

Connecting Literature and Math – A Component of STEM Curriculum

#10: *Inch by Inch* by Leo Lionni & *Actual Size* by Steve Jenkins

Introduction

Through two books, *Inch by Inch* by Leo Lionni, and *Actual Size* by Steve Jenkins, children are introduced to measurement and comparison. Leo Lionni uses the sharp definition of cutouts against white space to illustrate *Inch by Inch*, a story of an inchworm that is proud of its ability to measure anything under the sun. Through collages of cut and torn paper, Steve Jenkins illustrates animals both large and small in *Actual Size*, an informational book.

Teacher Notes about STEM

- *Early Childhood Educators are now linking together science, technology, engineering, and math into what is called STEM curriculum.*
- *CLAM focuses on Math, one of the components of a STEM curriculum.*
- *CLAM was developed to give preschool children foundations of mathematical understanding through concrete experiences; a foundation for life-long learning and school success in math.*

Arkansas Child Development and Early Learning Standards: Birth through 60 Months

Domain of Development and Learning: Mathematical Thinking
Domain Component: Measure and Comparison

Learning Goal:

MT3.1 Participates in exploratory measurement activities and compares objects (*measurement, comparison, seriation*)

Materials to Collect and Make

- Provide measuring tools: ruler, cloth measuring tape, yard stick
- Provide cardboard or card stock, marker and Unifix cubes
- Provide balance scale, rocks of different sizes and weights
- Make a Purple Cow recipe chart
- Provide grape juice (plastic jar), frozen vanilla yogurt, cups, spoons (one per child), 2 or more measuring cups (1/4), 2 or more liquid measuring cups with the 1/4 cup measure clearly marked

Story Presentation

Learning Goals:

LD1.1 Understands and responds to language (in child's home language) (*vocabulary and language comprehension*)

EL1.1 Shows interest in literacy experiences (*engagement in literacy experiences, variety of interests*)

EL1.2 Engages in read alouds and conversations about books and stories (*story comprehension, informational texts*)

MT3.1 Participates in exploratory measurement activities and compares objects (*measurement, comparison*)

MT1.1 Demonstrates number sense and an understanding of quantity (*number names and count sequence, connection of number, numeral and quantity*)

Book: *Inch by Inch* by Leo Lionni

First Reading of *Inch by Inch*

- Prepare to read the book, *Inch by Inch*.
- Show cover; give title, author and illustrator. (Explain that author is the person who writes the book and the illustrator is the person who draws the pictures.)
- Ask children to look at the cover and predict what the story is about. Call attention to the inchworm and say, "This is an inchworm. Let's read and find out what happens to the inchworm in the story."
- Read the story so all children can see the pictures in the book.
- Follow up by showing pictures and inviting children to help you name the different birds that the inchworm met and which parts of each bird's body the inchworm measured.

Second Reading of *Inch by Inch*

- Bring measuring tools to story time: ruler, cloth measuring tape, yard stick. Keep them out of sight of the children until you have read the story to them.
- Prepare to read the book, *Inch by Inch*.
- Show cover, give title, author and illustrator.
- Ask children why they think the title of the book is *Inch by Inch*.
- Ask children to show how big they think an inch is.
- Read the story so all children can see the pictures in the book.
- Follow up the second reading by showing the children the measuring tools. Allow them to examine the tools.
- Ask children to find the numeral 1 on their tool. Explain that this means one inch. Help children find the numeral. Children may notice other numerals on the tools. Explain that the 2 means two inches and so forth.
- Place the book on the floor and turn to the page where the inchworm is at the top of a plant looking at the nightingale. Use one of the measuring tools to measure the inchworm and say, "This inchworm is one inch long."
- Invite children to suggest other objects in the room they might measure.
- State that some of the measuring tools will be placed in learning centers for children to use for measuring.
- Place measuring tools in Block Center and in Discovery Center, for example.

Third Reading of *Inch by Inch*

- Prepare to read the book *Inch by Inch*.
- Show cover and invite children to recall the title. Give name of author and illustrator.
- Involve children in discussing the objects in the room they measured. “How many inches long was _____?” (objects they measured)
- Read the story so all children can see the pictures in the book.
- Follow up the third reading by asking children why the inchworm could not measure the nightingale’s song. (Inchworm measures things, not songs) How did the inchworm keep the nightingale from eating him? (He inched out of sight of the nightingale).

Book: *Actual Size* by Steve Jenkins

First Reading of *Actual Size*

- Be familiar with the book, *Actual Size*.
- Show the cover, give title, author and illustrator. (Explain that the author is the person who writes the words and the illustrator is the person who creates the pictures. In this book, Steve Jenkins is both the author and illustrator)
- Show the cover and invite children to discuss what they see. Accept all comments. If they say they see a hand, ask whose hand they think it might be. Say, “There are some really interesting animals in this book. Let’s read and find out about them.”
- Read the story so all children can see the pictures in the book.
- Show the first page and allow children to comment about what they see, and then read the text on both pages.
- Call attention to the dwarf goby at the bottom of the page and invite children to show you with their fingers how small it is.
- Continue reading and allowing children time to see and discuss the pictures.
- Comment about some of the sizes and illustration. For example, call attention to the eye of the squid, say it is 12 inches across and invite children to show you with their hands 12 inches.
- Continue reading the book and encourage children to comment about the animals and their sizes.
- Show the pages with the gorilla’s hands and the pygmy mouse lemur and ask if they have seen this picture before. Show the cover so children can see that the two illustrations are of the same two animals; a gorilla’s hand and a pygmy mouse lemur.
- Invite children to notice that both the huge gorilla and the pygmy mouse lemur have hands a lot like ours.
- Follow up the reading by showing the pages of the book and inviting children to name the animals and/or their body parts and to discuss what they remember about them.

Teacher Note: *As you are reading the story, if it seems appropriate, explain that words such as giant and goliath mean something is really big, while words such as dwarf and pygmy means something very small.*

Second Reading of *Actual Size*

- Bring a cloth measuring tape and a ruler to story time. Keep them out of sight until you have read the story.
- Invite a small group of 3 to 5 children to join you in reading *Actual Size*.
- Recall with children some of the animals they saw in the book.
- Read the story so all children can see the pictures in the book.
- Allow children time to see and discuss the pictures.
- Follow up by showing children the measuring tape and ruler.
- Ask if any of them know what they are and what they are used for.
- Explain that one is a measuring tape and one is a ruler.
- Allow children time to explore the tape and ruler.
- Ask children to find the numeral 1 on their measurer. Explain that this means one inch. Children may notice other numerals. Explain that the 2 means 2 inches and so forth.
- Involve children in measuring the pygmy shrew on the title page, the wingspan of the atlas moth, the dwarf goby, and the eye of the giant squid.

Teacher Note: *For a child who seems to really be interested in the various animals in the book, spend time discussing some of the in-depth information at the end of the story. Know the children and judge how much of the information to share.*

Additional Language, Literacy and Mathematical Thinking Activities

Learning Goals:

LD1.1 Understands and responds to language (in child's home language) (*vocabulary and language comprehension, follows directions*)

EL3.3 Demonstrates emergent writing skills (*letter and print writing concepts*)

MT1.1 Demonstrates number sense and an understanding of quantity (*number names and count sequence, connection of number, numeral and quantity*)

MT3.1 Participates in exploratory measurement activities and compares objects (*measurement, comparison*)

ST3.1 Engages in the scientific process to collect, analyze, and communicate information (*observations, questions, and predictions*)

Activity: Measuring with Our Feet

Materials: cardboard or card stock, marker, note paper or index cards, pencils

Directions:

- Recall with children that in the book, *Inch by Inch*, the inchworm used its body to measure the birds. We can use our feet for measuring things.
- Help each child trace around one of his or her feet on a piece of cardboard or card stock and then cut out the foot.
- Invite children to write their name on their foot so they will be able to know which foot is theirs.
- Demonstrate how to use the cardboard foot to measure the length of a table or a storage shelf.
- Suggest that children use their cardboard foot to measure other items in the room.
- Provide note paper or index cards and pencils so children can “write” down the measurements of the items they measure or ask you to record the information.
- Read back with the children the recorded information. For example, “The table in the Dramatic Play Center is 6 of my feet long.”
- Involve children in discussing which item they measured is the longest; which is the shortest.

Activity: Measuring Our Feet with Unifix Cubes

Materials: cardboard or card stock, marker, Unifix cubes

Directions:

- Help each child trace around one of his or her feet on a piece of cardboard or card stock and then cut out the foot.
- Invite each child to predict how many Unifix cubes he or she thinks will fit into the length of his or her foot. Record this number on the big toe of the cardboard foot.
- Allow children to use Unifix cubes to fit into the length of their individual feet.
- Involve each child in counting the number of Unifix cubes he or she used.
- Write on each child's foot outline the following: Elena's (child's name) foot is _____ (how many) Unifix cubes long.
- Ask children if the number of Unifix cubes used is more or less than predicted. If child needs support in answering the question, involve him or her in lining up the number of Unifix cubes predicted next to the actual number used, thus giving the child a visual clue.
- Invite each child to read to the group the sentence about his or her foot.

Teacher Notes:

- *If a child can/wants to write his or her own name and the numeral, allow him or her to do so.*
- *Make sure that children understand what is meant by the "length" of their feet.*

Activity: Measuring Shadows

Materials: cloth measuring tape, index card, marker or pencil

Directions:

- Choose a sunny day in the summer for this activity.
- Measure each child's height at arrival and record it on an index card as follows:
Today is _____ (month, date and year). _____'s (child's name) is _____ inches tall.
- Show children the time on the clock, take children outdoors, measure each child's shadow and record the information on the index card as follows: At 9:00 o'clock _____'s (child's name) shadow is _____ inches tall.
- Involve children in discussing if their shadows are the same height as they are, longer or shorter.
- Repeat this at least two more times during the day. **Try to make one of the times as close to noon as possible and the other mid-afternoon.**
- Gather children together, preferably in small groups, and read with them the information on their cards.
- Invite children to discuss why they think their shadows were not always the same length, or number of inches tall. Accept all answers.

Teacher Note: *Children may not understand that the position of the sun causes their shadows to be different lengths. To help them make this connection, consider the following:*

- *Repeat the Measuring Shadows activity on another sunny day soon after the original activity.*
- *Involve children in looking at the sun and stating its location each time.*
- *Guide them to see that the position of the sun determines the length of the shadow.*

Activity: Weighing Rocks

Materials: balance scale, rocks of different sizes and weights

Directions:

- Take the balance scale and some of the rocks to group time.
- Show the scale to the children and invite them to tell what they know about it.
- Explain to children that you will be in the Discovery Center with the scale and the rocks and invite them to join you to experiment with the scale and the rocks.
- Allow children to explore the rocks. Involve them in discussing what they notice about the rocks. Which rock is the heaviest? Which is the lightest?
- Explain that they can find out by weighing the rocks.
- Ask them to put one rock in one balance pan and another rock in the other balance pan. What do they notice about the pans?
- Involve them in discussing why they think one pan is lower than the other? Guide them to discover that the heaviest rock causes the pan to be lower than the other.
- Allow children to experiment with weighing the rocks. Can they balance the rocks on the scale?
- Suggest that children look for other objects they can weigh.

Learning Goals:

PH2.2 Adjusts grasp and coordinates movements to use tools (*utensils*)

PH3.1 Demonstrates interest in engaging in healthy eating habits and making nutritious food choices (*exploration of food experiences*)

LD1.1 Understands and responds to language (in child's home language) (*vocabulary and language comprehension*)

EL3.1 Responds to features of books and print (*print knowledge*)

MT3.1 Participates in exploratory measurement activities and compares objects (*measurement*)

Activity: Purple Cow

Materials: Purple Cow recipe chart, grape juice (plastic jar), frozen vanilla yogurt, cups, spoons (one per child), 2 or more measuring cups (1/4), 2 or more liquid measuring cups with the 1/4 cup measure clearly marked

Directions:

- Develop a poster with the Purple Cow recipe.
- Invite children to sit at the table and say with them the poem that is written below.
- Explain that the children will now make a "Purple Cow" for snack.
- Read the recipe with the children.
- Help each child add 1/4 cup frozen vanilla yogurt into a cup and pour 1/4 cup grape juice on top.
- Eat with a spoon and enjoy.

Purple Cow

I've never seen a purple cow,
I never hope to see one.
But if by chance I ever do,
I'd rather see than be one.

Teacher Notes:

- Allow children to do as much of this food experience as possible.
- Teachers and children should always wash hands before participating in a food experience.

Purple Cow Recipe Chart	
	Wash
	1/4 Cup
	Frozen Vanilla Yogurt
	1/4 Cup
	Grape Juice
	Eat and Enjoy!

Learning Environment

Teacher Note: As children are involved in learning centers, they are engaged in activities that support the following Domains of Development and Learning:

- *Emergent Literacy*
- *Mathematical Thinking*
- *Creativity and Aesthetics*

Manipulative Center (or Math Center)

- Unifix cubes
- Ruler

Block Center

- Add rulers (6 inch and 12 inch), cloth measuring tape, basket with index cards and markers and pencils
- Provide wood unit blocks

Dramatic Play Center

- Add plastic measuring spoons and cups with measurements clearly marked.
- Add 3 sizes of mixing bowls or plastic containers

Sand and Water Center

- Add plastic measuring cups and spoons, plastic containers in different sizes

Discovery Center

- Add balance scale
- Add objects such as rocks to weigh
- Add measuring tools such as rulers and cloth measuring tape

Library

- Add the book, *Actual Size*
- Add rulers and cloth measuring tapes

Transition Activities

- Have the children's outlines of their feet.
- Show an outline of a foot and ask "Whose foot is this?" When child identifies his/her foot, child transitions to next activity.

Family Connection

- Send home the cutout cardstock outline of their child's foot with a note explaining that the children have been learning about measuring and how the cardstock foot was used to measure things in the classroom.
- Suggest that families help their child measure items in the home such as the dining table or the height of a cabinet door.

Additional Books

Allen, Pamela. *Who Sank the Boat?*

Stevens, Janet and Susan Stevens Crummel. *Cook-a-doodle-doo!*

Tompert, Ann, illustrated by Lynn Munsinger. *Just a Little Bit*

Wellington, Monica. *Mr. Cookie Baker*

Assessment Ideas

Refer to page 5 in the guide: Activity – **Measuring Our Feet with Unifix Cubes** for an activity to assess the following concept and benchmarks.

Domain Component: Measurement and Comparison

Learning Goal:

MT3.1 Participates in exploratory measurement activities and compares objects (*measurement, comparison*)

To Assess:

- Work with each child individually to complete this activity.
- Assess children’s competence by observing and listening to them as they count the Unifix cubes they used, as they compare that number with the number of Unifix cubes they predicted, and as they “read” to the group the sentence about their feet.