion, although the speed was still below average.

Day/Date : THURSDAY, SEPTEMBER 11, 2025

Observation Time : 8:00-09:45 for 2 hours (2 x 35 minutes)

Full Name : IWAN UOPMABIN

Activity Title : Use of concrete media (sago leaf veins) as a tool to help understand the operations of addition, subtraction, multiplication and division of whole numbers up to 50.

Related to Title : This observation directly tests the effectiveness of natural media (sago leaf veins) which are available and easily obtained in the students' environment as a teaching aid to improve understanding of basic mathematical concepts.

1. Involvement: Active in competitions. Enjoys being asked to compete in counting with the media.
2. Conceptual Understanding: Quick grasp of addition. Subtraction takes longer. Media encourages repeated attempts.
3. Learning Outcomes: Pretest: 3/10. Posttest: 7/10. Improvement. The media increased his motivation and persistence in practicing.

Day/Date : THURSDAY, SEPTEMBER 11, 2025

Observation Time : 8:00-09:45 for 2 hours (2 x 35 minutes)

Full Name : BANGINIP UOPMABIN

Activity Title : Use of concrete media (sago leaf veins) as a tool to help understand the operations of addition, subtraction, multiplication and division of whole numbers up to 50.

Related to Title : This observation directly tests the effectiveness of natural media (sago leaf veins) which are available and easily obtained in the students' environment as a teaching aid to improve understanding of basic mathematical concepts.

1. Involvement: Be careful and thorough. Count the leaf veins repeatedly to be sure.
2. Conceptual Understanding: Deep. He questions if the number of leaf veins is not an even 10 in a bundle, and how to represent this.
3. Learning Outcomes: Pretest: 6/10. Posttest: 10/10. Improvement. The media facilitates deep conceptual understanding, not just memorization.

Day/Date : THURSDAY, SEPTEMBER 11, 2025

Observation Time : 8:00-09:45 for 2 hours (2 x 35 minutes)

Full Name : IKPAIP UOPMABIN

Activity Title : Use of concrete media (sago leaf veins) as a tool to help understand the operations of addition, subtraction, multiplication and division of whole numbers up to 50.

Related to Title : This observation directly tests the effectiveness of natural media (sago leaf veins) which are available and easily obtained in the students' environment as a teaching aid to improve understanding of basic mathematical concepts.

1. Involvement: Tends to be quiet and observe. Only becomes involved when the teacher approaches his desk.
2. Conceptual Understanding: The process is slow but steady. When using media, his expression shows he is processing information.

3. Learning Outcomes: Pretest: 1/10. Posttest: 4/10. Least improvement. Despite some progress, he is still heavily reliant on physical media and has not yet fully transitioned to abstract concepts.

INITIAL CONDITIONS (BEFORE MEDIA USE):

1. Learning number operations takes place conventionally using the lecture method.
 2. Students look passive and less enthusiastic
 3. Many students use their fingers as a counting tool.
 4. Some students seemed confused with the concept of "saving" and borrowing
- Conditions When Using Sago Leaf Vein Media:
5. Students show high enthusiasm for new learning media
 6. Learning activities become more interactive and fun
 7. Students are able to visualize the concept of place value through leaf segments.
 8. Student participation increased significantly in the learning process

AFTER USING THE MEDIA

1. Student Engagement

During the learning process using sago leaf vein media, students demonstrated very active engagement. Almost all students enthusiastically held, arranged, and counted using leaves while the teacher explained the material. The classroom atmosphere was interactive, students often responded to the teacher's questions, helped each other, and dared to come to the front of the class to solve problems. There were no students who were passive or showed boredom. Learning based on concrete objects made students more enthusiastic and focused because they learned while doing direct activities (learning by doing). This indicates an increase in students' physical, mental, and emotional involvement in learning.

2. Concept Understanding

The use of sago leaf veins helped students understand the concept of number operations more concretely. Students were able to represent addition by combining leaves, subtraction by taking away part of a leaf, multiplication as repeated addition, and division as the process of dividing leaves evenly. Most students were able to explain these concepts in simple language, such as "addition is joining leaves" and "subtracting is taking away leaves." This media made it easier for students to understand arithmetic operations that were previously considered abstract. However, some students still took longer to count large numbers of leaves and when subtracting more complex numbers.

3. Impact on Learning Outcomes

The implementation of sago leaf vein media has had a positive impact on student learning outcomes. There was a visible improvement in basic arithmetic skills, particularly in addition and subtraction. Previously passive students began to answer questions confidently and attempt to solve them. Students' speed and accuracy in solving problems also showed significant improvement. Furthermore, students demonstrated higher learning motivation, indicated by a desire to repeat the counting activity using leaves. Overall, learning outcomes improved in both cognitive and learning attitudes, although further practice is still needed to strengthen understanding of multiplication and division.

OBSERVATION RESULT INDICATORS

1. Students actively use media in learning

During the learning activities, students were very active in using the sago leaf vein media as a learning medium. They were directly involved in holding, arranging, moving, and counting the leaves according to the teacher's instructions. Most students also appeared enthusiastic in discussions with their group members when completing the counting tasks using the medium. No student was passive; all demonstrated participation, both physically and verbally. This indicates that the medium used was able to attract attention and increase student engagement in the learning process.

2. Students can solve number operation problems using media

Observations show that the majority of students are able to solve number operations (addition, subtraction, multiplication, and division) using sago leaf veins. Students can:

1. Combining leaves for addition
2. Taking leaves for reduction
3. Arranging repeated leaves for multiplication
4. Divide the leaves equally for distribution

Some students still needed guidance on problems involving large numbers, but generally, they were able to solve problems with the correct steps when using media. This shows that concrete media helps students understand the process of arithmetic operations more easily.

Aspects Observed	Before Media Use	After Media Use
Student activity	Tends to be passive, only Listen	Very active, hands-on using media
Interest in learning	Lack of enthusiasm, get bored quickly	More enthusiastic and happy to learn
Conceptual understanding	Many students are confused about concept of number operations	Understand more because see the counting process directly
Ability to solve problems	Often wrong and slow	Faster and more correct answers
Learning atmosphere	Less interactive	More interactive and fun

3. Comparison before and after media use

The results of observations before and after using learning media are shown in Table 2 below.

Table 1 Comparison before and after using learning media

From this comparison, it can be seen that the use of sago leaf vein media provides significant positive changes to the student learning process and outcomes, both in terms of involvement, understanding of concepts, and the ability to solve problems.

RESULTS OF VALUE DISCUSSION

Based on the data obtained, it can be analyzed as follows:

1. Effectiveness of Sago Leaf Vein Media:
 - There was a significant increase in the average score from 42.1 to 78.5
 - All students experienced an increase in grades ranging from +35 to +39 points.
 - The media successfully concretizes the abstract concept of number operations.
2. Cognitive Aspects:
 - Students understand the concept of place value through visualization of leaf segments.
 - The ability to complete addition and subtraction operations increases
 - Understanding the concepts of "saving" and "borrowing" is easier to digest.
3. Affective Aspect:
 - Student learning motivation increases drastically
 - Students' confidence in working on math problems grows
 - Students are more active and enthusiastic in the learning process
4. Contextual Relevance:
 - Sago leaf vein media is suitable for the students' cultural environment.
 - Learning becomes more meaningful and relatable
 - Effective and efficient use of local resources

TEACHER AND STUDENT RESPONSES

Teachers stated that the use of Omtim Urat Daun Sagu media significantly facilitated the learning process by making the material easier to understand and more enjoyable. Meanwhile, students reported preferring to learn with real-world media rather than simply using books and a blackboard.

DISCUSSION OF RESEARCH RESULTS

This discussion section describes the results of research on the use of Omtim Sago Leaf Veins media in explaining operations material to third-grade students of SD Inpres Okngam. Based on findings during the learning process, the use of this media has an effect on improving students' understanding of arithmetic operations as well as other aspects such as learning motivation, parental support, use of technology, teacher teaching methods, and the learning environment. research on the effectiveness of sago leaf veins media in improving understanding of number operations. Data collected through observation, interviews, and documentation studies were analyzed using an interactive model. *Miles and Huberman*, which includes three stages: data reduction, data presentation, and drawing conclusions

DATA REDUCTION

Data reduction is the process of selecting, focusing, and simplifying raw data from the field. This process allows researchers to organize the data so that substantive findings can be verified.

OBSERVATION DATA

Based on observations during the learning process, relevant data is focused on the following aspects:

1. Enthusiasm and Participation: 80% of students showed a significant increase in enthusiasm. They actively asked questions and were eager to answer when media was used.
2. Conceptual Understanding: Students who previously struggled to differentiate between the concepts of addition and subtraction began to visualize them. Addition is likened to "putting seeds together" and subtraction is like "taking seeds" from a shelf of leaf veins.
3. Collaboration: Learning becomes more interactive. Students help each other in groups to arrange and count the seeds on the media, demonstrating improved collaboration skills.

INTERVIEW DATA

The results of interviews with various sources were reduced to take the core themes:

1. Headmaster:
 - a) Innovation and Local Wisdom: Assessing the sago leaf vein media as a smart breakthrough because it utilizes local resources that are easily obtained and environmentally friendly.
 - b) Feasibility: States that this media is worthy of being adopted as an additional mathematical demonstration tool to overcome the limitations of facilities for its use.
2. Classroom teacher:

Changes in Learning Methods: Recognizes that this media changes the teaching method from lectures to more participatory. Effective visual aids: Emphasizes that this media is very helpful in explaining abstract concepts, especially to students who have kinesthetic and visual learning styles.
3. Students (15 People):

The opinions of 15 students were grouped into four main themes:

 - Interest and Motivation (13 Students): "Learning becomes fun like playing games.
 - Ease of Understanding (11 Students): "Finally understand why $7 - 3 = 4$. because the result of 7 is $(4+3)$.
 - Desire for Reuse (14 Students): When else will you use toys made from sago leaf veins?

- Initial Obstacles (3 Students): "Initially they were a bit confused about how to do it, but now they can count.
4. Parents (15 People):
- Interviews with parents revealed indirect impacts at home, with the following themes emerging:
- Increasing Learning Motivation (12 Parents): when their children are now more enthusiastic about going to school, they are very happy to learn number operations using sago leaf vein media.
 - Involvement in Learning (7 Parents): I also learned new ways to teach math to children.
 - Appreciation for Creativity (15 Parents): Good idea, no need to buy expensive props.

DATA PRESENTATION

The reduced data is presented in narrative form, tables and diagrams to provide a comprehensive picture.

Presentation in Narrative Form

The implementation of sago leaf vein media has successfully transformed the mathematics learning environment. Classes previously dominated by lectures have transformed into active spaces where students become the subjects of learning. This media serves as a cognitive tool that helps students construct their own conceptual understanding through the manipulation of concrete objects. As a result, not only cognitive understanding improves, but also students' motivation and confidence in learning mathematics.

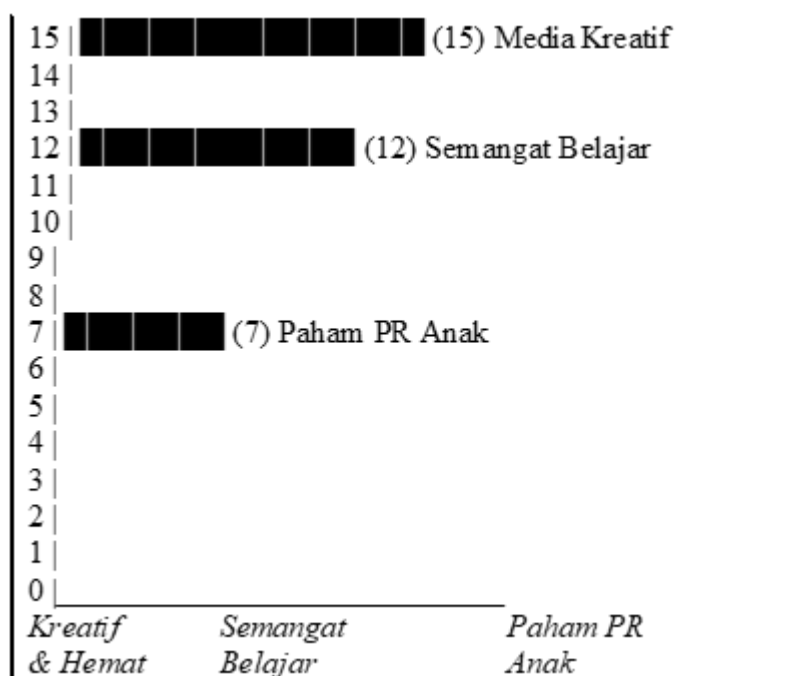
Presentation in Table Form

Table 5 below summarizes students' perceptions of media use.

Table 2 Student responses to the use of learning media

No	Response Categories	Amount	Student Percentage
1.	Fun and Interesting	13	86.7%
2.	Facilitate Concept Understanding	11	73.3%
3.	Want to Use Media Again	14	93.3%
4.	Experiencing Initial Obstacles	3	20%

Presentation in Diagram Form



The following bar chart visualizes the impact perceived by parents/guardians of students based on the interview results. Diagram 4.3.4.3 Parent/Guardian Perceptions of the Impact of Sago Leaf Vein Media (Number of Parents)

4. CONCLUSION

Based on the description above, it can be concluded that the use of sago leaf veins has a positive impact on improving learning outcomes and student effectiveness in understanding arithmetic operations. This medium is considered highly effective because it involves students' visual, kinesthetic, and direct experience aspects. It also enables them to visualize using the media taught by the teacher about natural media. Several conclusions can be drawn as follows:

1. Sago leaf vein media helps students understand the concept of arithmetic operations in a concrete and enjoyable way because it involves real objects from the surrounding environment.
2. The use of this media increases students' motivation and active participation during the learning process.
3. By applying sago leaf vein media, student learning outcomes have improved in terms of cognitive, affective, and psychomotor aspects.

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