Prekindergarten and Kindergarten Read-Aloud Routine

for Building Math Language and Conceptual Understanding

(Version 5, Spring 2022)

TEMPLE Read-Alouds Project

TEACHING EARLY MATH BY PROVIDING LANGUAGE EXPLORATION

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The target math concepts are based on the Texas Prekindergarten Guidelines: Mathematics Domain and the Texas Essential Knowledge and Skills: Kindergarten, §111.2 Mathematics.

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Introduction and Background

The TEMPLE Read-Alouds Project

The TEMPLE (Teaching Early Math by Providing Language Exploration) Read-Alouds Project was a partnership between the T.L.L. Temple Foundation and The Meadows Center for Preventing Educational Risk (MCPER) at The University of Texas at Austin. The goals of the project were to provide young students with a strong background in math vocabulary and to create opportunities to use that math vocabulary in discussions and activities relevant to their daily lives. The TEMPLE Read-Alouds Project provided preschool and kindergarten educators with a specific, research-based read-aloud routine and math-focused books that focused on the combined development of literacy skills (e.g., language, reading) and numeracy skills (e.g., counting, comparison, geometry).

With the TEMPLE Read-Alouds routine, educators read age-appropriate books with young children and made the experience interactive. That is, educators introduced and discussed math vocabulary, engaged children in discussions about the book's content, and did brief math activities to connect the math content to math in real life. Our hope is that the TEMPLE Read-Alouds routine continues to be used to introduce math vocabulary and concepts to emerging readers.

CREATING A LOW-COST MATH PLAY CENTER

Children learn about math by playing with math. A wide variety of math manipulatives (i.e., hands-on materials) are available for purchase, or you can collect everyday items that children can use for math play. Example manipulatives include the following:

- Number lines
- Items to count (e.g., rocks, feathers, teddy bear counters)
- Trays to separate objects (if metal, consider using magnetic numerals)
- Numerals that can be put in order or used to label groups (e.g., 0, 1, 2, 3, 4)
- Shapes (e.g., both two- and three-dimensional blocks, pattern blocks, shape-sorting toys)
- Items that can be sorted, matched, or made into patterns (e.g., the same items as for counting or shapes)
- Fake money and items to purchase
- Rulers and measuring tapes
- Measuring cups and water, rice, beans, or sand

Keep materials related to the current math unit accessible in your math play center for individual exploration during free time.

Math Concepts

The project's lessons are based on, and organized by, the following math concepts from the Texas Prekindergarten Guidelines and the Kindergarten Texas Essential Knowledge and Skills (TEKS).

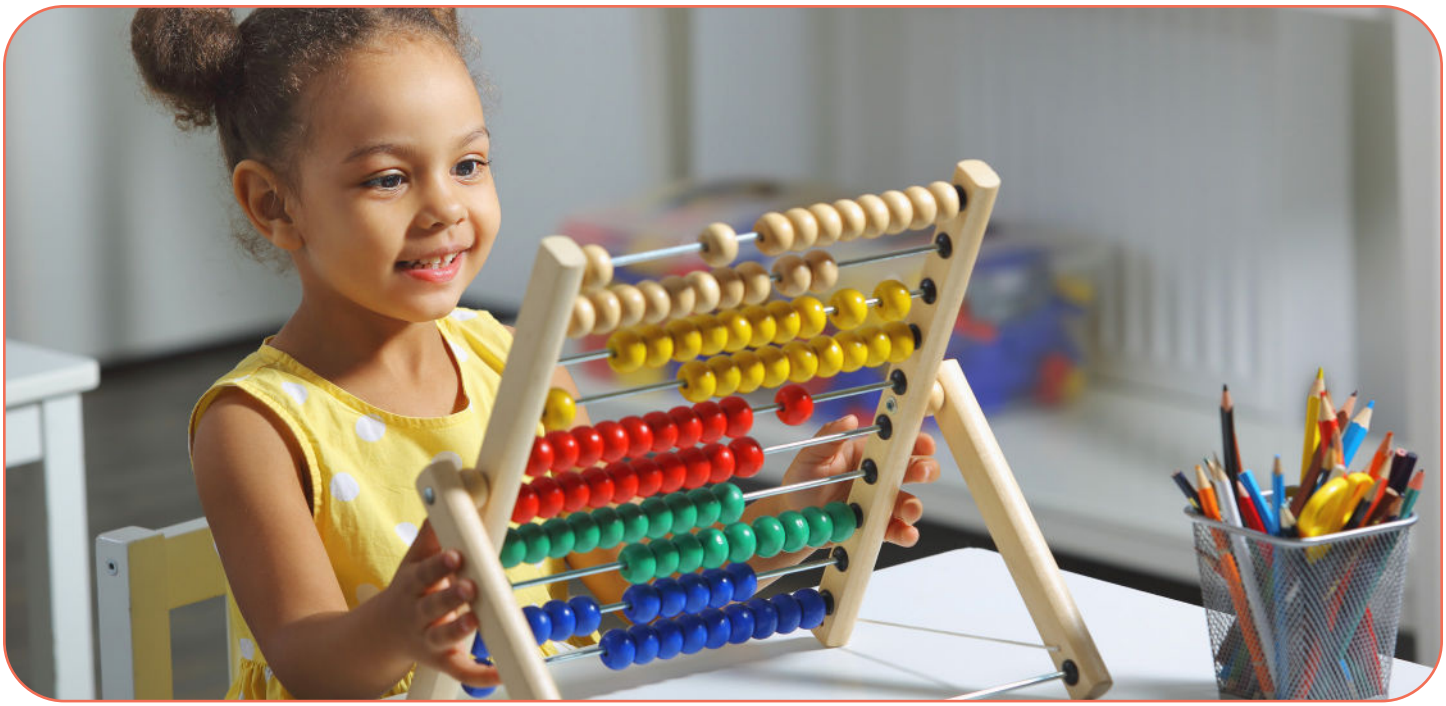
Prekindergarten

- Counting
  - Counting objects
  - Identifying numerals (e.g., 1, 2, 3, 4, 5)
  - Using ordinal words (e.g., first, second, third)
  - Recognizing how many, without counting, in small groups of objects (up to 5)
- Adding to or Taking Away
  - Addition concepts
  - Subtraction concepts
- Geometry and Spatial Sense
  - Shapes
  - Location
- Measurement
  - Comparisons
  - Length and width
  - Capacity
  - Weight
  - Time
- Classification and Patterns
  - Identifying size, color, and other attributes
  - Identifying same and different
  - Sorting and classifying based on attributes

Kindergarten

- Counting §111.2(b)(2)
  - Count forward and backward, read, and write numbers up to 20.
  - Recognize instantly the quantity of a small group of objects in organized and random arrangements.
  - Generate a set using concrete and pictorial models that represents a number that is more than, less than, and equal to a given number up to 20.
  - Compare sets of objects up to at least 20 in each set using comparative language and use comparative language to describe two numbers up to 20.

- Addition and Subtraction §111.2(b)(3)
  - Solve word problems to find sums up to 10 and differences within 10.
  - Explain the strategies used to solve problems involving adding and subtracting within 10.
- Identify Coins §111.2(b)(4)
- Algebraic Reasoning §111.2(b)(5)
  - Identify the pattern in a number word list.
  - Recite numbers up to at least 100 by ones and tens beginning with any number.
- Geometry §111.2(b)(6)
  - Identify two-dimensional shapes and three-dimensional solids.
  - Classify and sort regular and irregular two- and three-dimensional figures, regardless of orientation or size.
- Measurement §111.2(b)(7)
  - Give an example of a measurable attribute of an object, including length, capacity, and weight.
  - Compare two objects with a common measurable attribute to see which object has more.
- Data Analysis §111.2(b)(8)
  - Collect, sort, and organize data into two or three categories.
  - Draw conclusions from real-object and picture graphs.
- Personal Financial Literacy §111.2(b)(9)
  - Identify ways to earn income.
  - Differentiate between income and gifts and distinguish between wants and needs.



Math-Related Terminology

Vocabulary words and phrases are a key part of the lessons. When identifying focus words from the books, consider drawing from one or more of the following categories.

- **Precise number words**
  (e.g., one, two, three, six hundredths)
- **Imprecise terms expressing nonnumerical quantity**
  (e.g., a little bit, a lot, many, enough, few, some, part, whole, pair, both)
- **Shape and color names**
  (e.g., square, circle, right triangle, red, yellow, blue)
- **Terms that describe characteristics of form or arrangement**
  (e.g., square, round, rectangular, flat, diagonal, symmetrical, lined up, in a row, empty, full)
- **Precise terms related to measurement**
  (e.g., inch, meter, hour, minute, second, degree, pound, kilogram, gallon, acre, mile, dollar, nickel)
- **Imprecise terms for measurable characteristics**
  (e.g., huge, small, distant, heavy, tiny, giant, light, hot, chilly, long, early, late, years ago, now, tomorrow, expensive, cheap)
- **Terms related to sequence**
  (e.g., first, second, before, after, start, end, next, begin, finish, continue, repeat)
- **Terms used to compare**
  (e.g., same, different, equal, like, bigger, weaker, heavier, longer, as ___ as, exactly, _____ than, almost)
- **Terms used to distinguish or exclude**
  (e.g., just, only, not, rather, instead, those, but, however)
- **Terms related to location and spatial orientation**
  (e.g., here, there, in, on, in front, inside, outside, in the middle, high, low)
- **Terms related to direction and movement**
  (e.g., go away, reach up, down, around, through, go over to, lead the way, right, left)
- **Terms related to counting and operations**
  (e.g., count, keep track of, add, subtract, plus, minus, sum, difference, product, multiply, divide, increase, decrease)
- **Terms related to mathematical reasoning**
  (e.g., if ____ then _____, think, think about, guess, estimate, agree, solve a problem, clues, ideas)

Framework for Delivery of the Read-Alouds

After planning for the week, use the following general framework for each book.

Day 1

- Introduce the book.
- Introduce the target math concept.
- Introduce three to five new vocabulary words from the book.
- **Read the book**.
- Review the new vocabulary words.
- **Reread the book**, stopping at each target vocabulary word and illustration to clarify concepts and check for understanding.
- Explore new concepts and build skill with a hands-on activity.
- Use the skill as you go through the day.

Day 2

- Review concepts and vocabulary from the previous day's reading.
- **Reread the book**, stopping at each target vocabulary word and illustration to clarify concepts and check for understanding.
- Reinforce the new skill with another hands-on activity.
- Use the skill as you go through the day.

Day 3

- Review the target vocabulary words.
- Reinforce the new skill with another related math activity.
- Ask students how they used their new math skills throughout the week.

Step-by-Step Guide

Step 1: Plan the Week

- **Target a math concept.** The lessons are organized by standard and correspond to a book that we have provided, but each week you can choose any book you would like.

- Select a **book**.
  - The books do not have to be used in any order. You choose which book you want to read in any given week.
  - Choose books based on the students' prior level of understanding of the math concept. The book should introduce new information without being too challenging.
  - Consider the cultural background and interests of your student or classroom.

- Determine target **vocabulary** words and phrases.
  - For each book, choose three to five focus words. These can be new words related to the target concept or common words used in an unfamiliar (math) way.
  - Remember that familiar words may have different or more precise meanings when used in math.
    - For example, the *difference* between day and night and the *difference* between 5 and 2; at *least* you get to go and the *least* amount of money.
    - Vocabulary with different meanings can be confusing for students, so be sure to talk about the common use of the word and how the math meaning is different.
  - Think of a way to show the meaning without words (e.g., using an object, picture, or gesture) for each word to share with students.
  - Create vocabulary word cards.

- Consider **real-life connections** to the math concepts.
  - Think of ways students encounter or can use the target math concept in their daily lives.
  - Think of ways that other people in the community also use the target concept.
  - Consider how students can use the new math concept as you go throughout your typical day, such as in the following examples:
    - Counting: Count blocks, count snacks, count friends, etc.
    - Shapes: Ask about the shape of everyday objects as you use them.

- Plan math **enrichment** activities.
  - Many children's books about math contain suggested enrichment activities. Check your chosen books for ideas.
  - Plan three hands-on activities to go with the book. These activities do not need to be complicated but should allow students to explore, practice, and talk about the math concept from the book.
  - Ask questions during the activities to encourage math talk from preschoolers.
  - Consider adding a math play area in your home or classroom.

Step 2: Introduce and Preview the Book

- Preview the book and activate **prior knowledge**.
  - Show and read the front cover of the book.
  - Activate students' prior knowledge by making connections between what students already know and what they need to know to understand the story and the math concepts addressed.

- Introduce the **target math concept**.
  - Use prompts such as the following: "Today we will read a book about [math concept]. What do you already know about [math concept]?"
  - As students answer, ask follow-up questions to elicit curiosity about what they can add to their current knowledge.

- Briefly introduce the **new vocabulary** words.
  - Say and show each word and have students repeat it.
  - Provide the student-friendly definition and the wordless example (e.g., using an object, picture, or gesture) that you planned.
  - Use the same definition consistently throughout the week.
  - Keep the words visible while reading.

Step 3: Read the Book

- Tell students to listen for the **vocabulary words** while you read and to give a thumbs-up or other gesture when they hear one of the target words.

- Pose a specific **question** before reading or tell students to listen carefully while you read because you will ask questions at the end. This technique sets the purpose for reading and increases student engagement.

- Read **without stopping to discuss words and pictures** the first time through (research suggests that this technique supports understanding the storyline).

- Briefly **pause** before turning each page to allow the illustrations to support understanding.

- Have students tell you or a classmate about the story and **what they learned** from the book. Use prompts such as the following:
  - "What was your favorite part?"
  - "Did anything in the book surprise you?"
  - "Did you learn something you did not already know?"

Step 4: Reread and Discuss the Book

- Review the **vocabulary words** and definitions with students.
- Remind students to give you the agreed-upon **sign** when they hear a vocabulary word and tell students that the **pictures** help them to understand the math in the book.
- **Read the book a second time**, focusing on chosen vocabulary words and supporting illustrations by using the following techniques.
  - **Vocabulary**
    - Stop at each vocabulary word.
    - Guide students to tell you what each vocabulary word means or to demonstrate the meaning by using objects or gestures.
  - **Illustrations**
    - After reading each page, stop and ask whether the pictures give students more information.
    - Have students tell you or a classmate what they see.
    - Point out surprising or "hidden" information in the illustrations if students don't notice it.
- Ask students when they have used the math concept in their **own lives**. If they do not have their own examples, share the **real-life connections** that you planned.
- Display the new vocabulary words in a **prominent place** (e.g., refrigerator, vocabulary word wall, bulletin board).

Step 5: Extend Understanding and Practice Math Skills

- Have students explore the target math concept with a **hands-on activity**. This can be done immediately, later in the day, or even the next day.
- As students work, ask **questions** that require them to talk about the math they are doing.
- Use the **new vocabulary words** to talk about what students are doing.
- Connect the math activity to the **actions of the characters** in the story.
- Encourage students to tell others about the **math they worked on** that day.
- Ask students to look for ways to practice their **new skills** as they go through their day.

Step 6: Complete the Read-Aloud Routine

The first five steps cover planning through Day 1 of the typical routine. Days 2 and 3 include many of the same procedures detailed in previous steps, including the following.

Day 2

- Review **concepts and vocabulary** from the previous day's reading.
- Reread the book, stopping at each **target vocabulary word and illustration** to clarify concepts and check for understanding.
- Reinforce the new skill with another **hands-on activity**.
- Use the **math skill** as you go through the day.

Day 3

- Review the **target vocabulary words**.
- Reinforce the new skill with another **related math activity**.
- Ask students how they used their **new math skills** throughout the week.

Sample Lesson Outline for Prekindergarten
Biggest, Strongest, Fastest by Steve Jenkins

Target Math Concept

Use the standards to select a target math concept that can be taught using this book.

Vocabulary Suggestions

Select three to five of the following (use gestures as appropriate):

- biggest: Largest in size
- smallest: Littlest in size
- fastest: Moving the most rapidly
- strongest: Having the most power
- slowest: Moving with the least speed
- tallest: Having the greatest height, the highest

Suggested Questions for Discussion

- So many interesting animals were in the book! Have any of you seen any of these animals before?
- What are some of your favorite animals and what words would you use to describe them?
- What are your favorite pictures in the book? Which pictures in the book made it easiest to visualize the animals and their main features?
- Which of the animals from the book would you like to have as a pet? What special things would you have to do to take care of the animal?

Activity Ideas

Art Project

- Tell students that they will create their own special animal.
- Ask students what kind of special features or attributes the animal would have. Would it be the loudest animal? The softest animal?
- Ask students to think about what their animal might eat and where it might live. They can reference the chart in the back of the book to generate ideas and to use as a template for their own animal.
- Ask students to draw the animal and include some kind of scale comparison such as the ones seen in the book.

Biggest, Strongest, Fastest Charades

- Have students choose an animal and then act it out for the class, making sure to demonstrate any special features that would distinguish that particular animal.
- The student who guesses the animal should identify the special feature of the animal described in the book (e.g., the cheetah is the fastest animal).
- Have students then make puppets of the animal that they acted out in charades.

Sample Lesson Outline for Kindergarten

Super Sandcastle Saturday by Stuart J. Murphy

Target Math Concept

Use the standards to select a target math concept that can be taught using this book.

Vocabulary Suggestions

Select three to five of the following (use gestures as appropriate):

- tallest: Having the greatest height, the highest
- measure: To find out the size
- longest: The greatest distance from end to end
- deepest: Farthest down from the top
- up: The direction toward the sky
- inch: A standard unit of measure

Suggested Questions for Discussion

- Who had the deepest moat?
- Who had the longest wall?
- What is more correct, measuring the wall of the tower with inches or using your feet?
- Why couldn't Sarah, Juan, and Laura use shovels to measure how deep their moat was?
- Which tower measured the tallest in inches on the ruler, Sarah's or Juan's?
- Why is it important to use a ruler in measuring how tall, long, and deep something is?

Activity Ideas

How Tall Am I?

- Pair each student with a partner.
- Take 2 to 5 minutes for each group to select a small object in the classroom to use as a measuring tool.
- Take 10 to 15 minutes for partners to measure one another using their object and record their results.
- Extension activity: Ask the groups to go around the classroom measuring the height of objects. For example, ask students how many pencils tall the door is.

Tower Contest

- Gather materials to stage a tower-building game like the one in *Super Sandcastle Saturday*: wooden or plastic blocks and a timer.
- In the first round, see who can make the tallest tower.
- In the second round, see who can make the longest tower.