STEM Storytelling: *Using Picture Books to Integrate Mathematics*
Who Lives Here?

Logistics

These activities are designed for use in grade-levels kindergarten through second grade. An extension activity is provided that can be used with older students. These activities can be completed in a regular classroom setting, provided there are opportunities to reconfigure seating arrangements to use cooperative grouping strategies.

Materials

Activity 1: All Grade Levels: Storytelling (Estimated time: 45 minutes)
  For the teacher:
  - Copy of *Listen to Our World*
  - Document Camera

Kindergarten Activity (Estimated time: 60 minutes)
  For each partner team:
  - 1 Habitat Placemat
  - 1 set of Animal Figures with Images
  - 4 small sticky notes (optional)
  For the teacher:
  - 10-sleeve Pocket Chart
  - Animal Cards
  - Habitat Identification Signs
  - Copy of *Listen to Our World*

First Grade Activity (Estimated time: 60 minutes)
  For each partner team:
  - 1 Habitat Placemat
  - 1 set of Animal Figures
  - 1 set of Animal Math Magnets
  - 1 set of Number Cards   (1-10)
  - Student Pages
  For the teacher:
  - Copy of *Listen to Our World*
  - Habitat Identification Signs

Second Grade Activity (Estimated time: 45 minutes)
  For each partner team:
  - 1 Bar Graph Placemat
  - 1 set of Animal Figures
  - 1 sea turtle figurine and 1 turtle figurine
  For each student:
  - Copy of Student Pages
  For the teacher:
  - Copy of *Listen to Our World*
  - *Document Camera*

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Second Grade Extension Activity (Estimated time: 45 minutes)
  For each partner team:
  - Set of Habitat Matching Cards

Mapping Extension Activity (Estimated time: 45 minutes)
  For each partner team:
  - 11 – Sticker dots
  - 1 – World map sheet
  - 1 – Pencil

Standards

NGSS Scientific and Engineering Practices:
  - Developing and using models (SEP2)
  - Using mathematics and computational thinking (SEP5)
  - Constructing explanations and designing solutions (SEP6)
  - Obtaining, evaluating, and communicating information (SEP8)

NGSS:
  - *LS1.A:* All organisms have external parts. Different animals use their body parts in different ways to see, hear, grasp objects, protect themselves, move from place to place, and seek, find, and take in food, water and air. Plants also have different parts (roots, stems, leaves, flowers, fruits) that help them survive and grow.
  - *LS4.D (2-LS4-1):* There are many different kinds of living things in any area, and they exist in different places on land and in water
  - *ESS3-A:* Living things need water, air, and resources from the land, and they live in places that have the things they need. Humans use natural resources for everything they do.
  - *K-ESS3-1:* Use a model to represent the relationship between the needs of different plants and animals (including humans) and the places they live.
  - *K-ESS3.A :*Living things need water, air, and resources from the land, and they live in places that have the things they need. Humans use natural resources for everything they do.

Common Core State Standards Mathematical Practices:
  - *MP1:* Make sense of problems and persevere in solving them.
  - *MP2:* Reason abstractly and quantitatively.
  - *MP3:* Construct viable arguments and critique the reasoning of others.
  - *MP4:* Model with mathematics.
  - *MP5:* Use appropriate tools strategically.
  - *MP7:* Look for and make use of structure.

CCSS Mathematics:

- *K.CC.B.4:* Understand the relationship between numbers and quantities; connect counting to cardinality
- *K.CC.B.5:* Count to answer "how many?" questions about as many as 20 things arranged in a line, a rectangular array, or a circle, or as many as 10 things in a scattered configuration; given a number from 1-20, count out that many objects.
- *K.CC.C.6:* Identify whether the number of objects in one group is greater than, less than, or equal to the number of objects in another group, e.g., by using matching and counting strategies.
- *K.MD.B.3:* Classify objects into given categories; count the numbers of objects in each category and sort the categories by count.
- *1.MD.C.4:* Organize, represent, and interpret data with up to three categories; ask and answer questions about the total number of data points, how many in each category, and how many more or less are in one category than in another.
- *1.OA.A.1:* Use addition and subtraction within 20 to solve word problems involving situations of adding to, taking from, putting together, taking apart, and comparing, with unknowns in all positions, e.g., by using objects, drawings, and equations with a symbol for the unknown number to represent the problem.
- *1.OA.A.2:* Solve word problems that call for addition of three whole numbers whose sum is less than or equal to 20, e.g., by using objects, drawings, and equations with a symbol for the unknown number to represent the problem.
- *1.NBT.B.3:* Compare two two-digit numbers based on meanings of the tens and ones digits, recording the results of comparisons with the symbols >, =, and <.
- *2.MD.D.10:* Draw a picture graph and a bar graph (with single-unit scale) to represent a data set with up to four categories. Solve simple put-together, take-apart, and compare problems[1] using information presented in a bar graph.

CCSS ELA/Literacy:

- *SL.K-2.1:* Participate in collaborative conversations with diverse partners about *kindergarten, grade 1, or grade 2 topics and texts* with peers and adults in small and larger groups.
- *SL-K.2:* Confirm understanding of a text read aloud or information presented orally or through other media by asking and answering questions about key details and requesting clarification if something is not understood.
- *SL.K.3:* Ask and answer questions in order to seek help, get information, or clarify something that is not understood.

- *SL.K.6:* Speak audibly and express thoughts, feelings, and ideas clearly.
- *SL.1.2*: Ask and answer questions about key details in a text read aloud or information presented orally or through other media.
- *SL.2.2*: Recount or describe key ideas or details from a text read aloud or information presented orally or through other media.
- *SL.3.1:* Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on *grade 3 topics and texts*, building on others' ideas and expressing their own clearly.
- *RL.K-2.1*: Ask and answer questions about key details in a text.
- *RL.K-2.7:* Use information gained from the illustrations and words in a print or digital text to demonstrate understanding of its characters, setting, or plot.
- *L.K.5.A:* Sort common objects into categories (e.g., shapes, foods) to gain a sense of the concepts the categories represent.
- *L.K.5.D:* Distinguish shades of meaning among verbs describing the same general action (e.g., *walk, march, strut, prance*) by acting out the meanings.
- *L.K-2.6:* Use words and phrases acquired through conversations, reading and being read to, and responding to texts.
- *L.2.4:* Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on grade 2 reading and content, choosing flexibly from an array of strategies.
- *RF.2.4.A:* Read grade-level text with purpose and understanding.
- *RF.3.4.A*: Read grade-level text with purpose and understanding.
- *W.3.8:* Recall information from experiences or gather information from print and digital sources; take brief notes on sources and sort evidence into provided categories.

Introduction

Picture books which are interesting to young readers can be used to increase student motivation and engagement in science and mathematical content. Integrating multiple areas of the curriculum into a single lesson or unit enables students to see the value of the mathematics in science, or conversely, the value of science in mathematics. Literature is a vehicle which can be used to integrate the two. Both the NCTM (National Council of Teachers of Mathematics) and the NSTA (National Science Teachers Association) advocate the use of children's literature to teach important science and mathematical concepts.

Children's literature can be used to introduce a science phenomenon or mathematical concept, can be utilized as the context under which a

science or mathematical/statistical investigation is based, and can be used as a resource to generate questions and build problem-solving skills. Additionally, the illustrations in picture books can promote the development of inferential reasoning skills as questions are posed by the teacher that ask students to look beyond what is readily observed.

Activities

This series of activities invites students to explore animals and their habitats, classify "animal" figures by habitat, sort, represent, and analyze data. In the first activity, the picture book *Listen to Our World* by Bill Martin, Jr. and Michael Sampson will be used to discuss eleven different animals and their habitats. Questioning strategies will focus on student comprehension and inferential reasoning skills related to why each animal lives in a particular type of habitat. This book is utilized at all grade levels to introduce the subsequent activity.

The grade-level activities that follow integrate students' knowledge of animals and their habitats with classification and data analysis activities. Students will be expected to use data representations to answer mathematical questions developmentally appropriate for their grade. In the kindergarten activity, the focus will be on classifying animal figures into preferred habitats. Students will work together to assemble a class pictograph of their animals, and will use counting and comparing strategies to make sense of this representation.

The first-grade activity extends the sorting of the figures into student-generated categories and formally introduces the mathematical relations "greater than", "less than", and "equal to" for comparison of data.

The second-grade activity uses a constructed bar graph to reason within, between, and beyond the data collected after sorting the animal figures into habitat categories. Two turtle figures will be used to make comparisons and determine which habitat is most appropriate for each turtle based upon observed differences. As a formative assessment, students can match the animals that were introduced in the book to their habitat using a set of animal cards and habitat cards. Using habitat images, students can make inferences about how the habitat can provide basic needs for the animal that lives in the habitat. Students may also suggest additional animals that may live in a particular habitat.

An extension activity for older students uses locations given in the book to

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map the animal's habitat on a world map and use this "infographic" to answer questions. The focus of this activity is to use knowledge of latitude, longitude, and relative temperature on Earth to make inferences about the habitats of the animals in the story.

Activity 1: Storytelling

Objectives:
- Read the story *Listen to Our World* by Bill Martin, Jr. and Michael Sampson.
- Discuss the various animals and their habitats depicted in the story.
- Use Storytelling-Questioning techniques to develop inference skills.

Standards:

NGSS: SEP8, ESS3-A
CCSS ELA-Literacy: SL.K-2.1, SL.K-2.2, RL.K-2.1, L.K-2.7, L.K.5.D, L.K-2.6

Estimated Time: 45 Minutes

> ***Storytelling Activity*** **Materials:**
> *For the teacher:*
> - Copy of *Listen to Our World*
> - Document Camera

Advanced Planning:

It is recommended that a document camera be used for this activity to show students the illustrations in the book.

Suggested Inquiry Approach:

Students will be arranged either at their desks so that they can see the illustrations shown using a document camera, or gathered together on a carpet to listen to the story and observe the illustrations.

Pose the following introduction questions to evaluate prior knowledge:

- **What is an animal?**
- **Where do animals live?**

Begin reading the story *Listen to Our World*. The story uses a repetitive format to introduce each animal and discuss "their world." Beginning with the introduction of the parrot, the following questions may be used to allow students the opportunity to reflect on the information presented on each page.

<u>Parrot – *The rainforest is their world*</u>

- *What might the weather be like in the rainforest?*
- *Can you find one bird that is different than the other birds? How is the bird different?*
- *How many parrots are in the picture?*
- *Why might the parrots be squawking?*

<u>Gila monster – *The desert is their world*</u>

- *What do you know about the desert?*
- *Why do you think there are spikes on the cactus plant?*
- *Why might the Gila monster have a long tongue?*

<u>Eagle – *The wilderness is their world*</u>

- *Do you think those are baby eagles (eaglets) in the nest? Why do you think that?*
- *Have you ever seen a mountain? Where might there be mountains?*
- *Why do you think the eagle can fly so high?*

<u>Monkeys – *The jungle is their world*</u>

- *What do you think "dense canopy" might mean?*
- *How can monkeys swing on vines?*
- *What does the jungle look like?*

<u>Pandas – *The bamboo forest is their world*</u>

- *How are the baby pandas the same as the parent panda? How are they different?*
- *How is the rainforest that the parrots live in different than the bamboo forest of the pandas?*

<u>Crocodile – *The marshland is their world*</u>

- *Why would a crocodile make a "SNAP!" sound?*
- *Can you show me what "oozy" might look like?*
- *Can you glide like a crocodile? Show me.*
- *Why does the crocodile have so many teeth?*

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<u>Kangaroo – *The outback is their world*</u>

- *Why are the kangaroos making a shadow?*
- *Which kangaroo is the momma kangaroo? How do you know?*

<u>Lion – *The savanna is their world*</u>

- *Can you roar like a lion? Let me hear you.*
- *How are the baby lions (cubs) different than the parent lion?*
- *How are they the same?*
- *How many toes does each lion cub have?*
- *Do you think the adult lion has the same number of toes on each paw as the lion cub? Why?*

<u>Penguin – *The South Pole is their world*</u>

- *Where do you think the South Pole is located on a map (or globe)?*
- *What do you think it is like at the South Pole?*
- *Can you waddle like a penguin? Show me.*

<u>Elephant – *The grassland is their world*</u>

- *What is the elephant doing with the water?*
- *How do you think the water gets into the elephant's trunk?*
- *Do you know which elephant is the oldest? Why?*
- *Why do elephants have such big ears?*

<u>Whale – *The ocean is their world*</u>

- *What do you know about the ocean?*
- *Why do you think a whale lives in the ocean, but not a lake?*
- *Why do you think a whale comes to the surface of the ocean?*

<u>Child – *Our world*</u>

- *Where do children live?*
- *How are children the same?*
- *How are children different?*

Assessment/Debrief Activity 1:

Following the completion of the story, there are facts presented about each of the habitats. Older students may record facts about each of the animals and their habitats in a science notebook, if desired. Also, the following questions may be used to debrief the story:

- All of the animals in this book live in a *habitat*. What do you think a *habitat* is? Why do you think this?

- *For any of the habitats mentioned in the story, can you think of another animal that might also live in that habitat?*

- *Can you think of other habitats that animals live in besides those mentioned in the story?*

Kindergarten Activity

Objectives:
- Read the picture book, *Listen to Our World* by Bill Martin Jr. and Michael Sampson to determine where animals live and why they live there.
- Sort a collection of animals by their habitats, identify common characteristics of the animals within each habitat, and consider how the habitat provides for the animal.
- Numerically represent the total number of animals within a habitat, compare populations between habitats, and represent these values in a pictograph.

Standards:

NGSS: K-ESS3-1, K-ESS3.A, SEP2, SEP5, SEP8
CCSS Mathematics: K.CC.B.4, K.CC.B.5, K.CC.C.6, K.MD.B.3, MP1, MP2, MP3, MP4, MP6, MP7, MP8
CCSS ELA/Literacy: L.K.5.A, SL.K.1, SL.K.3, SL.K.6, L.K.6

Estimated Time: 60 Minutes

> *Kindergarten Activity*
> **Materials:**
> *For each partner team:*
> - 1 Habitat Placemat
> - 1 set of Animal Figures
> - 4 small sticky notes (optional)
>
> *For the teacher:*
> - 10-sleeve Pocket Chart
> - Animal Cards
> - Habitat Identification Signs
> - Copy of *Listen to Our World*

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Advanced Preparation:

The following materials should be prepared prior to the start of the activity:

☐ Display the 10-sleeve pocket chart in a visible area of the classroom.

☐ Verify that each Animal Figure collection consists of the following:

Chicken	**Pig**	**Horse**	**Sheep**	**Cow**
Cat	**Dog**	**Crab**	**Seahorse**	**Swordfish**
Stingray	**Octopus**	**Starfish**	**Polar Bear**	**Camel**
Elephant	**Tiger**	**Lion**	**Gorilla**	**Hippopotamus**

Note: The Animal Figures set included in this activity contains 20 items. This amount may be altered based on student ability and resource allotment. Animal figures can be purchased from EAI Education *as part of the Wacky n' Wild, Farm, and Underwater Sea Creatures Animal Collections. The Pet Counters can be purchased from* Didax.

Suggested Inquiry Approach:

Inform students that they will be reading *Listen to Our World* to learn about where animals live and why they live there. The storytelling-questioning strategy listed in *Activity 1: Storytelling* can be used to facilitate student discussion during the read-aloud.

In the next segment of the activity, students will work with a partner to complete a hands-on mathematical and scientific investigation. You may choose to strategically pair students based on academic level, behavior, or other indicators.

Additionally, it may be necessary to review appropriate ways to work with a partner. For example, you may ask students to complete a T-Chart to identify what working with a partner "looks like" and "sounds like".

Verify that students are seated with their assigned partner. Provide each partner team with a Habitat Placemat. Ask the students, "What habitats do you think we will be talking about today?" Elicit student answers.

Then, discuss each habitat as a class. It is recommended that you use the habitat placemat as a visual reference for students while you discuss a particular habitat.

Working with a partner...
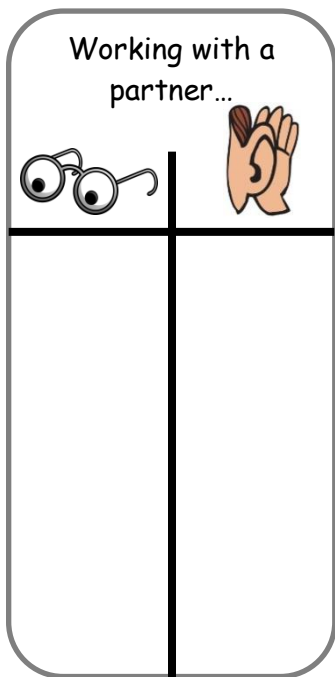
The following suggested questions can be used to facilitate discussion:

- What is special about animals that live in the _____ habitat?
- What do all of the animals that live in/on the _____ habitat have in common?
- What do all animals need to survive?
- How do you think animals that live in the _____ habitat get their food?
- How do animals that live in the _____ habitat survive?

Next, provide each partner team with a set of Animal Figures. Ask students to spread the animals out on their desk. Choosing one animal at a time, hold up the figure and ask for a student volunteer to identify the name of the animal. You may choose to ask students about any identifying characteristics of the animal that support their decision.

Inform partner teams that they will now sort the Animal Figures based on their habitat. Explain the following process to the students:

- Student A will select one animal from the Animal Figures.
- Student A will talk first, telling Student B, "*I think this animal lives in the _____ habitat because...*"
- Student B will then respond by either agreeing or disagreeing.
- If Student B disagrees, they will then say, "*I disagree, because...*"
- Student A will place the animal in the appropriate habitat on the Habitat Placement.
- Student A and B will take turns identifying and placing all of the animals in their correct habitats.

Students will now work together to sort each animal into a habitat. During this time, circulate around the room to evaluate student understanding, listen for misconceptions, and encourage positive student collaboration. This learning exercise allows young students to practice student collaboration and active listening skills.

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Note: During this exercise, partner teams may place an animal in an incorrect habitat. Allow the students to explain their reasoning, but refrain from correcting their error or guiding their thinking.

When partner teams have finished, explain to students they will now see how each group sorted their animals.

Ask student volunteers to recall the four habitats on their Habitat Placemat. As students identify each habitat, secure the corresponding Habitat Identification Sign next to a sleeve on the pocket chart.

Provide each partner team with one Animal Card. Ask each partner team to identify the animal on the card and then find the identical Animal Figure on their Habitat Placemat. As a team, the students will then recall the animal's habitat.

Explain to students that each partner team will share their Animal Card with the class. Ask each pair of students to bring their card up to the pocket chart, present the name of the animal, its habitat, and then place the card in the appropriate pocket as labeled by the Habitat Identification Card.

Note: Several animals could live in more than one habitat (i.e., dog). While one habitat is more natural than another, encourage the students to make a decision as a whole class. You may choose to have students vote and use this learning opportunity to discuss why the majority makes the selection.

Once all Animal Cards have been placed, ask the students to sit in front of the pocket chart. You may choose to have students gather together on a carpet or reposition their chairs.

The students will now count the number of animals placed within each category using a choral counting strategy. Follow the recommended procedure for each habitat represented in the pocket chart:

- Explain to students, *"How many of our animals live in the _____ habitat?"*
- Ask students to help count the number of animals that live in this habitat. As you point to each animal, all students should count aloud, saying the number name in the correct order, pairing each animal with one number name.
- Again, ask the students, *"How many of our animals live in the _____ habitat? How do you know?"* Student answers should

Note: If a number line or number path template is available, students may point to the corresponding numeral that represents the number of animals in the habitat.
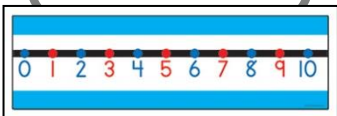
reflect their understanding that the last number recited indicates the total number of objects counted within the set.

- Ask the students to represent this number using their fingers.

Next, encourage the students to compare the number of animals within each habitat. If available, including a number line or number path may assist students in quantifying numbers. During this exercise, students should first think independently, and when instructed, turn to their neighbor to discuss their answer before sharing their idea with the class. Pose the following questions:

- Do *more* of our animals live in the wild or on the farm? How do you know this?
- Do *more* of our animals live in the house or in the ocean? How do you know?
- What other *more than* sentences could we make? Share with your partner. Then, we will share aloud.

Next, review the converse:

- Do *less* of our animals live in the wild or in the house? How do you know?
- Do *less* of our animals live in the ocean or on the farm? How do you know?
- What other *less than* sentences could we make? Share with your partner. Then we will share aloud.

Students may also be asked to consider other ways in which quantity is represented mathematically. Survey students on additional ways to say "more than" or "less than". Explain to the students that if *more* of the animal figures "live" in one habitat than another, it is said that the number of animals in the habitat with more animal figures is *greater than* the number of animals in the habitat with less animal figures. Conversely, if *less* (fewer) animal figures "live" in one habitat than another, it is said that the number of animal figures in the habitat with a smaller number of animal figures is *less than* the number of animal figures in the habitat with a larger number of animal figures.

Finally, assess student understanding with the following questions:

- Are the number of our animals that live in the wild *greater than or less than* the number of our animals that live on the farm?

- Are the number of our animals that live in the house *greater than or less than* the number of our animals that live in the ocean?
- What other *greater than* or *less than* sentences could we make? Share with your partner. Then, we will share aloud.

Students may also consider if any habitats have an *equal* number of represented animals. Require learners to explain their thinking.

The questions in this activity are intended to introduce the concepts of "greater than", "less than", and "equal to" when comparing two values. Additional work with this concept is necessary for students to demonstrate mastery of this concept.

Assessment/Debrief Kindergarten Activity:

- *Can you think of any other animals that may live in the habitats we talked about today?*

- *What other habitats are in the world? What animals live in these habitats?*

- *In which habitat do you think MOST of the animals in the world live? Why might you think that?*

- *Can you give an example of an animal that can live in one habitat but not another habitat? Explain.*

- *What new questions do you have? What are you wondering about now?**

* This final question prompts students to ask questions which may lead into student-led explorations of mathematical and scientific concepts. This opportunity allows students to pursue their interests and search for relationships beyond those embedded within this lesson.

As a final assessment, student teams may be asked to return to their desks, and with their partner, demonstrate their understanding of counting and cardinality. This can be achieved by providing each partner team with four small sticky notes and instructing the pairs to record the number of animal figures within each habitat on an individual sticky note. Students may then attach the sticky note to its corresponding habitat.

First Grade Activity

Objectives:

- Sort a collection of animal figures by habitat, numerically represent the total number of animals within each habitat, and compare populations between habitats.
- Solve simple put-together, take-apart, and compare problems using addition and subtraction operations.
- Compare numbers using the symbols <, = and >.

First Grade Activity **Materials:**
For each partner team:
- 1 Habitat Placemat
- 1 set of Animal Figures
- 1 set of Animal Math Magnets
- 1 set of Number Cards (1-10)
- Student Pages

For the teacher:
- Copy of *Listen to Our World*
- Habitat Identification Signs

Standards:

NGSS: LS1.A, SEP5, SEP8
CCSS Mathematics: 1.MD.C.4, 1.OA.A.1, 1.OA.A.2, 1.NBT.B.3, MP1, MP2, MP3, MP4
CCSS ELA/Literacy: SL.1.1

Estimated Time: 60 Minutes

Advanced Planning:

☐ Separate the Animal Math Magnets to create a set for each partner team. Students should have one *greater than* magnet, *less than* magnet and *equal to* magnet. You may choose to write the mathematical phrases on each magnet for additional support.

Note: The Animal Math Magnets can be purchased from Oriental Trading Company.

☐ Additionally, each partner team will need one set of Number Tiles (1-10). Cut apart the tiles and secure them with a paperclip.

☐ Verify that each Animal Figure collection consists of the following:

Chicken	**Pig**	**Horse**	**Sheep**	**Cow**
Cat	**Dog**	**Crab**	**Seahorse**	**Swordfish**
Stingray	**Octopus**	**Starfish**	**Polar Bear**	**Camel**
Elephant	**Tiger**	**Lion**	**Gorilla**	**Hippopotamus**

Suggested Inquiry Approach:

Inform students that they will be reading *Listen to Our World,* by Bill Martin Jr., to learn about where animals live and why they live there. The storytelling-questioning strategy listed in *Activity 1: Storytelling* can be used to facilitate student discussion during the read-aloud.

To begin the subsequent activity, distribute the Habitat Placemat and Animal Figures to each small group. Students will now complete the animal sorting exercise detailed in the *Kindergarten Activity.* At this time, prompt students to discuss each habitat, identify the animals included in their collection, and sort each animal into their appropriate habitat.

Once students have sorted all of their animals onto the Habitat Placemat, review their work as a class. During this discussion, identify any animals that have been "misplaced" and encourage students to appropriately express their reasoning. Constructing a class tally chart using the Habitat Identification Cards is one suggestion for representing the class consensus data.
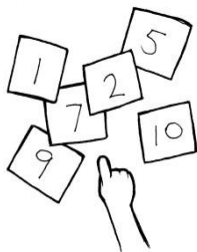
Next, provide each partner team with two sets of Number Cards. Instruct the students to arrange one set of cards in a line on their desk from least to greatest. Students will now count the number of Animal Figures in each habitat and place the corresponding Number Card in the outlined box of each habitat on their placemat. The additional number cards can be used if students have equal category sizes.

While completing this activity, circulate around the room. Verify that students are exercising positive collaboration skills, using appropriate

Notice that students may use a variety of counting strategies to determine the number of Animal Figures in each habitat.

- **Individual Counting**
- **Doubles Plus 1**
- **Doubling**
- **One More Than**
- **One Less Than**
- **Skip Counting**

strategies to count the animals within each habitat, and are able to correctly select the numerical value that represents the set.

Next, encourage students to make mathematical observations of their work. You may ask students, **"What do you notice?"** As students share their mathematical insights, question the validity of their insights. Posing questions such as, **"How do you know this?"** and **"How can you convince me?"** require students to justify their explanation.

Students may notice:

- **Habitats that have the same number of animals.**
- **The habitat that has the largest, or smallest, number of animals.**
- **Comparison statements which represent an understanding of one habitat having more or less animals than another habitat.**

During this conversation, ask students to elaborate on how to compare the number of animals in each habitat. Ask students the included questions and elicit answers from student volunteers:

- **What does it mean if one number is *greater than* another number?**
- **What is an example of one number that is *greater than* another number?**
- **What does it mean if one number is *less than* another number?**
- **What is an example of one number that is *less than* another number?**
- **What *greater than* or *less than* sentences could we make about the animals in each habitat? Share with your partner. Then, we will share aloud.**

Provide each partner team with a set of Animal Math Magnets. Explain to the students that these symbols are used to express when one number is "greater than", "less than", or "equal to" another number. Model several examples by randomly selecting two numbers and determining which magnet would be used in comparison. Prompt the students to also select two numbers, arrange them left to right, and then choose the correct inequality symbol that adequately represents the numerical relationship.

Note: To truly understand mathematical comparisons using inequality symbols, students must comprehend that values are assessed based on their

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NOTES

location on a number line. Often, inequality symbols are simply presented as an "alligator eats the bigger number" manner. While the Animal Math Magnet manipulatives allow students to naturally make this connection, it is essential that students learn to compare numbers from left to right. Encourage students to orally read aloud the inequality expressions that they generate using their number tiles and magnet symbols.

Distribute student page S1 (page 27) to each partner team. To complete this exercise, students will work collaboratively to complete the numerical comparisons across habitats.

Students should cooperatively complete the exercise in the following manner:

- Student A will read aloud the two habitats that are being compared.
- Student B will retrieve the Number Card from each habitat and place them on their desk next to each other, with the card of the first habitat to the left.
- Student A and B will determine if the first value is *greater than, less than, or equal to* the second value.
- Student B will place the appropriate Animal Math Magnet between the two values.
- Student A will record the appropriate inequality symbol in the answer box on their student page.
- Student A and B will exchange roles for each problem.

While completing their problems, students may also choose to compare the number of animals in each habitat by counting and comparing the actual Animal Figures. When finished, review student answers as a class.

Next, students will complete a series of addition and subtraction problems using the number of animals within each habitat. Distribute the student page S2 (page 28) to each partner team. Prior to beginning this portion of the activity, it may be necessary to review the addition sign as well as any strategies that assist students in performing these mathematical operations.

When all partner teams have finished, review their answers as a whole class. Encourage students to explain how they arrived at their answer.

Finally, ask the students to return to their Animal Figures and Habitat Placemat. Explain to the students that the four habitats included on their placemat are only one example of how these animals could be sorted.

Challenge the students to then sort their animals using different categories that they can select. If students are having difficulty coming up with their own categorization schemes, the following are some suggested ways:

- How animals move: by land, by sea, or both
- What animals eat: plants (herbivores), meat (carnivores), or both (omnivores)
- Students may further sort the "wild" habitat into: arctic, desert, jungle or savanna locations.

Assessment/Debrief First Grade Activity:

To debrief this activity, it is recommended that students use their new categories to create a graphical representation of the number of animal figures that they would place in their new categories. Then, provide students with Post-it notes or index cards to write down two different category names. Direct students to place the category names on their desk. Below the category names, instruct students to select the number tile that represents the number of animal figures in each category. Finally, have students compare the two values by placing the appropriate Animal Math Magnet symbol between the two category names.   Have student teams share their categories and equality/inequality statement with the class.

OPTIONAL RESOURCE

Math Muncher manipulatives, constructed out of craft sticks, glue, white paper or foam, and two googly eyes, can also be used to complete comparison mathematics problems. One set should be distributed to each partner team.
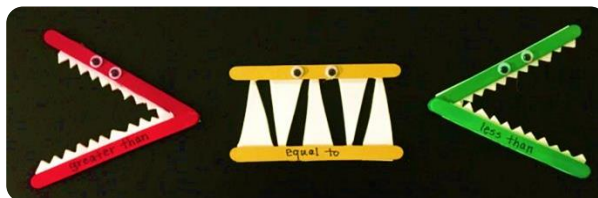
Who Lives Here?

Second Grade Activity

Objectives:

- Use animal figure manipulatives to create a bar graph to represent the habitats of the animals in the data set.
- Observe differences between two different turtles to determine the habitat that would "best" provide for their needs.
- Solve simple put-together, take-apart, and compare problems using information from the constructed bar graph on animal habitats.
- Use inferential reasoning skills to address question posed beyond the data.

> *Second Grade Activity*
> **Materials:**
> *For the teacher:*
> - Copy of *Listen to Our World*
> - *Document Camera*
>
> *For each partner team:*
> - 1 Bar Graph Placemat
> - 1 set of Animal Figures
> - 1 sea turtle figurine and 1 turtle figurine
>
> *For each student:*
> - Copy of Student Pages

Standards:

NGSS: LS4.D (2-LS4-1); SEP5, SEP8
CCSS Mathematics: 2.MD.D.10; MP.1, MP.2, MP.3, MP.4
CCSS ELA/Literacy: RL.2.7, SL.2.1, L.2.4
Estimated Time: 45 Minutes

Advanced Planning:

☐ Print out on 11" x 17" paper the Bar Graph Placemats (one for each pair of students)

☐ Verify that each Animal Figure collection consists of the following:

Chicken	**Pig**	**Horse**	**Sheep**	**Cow**
Cat	**Dog**	**Crab**	**Seahorse**	**Swordfish**
Stingray	**Octopus**	**Starfish**	**Polar Bear**	**Camel**
Elephant	**Tiger**	**Lion**	**Gorilla**	**Hippopotamus**

Note: For second-grade students, you may choose to substitute some additional animal figures that students may be able to categorize into more than one habitat category. Student partners will then need to arrive at a consensus habitat in which to place the animal. Examples include the goldfish and parrot.

Suggested Inquiry Approach:

To begin, read aloud the book *Listen to Our World* to students. The storytelling-questioning strategy listed in *Activity 1: Storytelling* can be used to facilitate student discussion during the read-aloud.

Next, group students into partner teams and provide each partner team with a copy of student pages 31 and 32.   Select one student to read aloud the information in the gray box. Allow teams time to describe each of the four "habitats" that will be used for this activity. Then, review with students what a habitat is and why an animal might live in a particular habitat (see Kindergarten and First Grade activities for reference). Elicit student responses.

Pass out the bar graph templates and animal figures to each team. Allow students time to make some observations about the bar graph template, and then ask students the following questions:

- **What does each of the category headings at the bottom of the template represent?**
- **Can you predict what our task might be for this activity?**
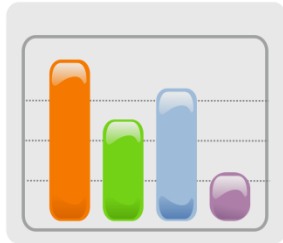
Select students to respond to the questions above. Next, direct students to collaboratively place each figure onto the bar graph template according to the habitat in which it is most likely to live. Also review, if necessary, the placement of the figures on the grid beginning at the bottom box and adding each additional figure into the first empty box directly above one already filled with a figure for a particular habitat.

Pass out one sea turtle figure and one land turtle figure to each team. Tell students that they will need to discuss where to place these additional figures. Students should note the similarities and differences in each of the figures and will then decide in which habitat to place them on their graphs. Once student teams have constructed their bar graph model, pass out student page 33 to each student.

Students will then draw a representation of their team's physical graph on paper and will use the information in the graph to answer a series of mathematical questions. Direct students to fill in the category labels, the scale on the left side of the graph, the label for the scale, the title of the graph, and then color in each bar to represent the number of animal

figures in each category on their template. Students may need to think about what is being tallied, or counted, in order to determine how to label the left side of the graph (number or frequency of animals in a category).

The assessment and discussion questions on pages 35 – 38 are designed to address skills along a continuum of reasoning from reading the data, reading between the data, and reading beyond the data advocated by Friel, Curcio, and Wright (2001). Student questions are slightly modified from the questions below. Note that the first two categories are provided to students as independent/partner classwork associated with the graph. Questions from the third group (Reading Beyond the Data) can be posed to the entire class, or can be discussed among small groups of students first before a whole-class discussion.

Reading the Data (information is read directly from the graph):

- How many animal figures were placed into each habitat?
- Which habitat had the most animal figures? How do you know?
- Which habitat had the least animal figures? How do you know?
- Did any habitat categories have the same number of animals? How do you know?

Reading Between the Data (the use of addition, subtraction, or comparison is involved):

- How many animal figures are there altogether? What strategies did you use to determine the total?
- Animals in the wild habitat and ocean habitat provide their own food? How many animals that we graphed provide their own food?
- Write a number sentence to show how many animals that we graphed do NOT provide their own food. Are there different ways that we could represent this?
- How many more of the animals on the graph are in the wild habitat category than in the house habitat category?
- There are twice as many animal figures in the farm category than in the house category. How could you show if this statement is true? How could you show if this statement is false?

Reading Beyond the Data (extend, predict, or infer from the data at hand):

- How many extra categories would you need if you wanted to separate the wild habitat category into different habitats?
- What would be the names of your new habitat categories? Did you use any of the habitat names from the book we read?
- How would you place the animal figures from the wild category into the new habitat categories?
- If you received another animal figure from your teacher, predict which habitat it is most likely to be from? Why do you think that?
- If we placed all of the animal figures into a bag and pulled one out, from which habitat category would the animal most likely be from? Why do you think that?
- Do you think that the highest category on your bar graph is really the habitat with the most animals? Why or why not?

An additional question (page 39) asks students to look at a list of words on chart paper in a cartoon and respond to the question, "What do you think the information on the chart paper is describing?" Students should recognize that the words on the chart paper are things that all animals need to survive.

Assessment/Debrief Second Grade Activity:

- *How did you and your partner decide in which habitat to place each animal figure?*

- *Were some animals easier to place on the graph than others? Why?*

- *Which animals did you and your partner have a difficult time placing on the graph? Why was it difficult to make a decision?*

Students may create another graphical representation using attributes of the plastic figures other than habitat. Color, the number of legs touching the surface of the table or expanding the "wild" classification are examples of other categories that can be used to create additional bar graphs using the selected figures. Also, figures not included in the task set can be combined with the current figures to have students create their own habitat categories, sort the figures into these categories and create a graphical representation of the data.

Who Lives Here?

Matching Activity (extension) Second Grade

Objectives:

- Match an animal from the book *Listen to Our World* by Bill Martin, Jr. and Michael Sampson with its habitat.
- Compare two different animals and their habitats to infer why the animal lives in its respective habitat.

Standards:

NGSS: LS4.D (2-LS4-1), SEP6
CCSS ELA-Literacy: SL.2.1, SL2.2, L.2.4, RF.2.4.A

> *Matching Activity*
> **Materials:**
> *For each partner team:*
> - Set of Habitat Matching Cards

Estimated Time: 45 Minutes

Note: The cards are formatted to use Avery Business Card 5371 templates if desired for ease in separating.

Advanced Planning:

- ☐ Be sure that both animal cards, habitat cards and habitat definition cards are cut apart.

Suggested Inquiry Approach:

To begin, arrange students in small groups of two or three. Read the story *Listen to Our World* to students (see *Activity 1*). Provide a set of Habitat Matching Cards to each group of students. Allow plenty of time for groups to match an animal on one card with one of the habitats. If desired, habitat definition cards are also included. A recording sheet is available (page 40). Choose one group and have them share a match that they feel confident is one that was discussed in the story. Ask the class if they agree or disagree. If students disagree, tell them that they have to present a different habitat for the animal and say why they believe that their choice is the correct habitat. Continue until all animals and their habitats have been discussed.

Assessment/Debrief Matching Activity:

- *Choose two animals and their habitats. Compare the habitats and features of the animals. Do some habitats seem similar?*

- *Why do you think that the animals in the book live in their chosen habitat?*

Provide teams the opportunity to share their responses with the class.

Mapping Activity (extension) Grades 3-4

Objectives:

- Identify locations on a map corresponding to habitat locations mentioned in *Listen to our World* by Bill Martin, Jr. and Michael Sampson.
- Use the relative location of the habitat to the equator or poles to reason about climate conditions at each habitat location and its impact on the animals that live there.

> **Mapping Activity**
> **Materials:**
> *For partner team:*
> - 11 – Sticker dots
> - 1 – World map sheet
> - 1 – Pencil

Standards:

NGSS: SEP6
CCSS Mathematics: MP.1, MP.2, MP.5
CCSS ELA-Literacy: RF.3.4.A, SL.3.1, W.3.8

Estimated Time: 45 Minutes

Advanced Planning:

Students will need 11 sticker dots (3/4") and a World map sheet for this activity (Kappa World Map Study Pads). For younger students, the blank side of the map can be pre-labeled with the locations that are found in the book *Listen to Our World*.

Suggested Inquiry Approach:

To begin, arrange students into partner groups (or another predetermined size). Be sure to complete Activity 1 so that students are familiar with the book, *Listen to our World*. At the end of the story, there are facts about each of the animals as well as the locations of their habitat. Tell students that today they will be marking locations of the animals on a map of the world. They will then use their maps to answer some questions about the animals that they learned about in the story.

Encourage teams to discuss their ideas on why each animal lives in their chosen location. Students may also discuss if a particular animal could live in another location than the one described in the book. Students may observe characteristics of the animal that make it suited for the location of its particular habitat.

Who Lives Here?

Assessment/Debrief Mapping Activity:

Questions such as the following can be asked of students depending upon their grade level:

- *How many animals on the map live in Africa?*

- *How many animals on the map live in North America AND South America?*

- *Using your map, which animal or animals like warmer/colder temperatures? How do you know?*

- *Which animals live between the latitudes of 15°S and 30°S?*

- *Approximately how many degrees of latitude separate the eagle from the monkey?*

Student teams may also write their own questions for another team to answer.

Resources

For a listing of NSTA's recommended science trade books to use in designing an integrated activity, visit the link at http://www.nsta.org/publications/ostb/

A listing of children's books with mathematical themes can be found at http://www.the-best-childrens-books.org/math-for-kids.html.

Cox, J. (n.d.). Using Children's Literature to Motivate Math Lessons. Retrieved February 08, 2017, from http://www.teachhub.com/using-children's-literature-motivate-math-lessons

Friel, S. N., Curcio, F. R., & Bright, G. W. (2001). Making Sense of Graphs: Critical Factors Influencing Comprehension and Instructional Implications. *Journal for Research in Mathematics Education, 32*(2), 124. doi:10.2307/749671

Hourigan, M., & A. L. (2015, Dec. & Jan.). Practical Problems: Using Literature to Teach Statistics. Retrieved February 08, 2017, from http://www.nctm.org/Publications/Teaching-Children-Mathematics/2015/Vol22/Issue5/Practical-Problems-Using-Literature-to-Teach-Statistics/ Vol. 22, No. 5 Teaching Children Mathematics

Martin, B., Sampson, M. R., & Sweet, M. (2016). *Listen to our world*. New York: Simon & Schuster Books for Young Readers.

Who Lives Here?
First Grade Activity, Student Pages

Page 1 of 3

Name: _____

Greater than, Less than, or Equal to?

Circle the words that make the problem true.

| Write the correct symbol (>, <, =) to make the problem true.

Ocean   is greater than / is less than / is equal to   Farm

Farm   is greater than / is less than / is equal to   Wild

Wild   is greater than / is less than / is equal to   House

Ocean   is greater than / is less than / is equal to   House

Farm   is greater than / is less than / is equal to   Ocean

House ( ) Farm

Ocean ( ) Wild

House ( ) Wild

Farm ( ) House

Wild ( ) Ocean

Who Lives Here?
First Grade Activity, Student Pages

Page 2 of 3

Name: _____

Animal Addition and Subtraction!

1. Farm + Ocean = _____

[ ] + [ ]

2. House + Farm = _____

[ ] + [ ]

3. Farm — House = _____

[ ] — [ ]

4. Wild + Farm = _____

[ ] + [ ]

5. Wild — Ocean = _____

[ ] — [ ]

6. Ocean — House = _____

[ ] — [ ]

Who Lives Here?
First Grade Activity, Student Pages

Page 3 of 3

Animal Addition and Subtraction!

Name: _____

Find the missing number. Place your number tiles in the box to help you solve the problem.

7. Farm + _____ = Wild

[ ] + ? = [ ]

8. House + _____ = Wild

[ ] + ? = [ ]

9. Farm + House + Wild = _____

[ ] + [ ] + [ ]

10. _____ + Farm = Ocean

? + [ ] = [ ]

11. Ocean - _____ = House

[ ] - ? = [ ]

12. Ocean + Wild + Farm = _____

[ ] + [ ] + [ ]

Who Lives Here?
Second Grade Activity, Student Pages

Name: _____

> The book *Listen to Our World* describes different habitats that animals live in to meet their needs. What needs do all animals have in common? Think about this question as you do the following activity with your team.

1. Describe each habitat in the space next to the picture.

_____
_____
_____
_____
_____
_____
_____
_____

_____
_____
_____
_____
_____
_____
_____
_____
_____

Who Lives Here?
Second Grade Activity, Student Pages

Page 2 of 2

| HOUSE | _____
_____
_____
_____
_____
_____
_____
_____
_____
_____ |
| Wild | _____
_____
_____
_____
_____
_____
_____
_____
_____
_____ |

2. Your teacher will now give you a bar graph template and a set of animal figures.

PREDICT: What are we going to do with the animals?

Who Lives Here?
Second Grade Activity, Student Pages

Page 1 of 1

Name: _____

Bar Graph of Animal Figure Habitats

Draw and label a bar graph of the number of animal figures in each of the four habitats shown on the template.

Who Lives Here?
Second Grade Activity, Student Pages

Name: _____

Questions Using Your Graph

1. How many animal figures were in each habitat?

Ocean	Farm	House	Wild

2. Which habitat category had the **most** animal figures?

   _____

3. Which habitat category had the **least** animal figures?

   _____

4. Do any habitat categories have the **same** number of animal figures?_____ How do you know? _____

5. How many animal figures are there altogether? _____

6. Animals in the **wild habitat** and **ocean habitat** provide their own food. How many animals that we graphed provide their own food? _____

Who Lives Here?
Second Grade Activity, Student Pages

Page 2 of 2

7. Write a number sentence to show how many animals that we graphed do NOT provide their own food.

8. How many more of the animals on the graph are in the wild habitat category than in the house habitat category? _____

9. There are twice as many animal figures in the farm category than in the house category. Show if this is true or false.

Who Lives Here?
Second Grade Activity, Student Pages

Page 1 of 3

Name: _____

Discussion Questions

1. How many extra categories would you need to separate the wild category into different habitats?

2. What would be the names of your new habitat categories?

3. How would you place the animal figures from the wild category into the new categories?

Who Lives Here?
Second Grade Activity, Student Pages

Page 2 of 3

4. If you received another animal figure from your teacher, **predict** which habitat category it most likely would be placed into?

Why?

5. If all the animal figures were placed into a bag, which habitat category would an animal figure most likely be from if you only pulled ONE animal figure from the bag?

Why do you think that?

6. Do you think that the highest category on your bar graph is really the habitat with the most animals?

Why or why not?

Who Lives Here?
Second Grade Activity, Student Pages

Page 3 of 3

Food
Water
Shelter
Oxygen
Space

7. What do you think the information on the chart paper is describing?

Extension: Habitat Matching

Use the cards to match an animal from the book *Listen to Our World* with its habitat and habitat definition. Record your matches in the table.

ANIMAL	HABITAT	DEFINITION