

# Instructional Units to Build 2nd-5th Grade Braille Readers' Skills with Line Plots, Pictographs, and Bar Graphs

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Image description: A male student views a pictograph produced with a fuser.

## Slide 2: AnimalWatch Vi Building Graphics Literacy

- Institute of Education Science grant funded from 2012-2016.
- Team developed an iPad app and accompanying materials to teach middle school students graphics literacy skills.
- iPad app is available at no cost from APH.

<https://www.aph.org/product/animalwatch-vi-building-graphics-literacy-for-ipad/>

- Graphics are available for \$350 from the Lighthouse.

<https://adaptations.org/products/br600>

- One conclusion of the researchers was that graphics literacy instruction must start earlier than middle school!

## Slide 3: Current Project: Instructional Units for 2<sup>nd</sup>-5<sup>th</sup> Grade Braille Readers

- Funded by the University of South Carolina
- Researchers developed 2 instructional units (no iPad app)
- Unit content is about endangered or invasive species
- Each unit contains:
  - A teacher guide
  - One tactile graphic of the animal and four content graphics
  - An audio file of the unit content
  - Fun facts about the animal
  - Extension activities that provide the student the opportunity to make their own graphics

## Slide 4: Research Was Part of the Project

- Students and TSVIs were enrolled in the research study.
- TSVIs completed a form as they observed their student during each unit.
  - Detailed how the student approached graphics
  - Provided information about how student got answers

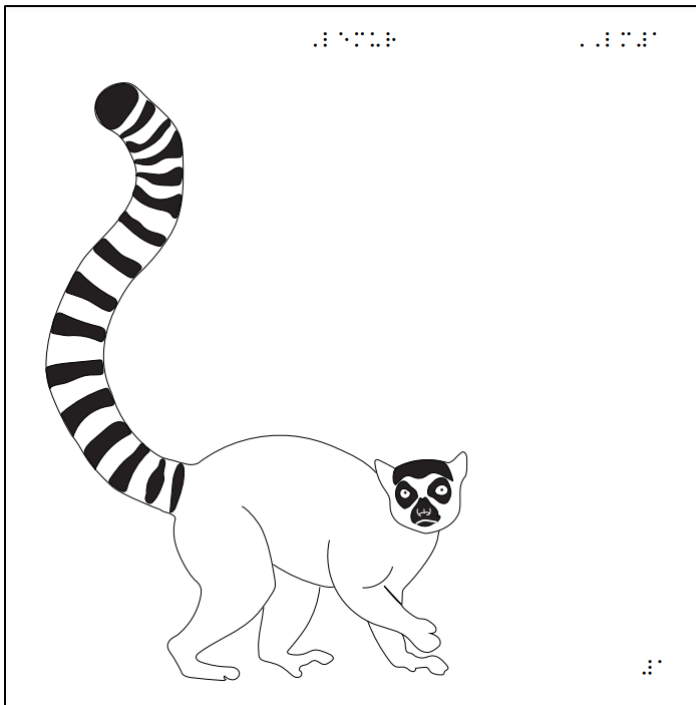
- One of the researchers observed 14 of 28 students during an instructional session.
  - Field notes were taken for later analysis.
  - Sessions were video recorded for later analysis.

#### Slide 5: The 28 2<sup>nd</sup>-5<sup>th</sup> Grade Students

- State: 16 states with the most from Texas (n=6), California (n=4), and Georgia (n=3)
- Grade: 2<sup>nd</sup> (n=6), 3<sup>rd</sup> (n=6), 4<sup>th</sup> (n=10), 5<sup>th</sup> (n=6)
- Gender: female (n=13), male (n=15)
- Ethnicity: Asian (n=3), Black (n=1), Hispanic or Latinx (n=4), Hawaiian (n=1), Multiracial (n=1), White (n=18)
- Eye condition: retinal diseases (n=7), ONH (n=5), glaucoma (n=4), Leber's (n=4), not known (n=3), other eye conditions/diseases (n=5)

#### Slide 6: Unit 1: Lemur Introduction

- Introduction contains information about the lemur.
- Students are provided a tactile drawing of the lemur to explore.
- Students listen to the sound the lemur makes.
- Students can practice jumping like a lemur.



#### Slide 7: Video: A 4<sup>th</sup> Grader Jumps Like a Lemur

A video will be shown and described by the presenters.

### Slide 8: Video: A 4<sup>th</sup> Grader Finds Out What 20 Pounds Feels Like

A video will be shown and described by the presenters.

### Slide 9: Unit 1: Introduction – Teacher Form

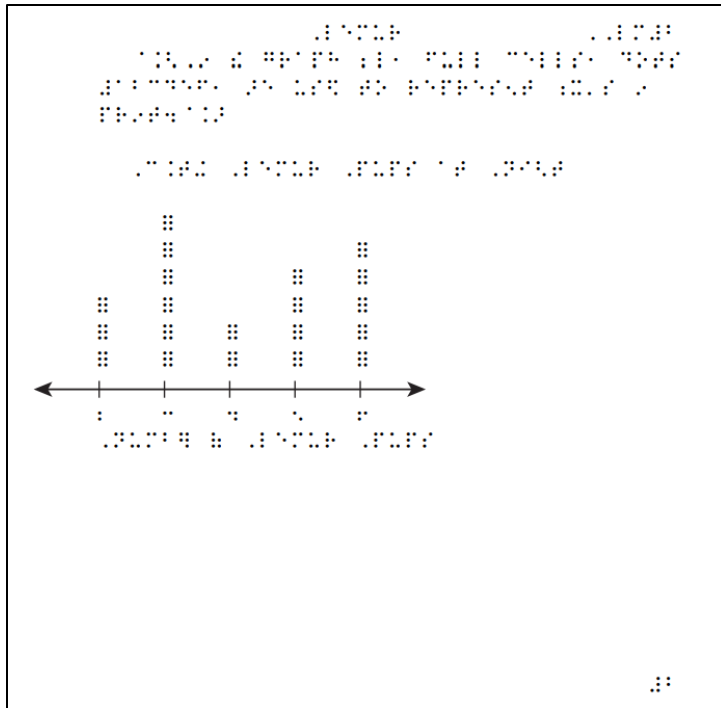
What did you observe as your student *independently* examined the drawing of the lemur on Tactile Graphic LM1? Check all that apply.

- a. The student used two hands to explore the lemur.
- b. The student was systematic in their exploration.
- c. The student began exploring at the top of the page.
- d. The student began exploring at the bottom of the page.
- e. The student began exploring in the middle of the page.
- f. The student commented that some of the areas felt different (raised texture vs. no texture).
- g. The student identified one or more body parts (tail, head, etc.)
- h. Other (please describe)

Image description: A female student tactually explores a lemur drawing produced with a fuser.

### Slide 10: Unit 1: First Line Plot

- Students are encouraged to be consistent in how they explore any graphic.
- Narrator walks students through exploring:
  - Running head
  - Transcriber's note
  - Title
  - Label
  - Number line
  - Left and right arrows



### Slide 11: Video: 5<sup>th</sup> Grader Explores the Line Plot

A video will be shown and described by the presenters.

### Slide 12: Unit 1: Finding Values on the Line Plot

“Let’s talk about how to read the data, or information, on Saleem’s line plot. When you read data on any tactile graphic, it is important to use two hands if you are able. Your hands can check each other’s work to make sure you have the correct answer.

So, let’s have you start by finding the number line toward the bottom of the line plot.

- Find the number 2 on the number line. Do you know how many times Saleem saw 2 pups?
- To find out, keep your left index finger on the 2, and then move your right index finger up and count the number of full cells. Continue to count until you can no longer feel any full cells in the next line above. Did you count 3 full cells?”

Image description: The line plot on Slide 10 is shown.

### Slide 13: Unit 1: LM2 – Teacher Form

The student:

- a. Independently located and read the title.
- b. Independently located the title and read the title with my help.
- c. I had to guide/help the student to locate and read the title.

As the student was directed by the narrator to examine the parts of the line plot on Tactile Graphic LM2, I:

- a. Watched the student work independently.
- b. Assisted the student once or twice.
- c. Frequently guided the student verbally.
- d. Frequently provided physical assistance.
- e. Frequently provided verbal prompts and physical assistance.

Image description: A female student tactually explores a line plot produced with a fuser.

### Slide 14: Unit 1: Verifying Values on the Line Plot

“Let’s make sure you’re right. Move your right index finger down counting the number of full cells. When you get back to the 2 below the number line you should again have counted 3 full cells. If you did, that’s super!

You verified, or checked, that you had the correct answer. Good for you! It’s always important to verify your work. It takes a little extra time, but it’s important so you find the correct answer.

- Three times during the night Saleem saw a mother lemur who had 2 pups with her.”

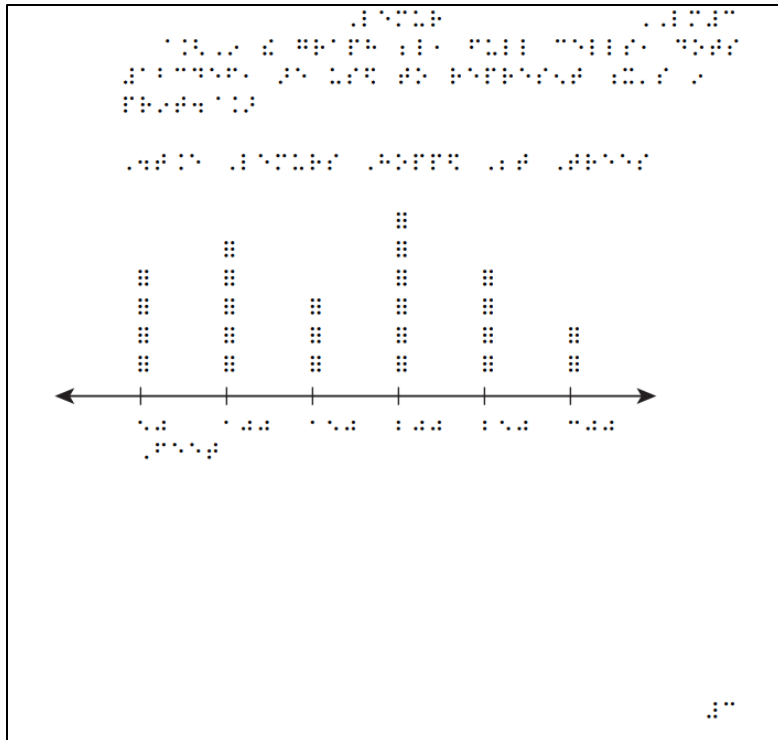
Image description: The line plot on Slide 10 is shown again.

### Slide 15: Video: 5<sup>th</sup> Grader Verifies Information

A video will be shown and described by the presenters.

### Slide 16: Second Line Plot

- Narrator points out the need to use skip counting.
- Students are directed to count the number of lemurs who jumped 100 feet.
- Students are then directed to complete Activity 2 with no assistance from the TSVI.



### Slide 17: Unit 1: Activity 2 Questions

1. How many times did Carole observe lemurs that hopped 150 feet?
2. How many times did Carole observe lemurs that hopped 300 feet?
3. How many times did Carole observe lemurs that hopped 200 feet?
4. Look at how many times Carole observed lemurs that hopped 50 feet and then how many times she observed lemurs that hopped 250 feet. How many times did she observe lemurs that hopped 50 feet or 250 feet altogether?
5. Look at how many times Carole observed lemurs that hopped 200 feet and then how many times she observed lemurs that hopped 300 feet. How many times did she observe lemurs that hopped 200 or 300 feet altogether?

### Slide 18: Unit 1: Teacher Form for Activity 2

#### QUESTIONS THAT STUDENTS WERE ASKED:

- How many times did Carole observe lemurs that hopped 150 feet?
- How many times did Carole observe lemurs that hopped 150 feet?  
[Drop down box ranging from 0-20]

What did you observe as the student used the tactile graphic in order to answer the question? Check all that apply.

- a. The student independently located the information using the strategy just taught by the narrator.

- b. The student independently located the information, but they did not use the strategy just taught by the narrator.
- c. The student did not locate the information on the graphic.
- d. The student verified their answer.
- e. The student asked for assistance.

Image description: The line plot on Slide 16 is shown.

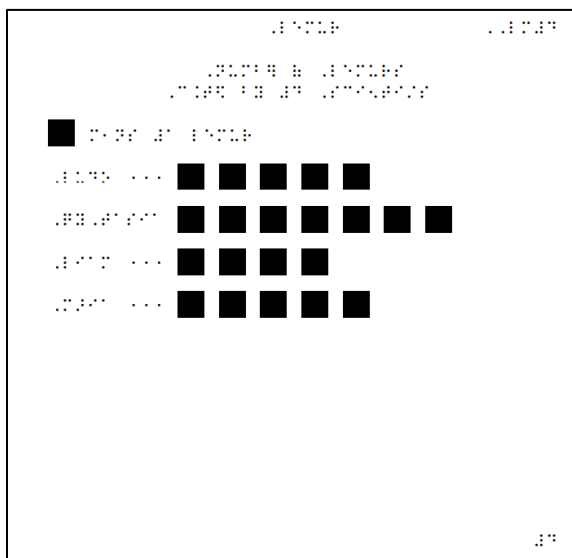
### Slide 19: Researchers' Observations of Students Completing Activities

- Prior to the activity, students had an opportunity to explore and interact with the graphic that was used for the activity.
- We kept the numbers "simple" so that students would not be penalized if they did not have strong math skills.
- As a result:
  - Some students had memorized the information prior to the activity.
  - Few students verified their answers.

Image description: A male student tactually explores a pictograph produced with a fuser.

### Slide 20: Unit 1: First Pictograph

- Students are directed to explore the graphic
  - Title
  - 1 square means 1 lemur
  - Names
  - Guide dots
  - Counting the number of lemurs Ludo counted
  - Counting the number of lemurs Maria counted



### Slide 21: Video: 4<sup>th</sup> Grader Explores Pictograph 1

A video will be shown and described by the presenters.

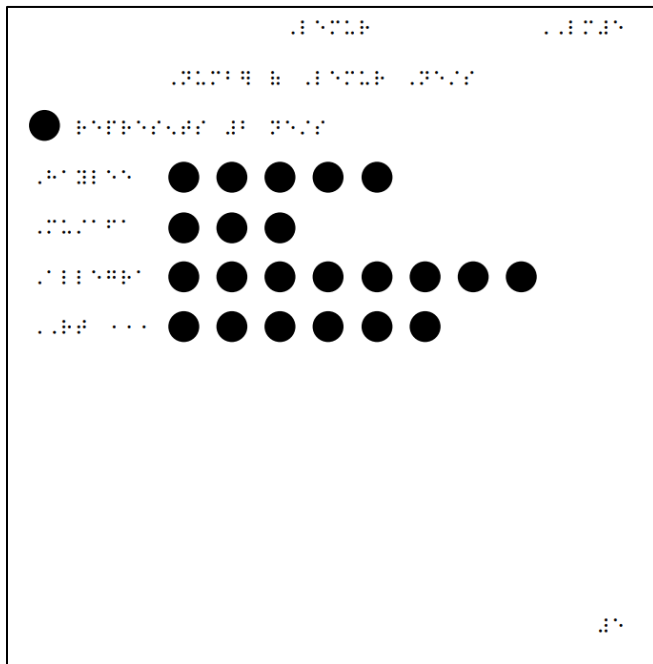
### Slide 22: Unit 1: Second Pictograph

"RT is one of the scientists who counted nests. Can you find his name on the pictograph?"

- Is RT's name first, second, third, or fourth in the pictograph?
- Yes, RT's name is fourth (or last) in the pictograph.

Now remember each circle represents 2 nests.

- How many nests did RT count?
- While keeping your left index finger on RT's name, use your right index finger to count the number of circles on the pictograph. Check that you have the right number by moving your right index finger back to the left and re-counting the circle. Did you count 6 circles?



### Slide 23: Unit 1: Opportunity for Students to Create Line Plots

"1. Put a piece of paper in your braillewriter. At the top of the paper, braille the title "Number of Nests in Trees". Towards the bottom of the paper, braille the numbers 1-5. Leave 3 blank cells between numbers.

2. Take the paper out of your braillewriter and place a Wikki Stix<sup>®</sup> above the numbers.

3. Use the foam shapes to make the line plot.

- There are 5 trees with 1 nest.
- There are 3 trees with 2 nests.
- There are 6 trees with 3 nests.



- There is 1 tree with 4 nests.
- There are 2 trees with 5 nests.”

Image description: Two images are shown of a male student. In the first he is creating a line plot by placing green squares on a braille page. In the second he is holding up his completed line plot.

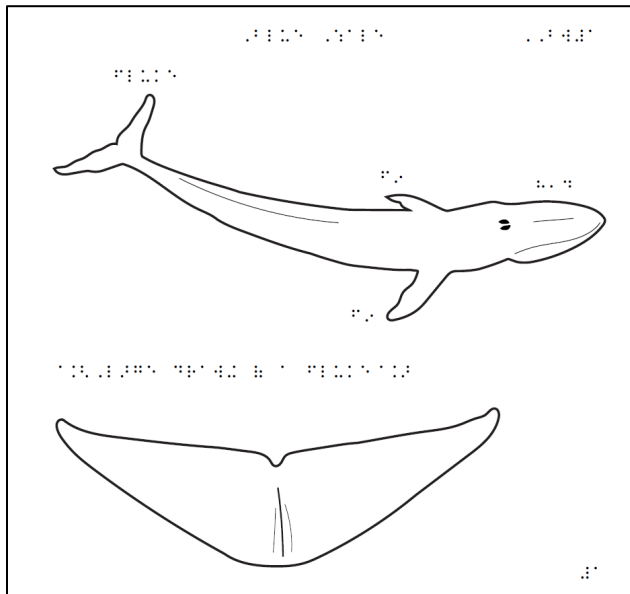
#### Slide 24: Video: 2<sup>nd</sup> Grader Creating a Line Plot

The same directions from Slide 23 are shown.

A video will be shown and described by the presenters.

#### Slide 25: Unit 2: Blue Whale Introduction

- Introduction contains information about the blue whale’s size and weight.
- Students are provided a drawing of the blue whale to explore.
- Students listen to the sound the blue whale makes.
- Students are provided 90 feet of rope to measure the length of a blue whale.



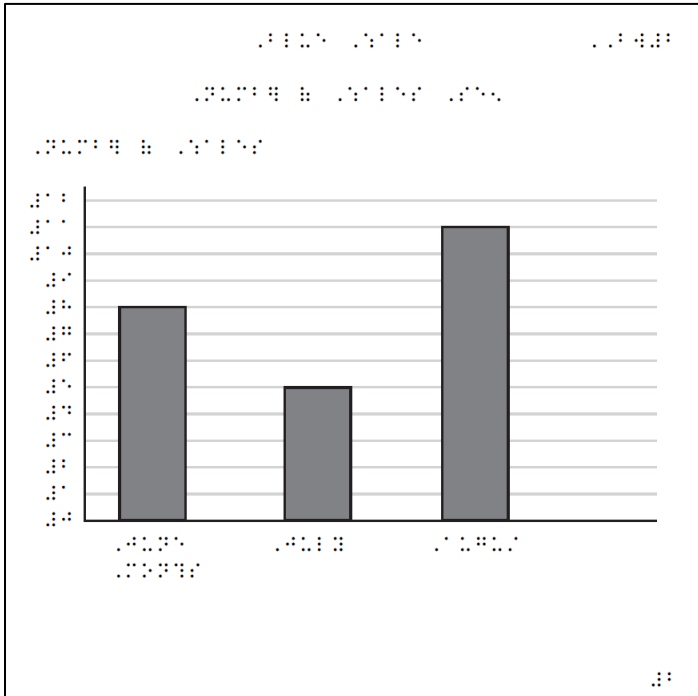
#### Slide 26: Video: 4<sup>th</sup> Grader Experiences 90 Feet

A video will be shown and described by the presenters.

#### Slide 27: Unit 2: First Bar Graph

- Students review/are introduced to:
  - Title
  - X-axis and label
  - Y-axis and label
  - Categories on the x-axis
  - Values on the y-axis

- Gridlines
- Locating the height of a bar
- Verifying the height of a bar



### Slide 28: Unit 2: Instruction to Find the Height of a Bar

1. Locate the label for June on the x-axis.
  2. Move your index finger on your right hand up the bar for June until you get to the top of the bar. Keep your finger there!
  3. With the index finger on your left hand carefully follow the gridline to the left until you find the value on the y-axis.
  4. What is the value? Yes, it is 8.
  5. Now, let's make sure your left index finger didn't get lost.
  6. Move your left index finger across the gridline until it meets your right index finger. If they meet up, then you know you went straight!
- Unit 2: Second Bar Graph

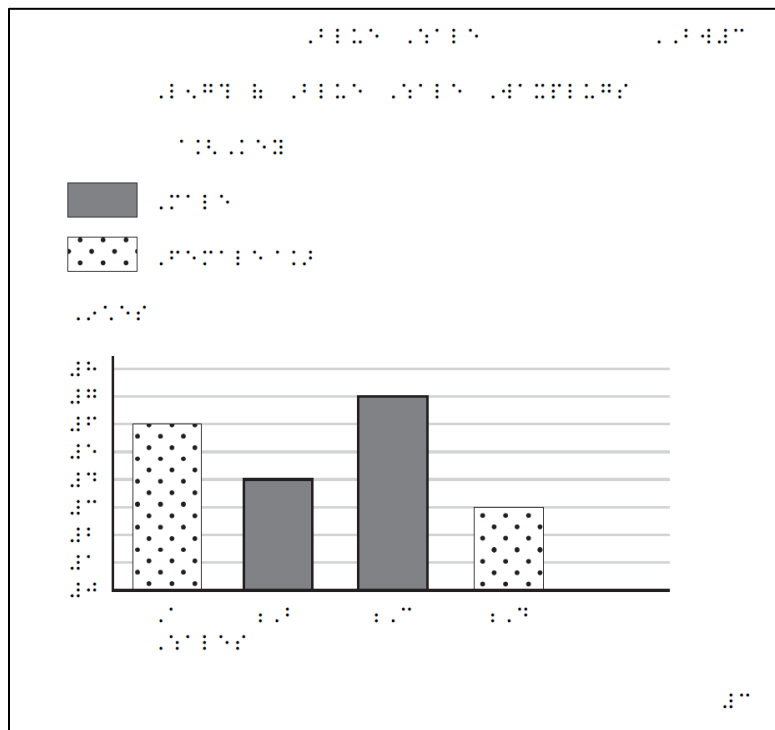
Image description: The same bar graph as on slide 27 is shown.

### Slide 29: Unit 2: Instruction to Find the Height of a Bar

Students are introduced to the key.

"Did you find something on Geraldo's bar graph that wasn't on Maureen's bar graph when you explored the page? What did you find? Did you find the word "key" and then two textures, one smooth for males and one bumpy for females?"

A key on a bar graph isn't the type of key we use to open a locked door. A key on a bar graph has information you need to understand the bar graph. Since Geraldo's bar graph has data for both male and female blue whales, he uses two different textures to show which bars are for the female blue whales and which are for the male blue whales."



**Slide 30: Video: 4<sup>th</sup> Grader Measures the Height of the Bars**

The graphic is on the APH *All in One Board*, and the blue line is from the APH *All Aboard! The Sight Word Activity Express*. The numbers are from the *Math Window*.

Image description: The same bar graph as on slide 29 is shown.

A video will be shown and described by the presenters.

**Slide 31: Video: 2<sup>nd</sup> Grader Completes a Question in Activity 2**

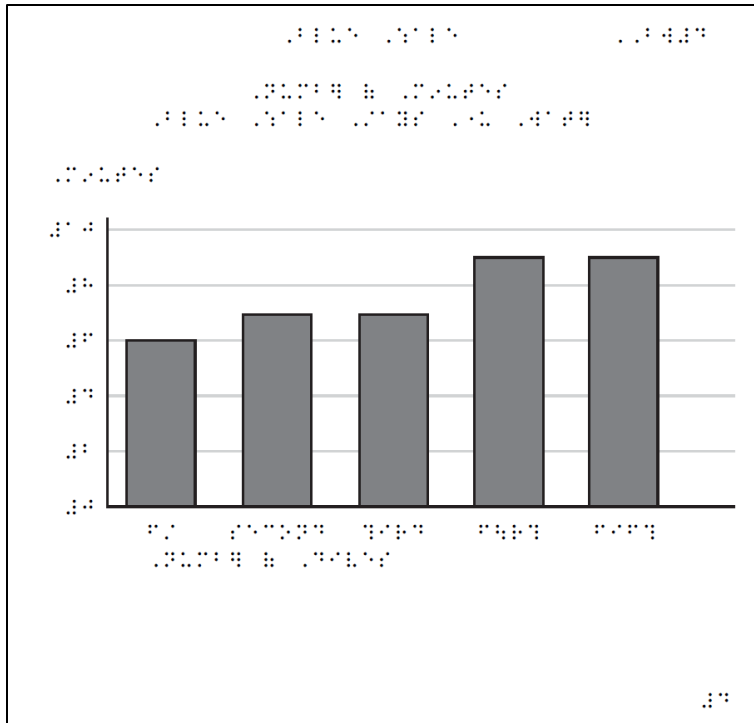
How many inches altogether are the waxplugs of the female whales?

Image description: The same bar graph as on slide 29 is shown.

A video will be shown and described by the presenters.

**Slide 32: Video: 4<sup>th</sup> Grader Measures the Height of the Bars**

A video will be shown and described by the presenters.



### Slide 33: Unit 2: Third Bar Graph

Students learn to find the value of a bar that does not fall on a gridline.  
 "Find the bar labeled 'Second'. When you get to the top, leave your right index finger in place and move your left index finger to the y-axis.

Are you noticing two things?

First, the top of the bar isn't on a gridline; it's between two of them!

Second, when you get to the y-axis there is not a number!"

Image description: The same bar graph as on slide 32 is shown.

### Slide 34: Third Bar Graph, Continued

"Wow, how are you going to figure out how many minutes the blue whale stayed under the water?

Here's an idea. Look at the value on the y-axis below where your finger is.

The value is 6. Now look at the value that is above where your finger is. The value is 8.

What number comes between 6 and 8?

Right, 7! So the blue whale stayed under the water for 7 minutes before coming up to breathe through its blowhole.

Make sure you're correct. Is your left index finger between the gridlines for 6 and 8?

Move your left index finger to the right until you reach the second bar. Are you at the top of the bar? If you are, then you are confirming, that is

showing you're correct.

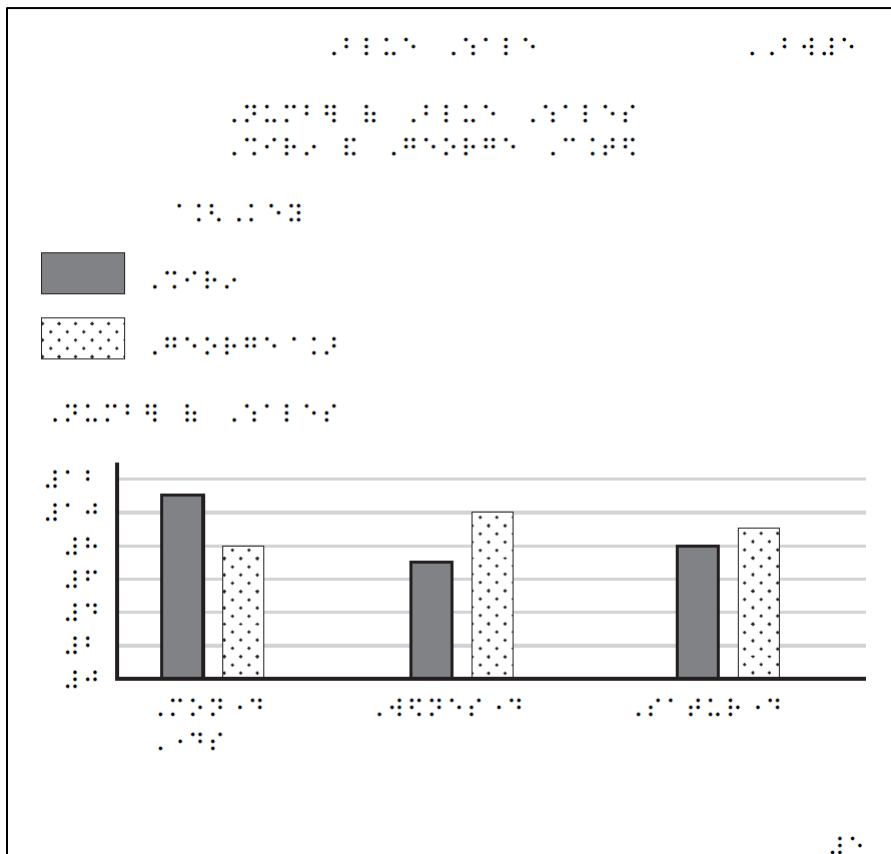
Image description: The same bar graph as on slide 32 is shown.

### Slide 35: Fourth Bar Graph

Students are introduced to a key for a double bar graph.

"When Shirin and George got back to the aquarium where they work, they each made a bar graph. Then they decided to put their two bar graphs together so their data, the number of blue whales they each counted, was on the same bar graph.

Do you think their bar graph will have a key? Why or why not?"



### Slide 36: Opportunity for Students to Create Bar Graphs

1. Put a piece of paper in your braillewriter. At the top of the paper, braille the title "Lengths of Four Blue Whales".
2. Skip a blank line and in cell 1 braille "Feet."
3. Skipping 2 blank lines after each number braille the numbers 100, 75, 50, 25, and 0 on the left side of the page.
4. At the bottom of the pages braille the letters A, B, C, and D leaving 5 cells between letters.

5. Take the paper out of your braillewriter and place a Wikki Stix® to the right of the numbers to make the y-axis.
5. Place a Wikki Stix® above the letters A, B, C, and D to make x-axis.
6. Cut the textured strips to represent the bars.
7. Heights are provided for bars A, B, and C. Student selects height for bar D.

Image description: There are two images. In the first a male student holds up a bar graph he created. In the second a second bar graph created by a student is shown.

### Slide 37: Our Advice as You Work with Elementary Braille Readers

- If your focus for the lesson is on graphics literacy, provide the student assistance with reading and math.
- Teach students to be systematic.
- Provide students an opportunity to explore a tactile graphic before asking them to locate and interpret information.
- Teach students to verify information.
- Provide opportunities for students to create their own tactile graphics.
- Model how you search and use information in graphics.
- Use meaningful and motivating material.

Image description: Two images are shown. In the first a male student reads bar graph produced with a fuser. In the second a male student creates a line plot.