Unit 5 Week 2	***Small Groups: Shadow Measuring*** **High Support**	**Math** **SG1**	**Standards:** MELDS.M.MP.PS.5 MELDS.M.CCC.PS.5 MELDS.M.MD.PS.9 MELDS.M.MD.PS.10 MELDS.M.MD.PS.11

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Guiding Math Ideas:

- Integrated projects- Science/Technology/Engineering Math [STEM]- Measuring
- Problem Solving- Finding meaning and testing theories

Math Concepts from Unit Learning Progressions:

- How many means the last number counted and represents the amount in the entire group.
- Growing use of accurate measurement terms
- Using tools to measure and compare shadows.
- Experimenting with non-standard measurement and standard measurement-Direct and Indirect Comparison.
- Exploring length and height: Continuous and discrete measurement

Materials:

- *Whose Shadow is This? OR Guess Whose Shadow*
- Light Source- Small Lamp without shade is preferred- or use large Flashlight
- Whiteboard, White Wall or White paper/sheet attached to wall
- Markers
- Small classroom items
- Unifix cubes
- Data collection paper- Large paper for recording findings.

Math Vocabulary:

- Shadow- the special shape we see when something blocks the light shining on a person or thing. It is dark.
- Compare or Comparison- A way to find out how things are alike or different
- Length- how long something is from end to end.
- Height- How tall something is from top to bottom
- Width- how wide something is from side to side

Preparation:

This activity is a follow-up to Week 2 Large Group *Whose Shadow is This*?

Use the shadow-casting area as described in Large Group, making adjustments for Small Group as needed. Use large white paper or a whiteboard rather than projecting shadows directly on a wall (You will be marking on the shadow-casting area.)

Create a data collection method such as a large paper, a notebook on table, etc. Write *Shadow Measuring* at the top. See sample at end of lesson plan.

Gather an assortment of small classroom items and place in basket on table along with other supplies for easy access.

Procedure:

Introduce the activity and show the book, *Whose Shadow is This*? as a resource.
When we did Large Group, we wondered how we might measure shadows. Today we are going to experiment with measuring shadows. Shadows are different for each object. Shadows could be large or small. Let's see how we might measure them.
I have a block in this basket. I wonder how big its shadow is.
First let's measure the things we have using our Unifix cubes.
Place some objects on the table with basket of Unifix cubes. Children will choose objects and create Unifix models the same length or width as the object.
Example: *This spoon from the Home center is 8 cubes long.*
Demonstrate how to place objects in front of the light source and project the shadow.
How could we measure its shadow?
Child places object in front of light source and compares their Unifix creation to the shadow. Make marks on the wall paper indicating top and bottom (or side to side) to assist with creating Unifix cube chains if needed.
Note differences. Create another Unifix cube group of the shadow object.
Then compare them side by side and note the differences.
Invite children to take turns choosing objects, and measuring them. Encourage them to measure objects for width as well as height and length, using accurate terms. Record the data as you continue the activity, allowing children to experiment with a variety of objects as well as the relationship of the object to the light source
At the end of the activity, read the data together:
The spoon was 8 cubes long when we measured it on the table, but the shadow was 10 cubes long.
OR
When the spoon was close to the light, the shadow was 10 cubes long. When it was farther away, it was 9 cubes.

Strategies to Provoke Math Thinking:

- Measurement is both easy and complex-- easy because we do it every day, and complex because it requires multiple skills and understanding of quantity to do it accurately. While it may seem straightforward and clear to measure things using tools, the many concepts included in measuring require lots of experimentation. Here are 2 of the complex ideas about measurement introduced in this activity.
    - Non-standard measurement: The Unit. This activity introduces the important concept of the Unit in measurement. In this case, even though Unifix cubes are all the same size, they are still a **Non-standard measurement,** (They do not have a number system attached to them, and thus are not considered standard measuring tools, such as rulers or measuring tapes, or scales.). Understanding a unit and what kinds of units can be used in

non-standard measurement will require lots of experimentation.

- Direct and Indirect Comparison: This activity includes the idea of direct and indirect comparison. When 2 objects are side by side and are compared, that is direct comparison. When a representation of the object (such as the Unifix cubes) are compared, that is indirect comparison. Indirect comparison is often needed when we cannot directly compare something. For example, we cannot move our shadow beside us and compare it directly to our bodies, or physically move two buildings side by side and compare them for height. We can *indirectly* compare them by using measuring tools.

Adaptations for Additional Challenge:

- Continuous and Discrete Measurement: When we use a measuring tape or string to measure, we are using continuous measurement. When we use a Unit over and over, such as a small ruler that we place end to end, we are using discrete measurement. Encourage children who have special interest in measuring to use both types of measuring tools by placing a basket of different sizes and types of measuring tapes, as well as different sizes of rulers on the shelves in your math or manipulative center, along with a journal.
- Create Measuring Challenges, such as measuring all the trucks in the Block Center, or finding out which book in the Reading Center is tallest. Observe children's growing skills and provide support and information on such things as: how to accurately measure; what attribute children are measuring (height, width); and different ways to measure the same thing.

Documentation:

Use data collection from Small Group Activities and/or personal journals that children create to document their growing skills in understanding measurement. Use concrete examples to share with families, as measuring things and using measurement terms happens in everyday life and can be reinforced at home.

Provocation:

Take Shadow Measuring problems outdoors by taking a basket of measuring tools to the playground
and recording children's findings on paper or in a journal as they measure the shadows of playground
equipment or natural objects. Share their findings during SWPL, lunch, or other transition times.

Sample Data Collection Chart

Object	Unifix Cube Measurement	Shadow Cube Measurement (Near)	Shadow Cube Measurement (Far)
Block	**6**	**10**	**8**
Crayon	**4**	**6**	**2**
Hot Wheel Car	**2**	**3**	**1**