Bridging for Math Strength Resources

Standards of Learning Curriculum Framework

Standard of Learning (SOL) 4.14

The student will

a) collect, organize, and represent data in bar graphs and line graphs;

c) compare two different representations of the same data (e.g., a set of data displayed on a chart and a bar graph, a chart and a line graph, or a pictograph and a bar graph).

Student Strengths	Bridging Concepts	Standard of Learning
Students can collect, organize, and represent data in a pictograph and bar graph. Students can read and interpret data represented in pictographs and bar graphs.	Students understand the purpose of a graph in formulating questions, collecting and organizing data, and analyzing the data represented. Students are also familiar with the parts of the graph and are able to read a scale in increments of whole numbers.	Students can a) collect, organize, and represent data in bar graphs and line graphs; c) compare two different representations of the same data (e.g., a set of data displayed on a chart and a bar graph, a chart and a line graph, or a pictograph and a bar graph).

Understanding the Learning Trajectory

Big Ideas:

- Students see that graphs and charts tell about information and that different types of representations tell different things about the same data. (Van de Walle et al., 2018)
- Statistics involves a four-step process: formulating questions, collecting data, analyzing data, and interpreting results. (Teaching Student-Centered Mathematics)
- Bar graphs are useful for illustrating categories of data that have no numeric ordering. (Van de Walle et al., 2018)
- A line graph is used when there is a numeric value that is represented along a continuous number scale. (Van de Walle et al., 2018)

- Students should have the opportunity to compare different types of representations such as a chart and graph to learn how different graphs can show different aspects of the same data. (VDOE Curriculum Framework 4th Grade)

Formative Assessment:

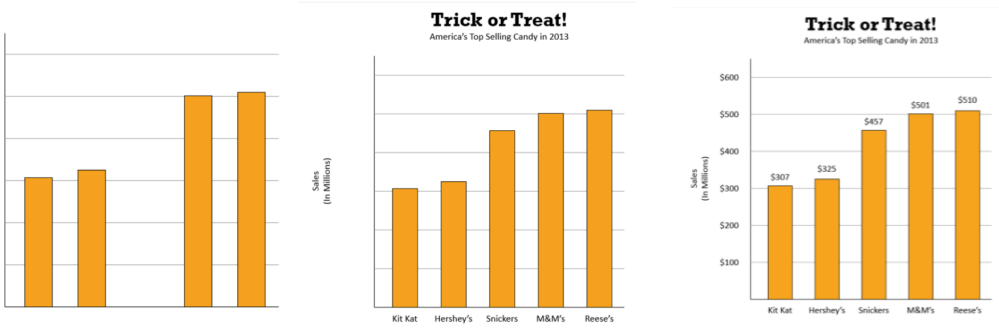
- VDOE Just in time Quick Check SOL 4.14a PDF / Desmos
- VDOE Just in time Quick Check SOL 4.14c PDF / Desmos

Important Assessment Look Fors:

- The student can formulate questions, gather data, and create a graph.
- The student can create a bar graph with an appropriate title, scale, and labeled axis to represent the data.
- The student can create a line graph with an appropriate title, scale, and labeled axis to represent the numerical data.
- The student is able to organize data into a chart or table and is able to determine the best graph to represent the data.
- The student understands the different purposes of using a chart or graph (bar, line, or pictograph) to represent the same data.

Purposeful Questions:

- What information can you gather from the data represented in the graph?
- What do you notice about the graph? What do you wonder about the information presented in the graph?
- How can you determine an appropriate scale to use when creating a bar or line graph?
- What would be an appropriate title for the graph?
- What different information can you gather when looking at the chart compared to a bar graph?
- When looking at the bar graph, what visual information can you gather?
- When looking at two different representations such as a chart and line graph, what different information can you gather from the same data?

Bridging Activity to Support Standard	Instructional Tips
Routine Slow Reveal Graph	In a Slow Reveal routine, you present a graph with no numbers and slowly reveal more information on the graph. Throughout the routine, students are encouraged to have a rich mathematical discussion about what they notice and wonder. The Halloween-themed numberless graph, is a great example of a slow reveal graph that can be used in the classroom. This blog includes more information about the Halloween themed slow reveal. The images below show an example of the graphs that are revealed slowly. 
Rich Tasks Graphing Task	Students use the clues below to determine the data to create a graph to represent the population of the towns. There are multiple answers for this particular task, so identifying strategies and specific parts of the graph to represent the data would be meaningful when

	connecting students' graphs. There are several options to use when creating the graph. Students can create a graph on grid paper or on-line. Create a graph is a great resource to use to create a graph on-line. **Graphing Task** Sam made the following conclusions after looking at a graph that compared the population of 4 towns. Sam's conclusions: 1. About twice as many people live in Stockton than in Grayville. 2. Bricktown has the greatest population. 3. About 2,000 more people live in Grayville than in Weston. Construct a graph that matches Sam's conclusions. Explain your thinking using pictures, words, and symbols.
Games: Interpreting Distance-Time Graphs	Students take turns at matching sets of cards that include a line graph, table with data, and an interpretation. There are several options when playing this game: students can take a graph and find a story that matches it or you could take a story and find a graph that matches it.

Other Resources:

- VDOE Mathematics Instructional Plans (MIPS)
  - 4.14abc - Analyzing Temperature Data (Word) / PDF Version
  - 4.14abc - Statistics: Sandwich Data (Word) / PDF Version
- VDOE Co-Teaching Mathematics Instruction Plans (MIPS)
  - 4.14a - Collecting Data for Bar Graphs and Line Graphs (Word) / (PDF)
- VDOE Word Wall Cards: Grade 4 (Word) | (PDF)
  - Bar Graph
  - Line Graph
- VDOE Algebra Readiness Remediation Plans
  - 4.14ab (Word) / PDF
- Graphing Stories
  - 15 second videos for students to collect data to create a graph

Learning Trajectory Resources:

Charles, R. (2005). Big ideas and understandings as the foundation for elementary and middle school mathematics. *Journal of Mathematics Education Leadership*, *7*(3), NCSM.

Clements, D. H., & Sarama, J. (2019). Learning and teaching with learning trajectories [LT]2. Marsico Institute, Morgridge College of Education, University of Denver. https://www.learningtrajectories.org/

Common Core Standards Writing Team. (2019). Progressions for the Common Core State Standards for Mathematics. Tucson, AZ: Institute for Mathematics and Education, University of Arizona.

Richardson, K. (2012). How Children Learn Number Concepts: A Guide to Critical Learning Phases. Bellingham: Math Perspectives Teacher Development Center.

Van De Walle, J., Karp, K. S., & Bay-Williams, J. M. (2018). *Elementary and Middle School Mathematics: Teaching Developmentally.* (10th edition) New York: Pearson (2019:9780134802084)

VDOE Curriculum Framework for All Grades - Standard of Learning Curriculum Framework (SOL)