NEW MEXICO
Public Education Department

1.MD: MEASUREMENT & DATA

Cluster Statement: A: Measure lengths indirectly and by iterating length units.

Major 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.)

Standard Text	**Standard for Mathematical Practices**	**Students who demonstrate understanding can:**
1.MD.A.1: Order three objects by length; compare the lengths of two objects indirectly by using a third object.	SMP 6: Students can attend to precision by using correct and appropriate vocabulary when comparing two or three objects, referencing words such as "shorter," "longer," "shortest," and "longest." SMP 7: Students can look for and make use of structure by ordering the same three objects in two different orders (longest to shortest or shortest to longest).	• Identify which of two objects is longer or shorter. • Order three objects by length (longest to shortest or shortest to longest). • Decide how the lengths of two objects relate to one another by comparing them both to a third object (e.g. the crayon is shorter than the pencil because it is shorter than the marker and the marker is shorter than the pencil). **Depth of Knowledge:** 2-3 **Bloom's Taxonomy:** Analyze and Evaluate
Standard Text	**Standard for Mathematical Practices**	**Students who demonstrate understanding can:**
1.MD.A.2: Express the length of an object as a whole number of length units, by laying multiple copies of a shorter object (the length unit) end to end; understand that the length measurement of an object is the number of same-size length units that span it with no gaps or overlaps. *Limit to contexts where the object being measured is spanned by a whole number of length units with no gaps or overlaps.*	SMP 5: Students can use tools strategically by using non-standard tools to measure and estimate length. SMP 6: Students can attend to precision by measuring accurately (no gaps or overlaps and with the correct number of length units lined up from end-to-end) using non-standard tools.	• Illustrate how to use multiples copes of a shorter objects to find the length of a longer object. • Connect the length of the longer object to the total number of shorter objects used and express the length of the longer object as the whole number of shorter objects used. • Describe why gaps and overlaps are not allowed when measuring the length of an object.

		Depth of Knowledge: 1-2 **Bloom's Taxonomy:** Knowledge, Understand and Apply
Previous Learning Connections • Connect to describing measurable attributes of objects, such as length (**K.MD.1)** • Connect to directly comparing two objects with a measurable attribute in common, to see which object has "more of"/"less of" the attribute and describing the difference. For example, directly comparing the heights of two children and describing one child as taller/shorter. **(K.MD.2)**	**Current Learning Connections** • Connect to non-standard objects and more standard measurement tools to help students state length units in whole numbers and make direct and indirect comparisons of objects.	**Future Learning Connections** • Connect to making decisions about the tool's students use to measure the length of an object by selecting and using tools such as a yardstick, meter stick, rulers, tape measures, etc. **(2. MD.1)** • Connect to measuring to determine how much longer one object is than another and expressing the length difference in terms of a standard-length unit **(2. MD.4)**

Clarification Statement:

- 1.MD.A.1: This standard focuses on the property of **transitivity**: If A is longer than B and B is longer than C, then A must be longer than C as well. Students will revisit this idea in future grades. Students should apply the principle of transitivity of measurement to make indirect comparisons of the length of objects, but they need not use this technical term.
- 1.MD.A.2: Measuring length or distance consists of two aspects, choosing a **unit** of measure and subdividing (mentally and physically) the object by that unit, placing that unit end to end (**iterating**) alongside the object. The **length** of the object is the number of units required to iterate from one end of the object to the other, without gaps or overlaps.

Common Misconceptions

● Students may not accurately line up the objects being compared.

● Students may believe they need to sort a second time to move from shortest to longest or longest to shortest rather than realizing the inverse relationships will hold.

● Students may not accurately line up the multiple copies of the shorter object being used to measure the larger object.

● Students may not realize that the shorter object needs to be iterated and use multiple types or sizes of shorter objects.

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 rehearses prior learning when studying measure lengths indirectly and by iterating length units. because in kindergarten children are exposed to comparing objects based on

attributes, referring to this will help students understand measurement by noticing how long or short something is.

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

- K.MD.A.1: This standard provides a foundation for work with measure lengths indirectly and by iterating length units because students often initially hold undifferentiated views of measurable attributes, saying that one object is "bigger" than another whether it is longer, or greater in area, or greater in volume, and so forth. For example, two students might both claim their block building is "the biggest." Conversations about how they are comparing—one building may be taller (greater in length) and another may have a larger base (greater in the area)—help students learn to discriminate and name these measurable attributes. As they discuss these situations and compare objects using different attributes, they learn to distinguish, label, and Describe several measurable attributes of a single object. 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

Interest: *How will the learning for students provide multiple options for recruiting student interest?*

- For example, learners engaging with measure lengths indirectly and by iterating length units. This benefits when learning experiences include ways to recruit interest such as providing novel and relevant problems to make sense of complex ideas in creative ways because students should measure something that interests them (namely themselves) by laying multiple copies of a shorter object that represents the length unit end to end. This task provides students an opportunity to discuss the need to be careful when measuring as it is very likely that some of them will get incorrect comparisons of their leg length with their partner's leg length. With some body parts, it's not clear where to begin and end the measurements. This is a good opportunity to help the students think more precisely about how to define the "beginning and endings" more precisely.

Build

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

- For example, learners engaging with measure lengths indirectly and by iterating length benefit when learning experiences attend to students attention and affect to support sustained effort and concentration such as providing feedback that encourages perseverance, focuses on development of efficacy and self-awareness, and encourages the use of specific supports and strategies in the face of challenge because the use of a variety of different length units, before students understand the concepts, procedures, and usefulness of measurement, may actually deter students' development. Instead, students might learn to measure correctly with standard units, and even learn to use rulers, before they can successfully use nonstandard units and understand relationships between different units of measurement.

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 measure lengths indirectly and by iterating length 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 it is important for students to know specific measurement terms in order to measure accurately.

Expression and Communication: *How will the learning provide multiple modalities for students to easily express knowledge, ideas, and concepts in the learning environment?*

- For example, learners engaging with measure lengths indirectly and by iterating length benefit when learning experiences attend to the multiple ways students can express knowledge, ideas, and concepts such as providing scaffolds that can be gradually released with increasing independence and skills (e.g., embedded into digital programs) because as students are learning to measure, they may need guidance and support to make sure they are measuring accurately.

Internalize

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

- For example, learners engaging with measure lengths indirectly and by iterating length 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 making explicit cross-curricular connections (e.g., teaching literacy strategies in the social studies classroom) because measurement directly correlates with science and students can use measuring in science during different experiments.

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 measure lengths indirectly and by iterating length units by examining tasks from a different perspective through a short mini-lesson because sometimes students may need to be taught in a different way. To realize that arbitrary (and especially mixed size) units result in the same length being described by different numbers, a student must reconcile the varying lengths and numbers of arbitrary units.

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 measure lengths indirectly and by iterating length units by confronting student misconceptions because children should engage in experiences that allow them to connect number to length, using manipulative units that have a standard unit of length, such as centimeter cubes. These can be labeled "length-units" with the students. Students learn to lay such physical units end-to-end and count them to measure a length. They compare the results of measuring to direct and indirect comparisons.

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 the opportunity to explore links between various topics when studying measure lengths indirectly and by iterating length unit because measurement can be used across multiple areas and allowing students to connect this way will help them deepen their understanding.

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?

Task: When planning with your HQIM consider how to modify tasks to represent the prior experiences, culture, language and interests of your students to "portray mathematics as useful and important in students' lives and promote students' lived experiences as important in mathematics class." Tasks can also be designed to "promote social justice [to] engage students in using mathematics to understand and eradicate social inequities (Gutstein 2006)." For example, when studying measure lengths indirectly and by iterating length units the types of mathematical tasks are critical because it will allow students to measure using different tools that may be associated with their culture. They could also measure various objects that are important to their culture. For example, having students bring in an item that may be pertinent in their family such as native jewelry or sombrero etc.

Standards Aligned Instructionally Embedded Formative Assessment Resources:
Source: https://tasks.illustrativemathematics.org/content-standards/1/MD/A/2/tasks/1086
Growing Bean Plants
Provided by Illustrative Mathematics
Materials

- 2 clear plastic cups for each pair of students
- 4 bean seeds for each pair
- soil
- Uni fix cubes
- a plant or math journal to record data in

Actions
Students in pairs grow bean plants from seed. Students should label the first cup with an A and the second cup with a B and write their names on the cups. Then they fill their plastic cups 2/3 full of soil and place two bean seeds in each cup about one inch below the surface of the soil. Water the seeds and place the cups on a window ledge where they will receive sun light. The teacher should grow several cups to be "class plants" and as backups.
The beans will sprout within 7-10 days. When the bean seeds start to grow, choose two plants to be the class plants. Every few days, the class should water the plants. As a whole group, they measure the height of the class plants with unifix cubes. The first few times the teacher can do it, then the students can take turns measuring and recording the height in a table.

Date	Plant A	Plant B
March 1	2	1
March 4	4	3
March 8	8	5
March 11	11	7

The measurements should be recorded to the closest whole number.
Once students have done the measuring and recording as a whole group, the pairs of students can measure their own bean plants. They should measure the tallest plant in each cup if more than one bean sprouts.
Students record each measurement in a table with the date in a math journal (or a plant journal for this project only if the class does not keep math journals).
After the students have measured their plants, they answer these two questions:
Which plant is tallest today?
How much taller is it?
On the last day of the activity, the students can compare the tallest plant in the room with the shortest plant.
This type of assessment question adds some rigor to the activity, by collecting actual growth data, providing practice for students in measuring and recording length measurements. In addition to measuring and recording plant height, students can also count and record how many leaves their plant has on each date.

Relevance to families and communities:
During a unit focused on measure lengths indirectly and by iterating length unit, 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, order family members as tallest to shortest of shortest to tallest, give your student many opportunities to measure objects using other, smaller objects, e.g., "How many Lego pieces long is your book? How many blueberries long is this notebook?"

Cross-Curricular Connections:

Science: In first grade the NGSS recommend studying light, transparency, and shadows. Consider providing a connection for students to order the lengths of the shadows of various items.

Social Studies: A map and strings is often used to track Flat Stanley's travels (*Flat Stanley* by Jeff Brown). Consider providing a connection for students to measure and/or compare the lengths of the strings.