

3.MD: MEASUREMENT & DATA

Cluster Statement: B: Represent and interpret data.

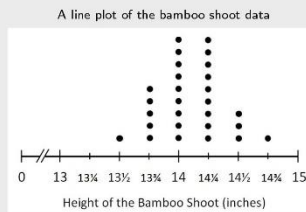
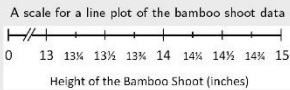
Supporting Cluster (Students should spend the large majority of their time (65-85%) on the major work of the grade/course. Supporting work and, where appropriate, additional work should be connected to and engage students in the major work of the grade.)

<p>Standard Text</p> <p>3.MD.B.3: Draw a scaled picture graph and a scaled bar graph to represent a data set with several categories. Solve one- and two-step "how many more" and "how many less" problems using information presented in scaled bar graphs. <i>For example, draw a bar graph in which each square in the bar graph might represent 5 pets.</i></p>	<p>Standard for Mathematical Practices</p> <p>SMP 1: Students can make sense of problems and persevere in solving them by solving one- and two-step problems by analyzing and deciphering information presented in the scaled graphs.</p> <p>SMP 4: Students can model with mathematics by using strategies to determine the appropriate scale to draw scaled graphs.</p> <p>SMP 6: Students can attend to precision by accurately reading the key or scale and using appropriate vocabulary to describe bar and picture graphs.</p>	<p>Students who demonstrate understanding can:</p> <ul style="list-style-type: none"> • Interpret data in a scaled picture and bar graphs (e.g., one box equals 4 students). • Collect data by asking a question that yields data in several categories • Draw a scaled picture graph and a scaled bar graph (with axes provided) to represent a data set with several categories. • Solve one and two-step "how many more" and "how many less" problems using information from these graphs.
		<p>Depth of Knowledge: 1, 2</p>
		<p>Bloom's Taxonomy: Understand, Apply and Analyze</p>
<p>Standard Text</p> <p>3.MD.B.4: Generate measurement data by measuring lengths using rulers marked with halves and fourths of an inch. Show the data by making a line plot, where the horizontal scale is marked off in appropriate units— whole numbers, halves, or quarters.</p>	<p>Standard for Mathematical Practices</p> <p>SMP 5: Students can use tools by using rulers to measure items and creating line plots to represent the data.</p> <p>SMP 6: Students can attend to precision by measuring with a ruler to the nearest quarter- or half-inch and using appropriate vocabulary to label and describe line plots.</p> <p>SMP 7: Students can look for and make use of structure by noting that on a line plot the largest</p>	<p>Students who demonstrate understanding can:</p> <ul style="list-style-type: none"> • Generate measurement data by measuring lengths using rules marked with whole inches and halves and fourths of an inch. • Create a line plot where the horizontal scale is marked off in appropriate units-whole numbers, halves, or quarters. • Analyze data from a line plot.

	<p>quantity of a particular length is found by the most X's, the longest length is found with the measurement of the X furthest to the right, and the total amount of measurements is equal to the number of X's.</p>	<p>Depth of Knowledge: 2</p>
		<p>Bloom's Taxonomy: Apply and analyze</p>
<p>Previous Learning Connections</p> <ul style="list-style-type: none"> Connect to practice measuring objects and inputting data on picture and bar graphs to represent data and well as answering questions relating and comparing the data represented on the graphs. (2.MD.1-4, 10) 	<p>Current Learning Connections</p> <ul style="list-style-type: none"> Connect to solving two-step word problems using the four operations and representing these problems using equations with a letter standing for the unknown quantity. (3.OA.8) Connect to understanding a fraction as a number on the number line and representing fractions on a number line diagram. (3.NF.2) 	<p>Future Learning Connections</p> <ul style="list-style-type: none"> Connect to making a line plot to display a data set of measurements in fractions of a unit ($\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{8}$) and solving problems involving addition and subtraction of fractions by using information presented in line plots. For example, from a line plot find and interpret the difference in length between the longest and shortest specimens in an insect collection. (4.MD.4) Connect to understanding a fraction $\frac{a}{b}$ with $a > 1$ as a sum of fractions $\frac{1}{b}$. (4.NF.3)
<p>Clarification Statement: 3.MD.B.3: In Grade 3, the most important development in data representation for categorical data is that students now draw picture graphs in which each picture represents more than one object, and they draw bar graphs in which the height of a given bar in tick marks must be multiplied by the scale factor in order to yield the number of objects in the given category. These developments connect with the emphasis on multiplication in this grade.</p> <p>3.MD.B.4:</p>		

Students' measurements of a statue and of a bamboo shoot

Statue measurements		Bamboo shoot measurements	
Student's initials	Student's measured value (inches)	Student's initials	Height value (inches)
W.B.	64	W.B.	13 3/4
D.W.	65	D.W.	14 1/2
H.D.	65	H.D.	14 1/4
G.W.	65	G.W.	14 3/4
V.Y.	67	V.Y.	14 1/4
T.T.	66	T.T.	14 1/2
D.F.	67	D.F.	14
B.H.	65	B.H.	13 1/2
H.H.	63	H.H.	14 1/4
V.H.	64	V.H.	14 1/4
I.O.	64	I.O.	14 1/4
W.N.	65	W.N.	14
B.P.	69	B.P.	14 1/2
V.A.	65	V.A.	13 3/4
H.L.	66	H.L.	14
O.M.	64	O.M.	13 3/4
L.E.	65	L.E.	14 1/4
M.J.	66	M.J.	13 3/4
T.D.	66	T.D.	14 1/4
K.P.	64	K.P.	14
H.N.	65	H.N.	14
W.M.	67	W.M.	14
C.Z.	64	C.Z.	13 3/4
J.I.	66	J.I.	14
M.S.	66	M.S.	14 1/4
T.C.	65	T.C.	14
G.V.	67	G.V.	14
O.F.	65	O.F.	14 1/4



In Grade 3, students are beginning to learn fraction concepts (3.NF). They understand **fraction equivalence** in simple cases, and they use visual fraction models to represent and order fractions. Grade 3 students also **measure lengths** using **rulers** marked with **halves** and **fourths** of an **inch**. They use their developing knowledge of **fractions** and **number lines** to extend their work from the previous grade by working with measurement data involving fractional measurement values.

Common Misconceptions

- Students many not count each square or tick mark on a scaled graph as one (rather than one unit)
- Students may confuse the axes on a graph

Multi-Layered System of Supports (MLSS)/Suggested Instructional Strategies

Pre-Teach

Pre-teach (targeted) *What pre-teaching will prepare students to productively struggle with the mathematics for this cluster within your HQIM?*

- For example, some learners may benefit from targeted pre-teaching that provides additional time for confusion to happen with new mathematical ideas when studying representing and interpreting data because this will allow students time to practice new concepts without fear and to experiment with ideas that they may not otherwise explore.

Pre-teach (intensive) *What critical understandings will prepare students to access the mathematics for this cluster?*

- 1.MD.C.4: This standard provides a foundation for work with representing and interpreting data because this standard introduces the idea of collecting data and representing as well as analyzing “one more” and “one less”, thus connecting to the comparative aspect of interpreting data in 3rd grade . If students have unfinished learning within this standard, based on assessment data, consider ways to provide intensive pre-teaching support prior to the start of the unit to ensure students are ready to access grade level instruction and assignments.

Core Instruction

Access

Effort and Persistence: *How will the learning for students provide options for sustaining effort and persistence?*

- For example, learners engaging with representing and interpreting data benefit when learning experiences attend to students’ attention and affect to support sustained effort and concentration such as providing feedback that emphasizes effort, improvement, and achieving a standard rather than on relative performance because students need to feel empowered to self-regulate by creating motivation to reach their goals through support and guidance. Students are encouraged to use information learned and then incorporate their learning into representations and interpretations of data.

Build

Language and Symbols: *How will the learning for students provide alternative representations to ensure accessibility, clarity and comprehensibility for all learners? (e.g., a graph illustrating the relationship between two variables may be informative to one learner and inaccessible or puzzling to another; picture or image may carry very different meanings for learners from differing cultural or familial backgrounds)*

- For example, learners engaging with representing and interpreting data benefit when learning experiences attend to the linguistic and nonlinguistic representations of mathematics to ensure clarity can comprehensibility for all learners such as pre-teaching vocabulary and symbols, especially in ways that promote connection to the learners’ experience and prior knowledge because students are able to benefit from learning experiences that create a safe environment to learn and understand that attends to students as individual learners.

Internalize

Comprehension: *How will the learning for students’ support transforming accessible information into usable knowledge, knowledge that is accessible for future learning and decision-making?*

- For example, learners engaging with representing and interpreting data benefit when learning experiences attend to students by intentionally building connections to prior understandings and experiences; relating important information to the learning goals; providing a process for meaning making of new learning; and, applying learning to new contexts such as incorporating explicit opportunities for review and practice because students make meaningful and relevant connections when supported through scaffolding and opportunities to practice.

Re-teach

Re-teach (targeted) *What formative assessment data (e.g., tasks, exit tickets, observations) will help identify content needing to be revisiting during a unit?*

- For example, students may benefit from re-engaging with content during a unit on representing and interpreting data by revisiting student thinking through a short mini-lesson because this will allow both the student and the teacher to investigate where the student's thinking went off track and perform some error analysis on the path the student took.

Re-teach (intensive) *What assessment data will help identify content needing to be revisited for intensive interventions?*

- For example, some students may benefit from intensive extra time during and after a unit representing and interpreting data by confronting student misconceptions because interpreting data can involve many student misconceptions as to how to go about interpreting the information; therefore confronting those misconceptions is vital in helping students to understand the process and purpose for interpretation.

Extension

What type of extension will offer additional challenges to 'broaden' your student's knowledge of the mathematics developed within your HQIM?

- For example, some learners may benefit from an extension such as in-depth, self-directed exploration of self-selected topics when studying representing and interpreting data because this would allow students to explore how they can apply this learning as individuals.

Culturally and Linguistically Responsive Instruction:

Validate/Affirm: How can you design your mathematics classroom to intentionally and purposefully legitimize the home culture and languages of students and reverse the negative stereotypes regarding the mathematical abilities of students of marginalized cultures and languages?

Build/Bridge: How can you create connections between the cultural and linguistic behaviors of your students' home culture and language the culture and language of school mathematics to support students in creating mathematical identities as capable mathematicians that can use mathematics within school and society?

Posing Purposeful Questions: CLRI requires intentional planning around the questions posed in a mathematics classroom. It is critical to consider "who is being positioned as competent, and whose ideas are featured and privileged" within the classroom through both the types of questioning and who is being questioned. Mathematics classrooms traditionally ask short answer questions and reward students that can respond quickly and correctly. When questioning seeks to understand students' thinking by taking their ideas seriously and asking the community to build upon one another's ideas a greater sense of belonging in mathematics is created for students from marginalized cultures and languages. For example, when studying representing and interpret data the pattern of questions within the classroom is critical because in data interpretation there is always various perspectives that play into what that data set reflects and asking deep questions allows students to explore those perspectives together as a class.

Standards Aligned Instructionally Embedded Formative Assessment Resources:

Source: <http://tasks.illustrativemathematics.org/content-standards/3/MD/B/3/tasks/1315>

Classroom Supplies Task

Addresses standard 3. MD.B.3. Draw a scaled picture graph and a scaled bar graph to represent a data set with several categories. Solve one- and two-step "how many more" and "how many less" problems using information presented in scaled bar graphs. For example, draw a bar graph in which each square in the bar graph might represent 5 pets.

The purpose of this task is for students to "Solve problems involving the four operations" (3.OA. A) and "Draw a scaled picture graph and a scaled bar graph to represent a data set with several categories" (3. MD.3).

Relevance to families and communities:

During a unit focused on representing and interpret data, consider options for learning from your families and communities the cultural and linguistic ways this mathematics exists outside of school to create stronger home to school connections for students, for example, discussing data that is relevant to the lives of students in the

Cross-Curricular Connections:

Science: In third grade the NGSS recommends students work with data related to weather conditions. Consider providing opportunities to make a picture graph or bar graph to display and analyze weather data.

Social Studies: In third grade one of ideas the New Mexico Social Studies Standards state focuses on is the rights of citizens. Consider providing opportunities to use

<p>class such as exploring data trends regarding human migration, population growth, and language usage.</p>	<p>and interpret data within this context, such as the growth of the civil rights movement in the 1950s-60s.</p>
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