**Mathematicians Ask Questions**

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| **This is lesson four in a series of six lessons focused around developing a mathematical community at the beginning of the school year.  While this lesson addresses standards NC.K.MD.1 and NC.K.MD.2, its primary goal is for students to recognize that mathematicians ask questions to gather information.** |

**NC Mathematics Standard(s):**

**Describe and Compare Measurable Attributes.**

**NC.K.MD.1** Describe measurable attributes of objects; and describe several different measurable attributes of a single object.

**NC.K.MD.2** Directly compare two objects with a measurable attribute in common, to see which object has “more of/less of” the attribute [without counting], and describe the difference.

**Standards for Mathematical Practice:**

1. Make sense of problems and persevere in solving them.

3. Construct viable arguments and critique the reasoning of others.

**Student Outcomes:**

* I can identify, describe and compare measurable facts about two objects.
* I can ask questions to gather information to solve problems.

**Math Language**

* taller/shorter, shorter/longer
* comparing
* mathematician
* question

**Materials:**

* collections of classroom object to describe

**Directions**

1. Review vocabulary: taller/longer and shorter.
   * Introduce ***taller,* *longer***, and ***shorter***. Have class use gestures to act out words.
     + Move hand from floor to head to show tall, and floor to knee to show short.
     + Move hand from one side of the carpet to the other side to show long. Move hand from one end of a floor tile to the other end of the tile to show short.

Note: ***Tall*** is a vertical measurement, while ***long*** is a horizontal measure of length.

* + Ask two students to go to the front of the room. Decide who is taller/shorter. Then, look at their feet. Discuss who has the longer/shorter feet. Repeat several times.
  + Play a brief game of “I Spy Measurement”. Pick a secret shape, and give a clue using a size word: ***taller****,* ***longer***, or ***shorter***. For example:
* *I spy something that is* ***taller*** *than the teacher.* (e.g., a smartboard or door)
* *I spy something that is* ***shorter*** *than my hand.* (e.g., a block or sticky note)
* *I spy something that is* ***longer*** *than a pencil.* (e.g., pencil box or desk)
  + As the class plays “I Spy Measurement”, encourage students to ask questions to determine the object. For example, a student may ask: *Is it the door?*

1. Relate today’s activity to the idea that mathematicians ask questions to collect information.
   * Say: *In order to name the secret objects in our “I Spy Measurement” activity, you had to ask questions.*  *By asking questions, you were being mathematicians. Mathematicians ask questions to gather information and decide if they have enough information to solve problems.  They also listen carefully for the answers.*
2. Provide directions for partner activity.
   * Say: *Mathematicians, now you and your partner will play “I Spy Measurement”. This time, Partner A will find a secret object in the room and give Partner B a clue using a size word:* ***taller****,* ***longer****, or* ***shorter****. Partner B, will ask questions to help you name the secret object.*
   * Model playing “I Spy Measurement” with a partner. Be sure to give an initial clue using a size word: ***taller***, ***longer***, or ***shorter***.
3. Allow 5 minutes for students to complete partner activity.
   * As students work, observe any areas of difficulty.
   * Partners should pick a different object if it is not guessed after several attempts.
4. Have class discussion about partner activity.
   * Have several students share questions they asked their partners. Discuss how these questions helped them name the secret object.
   * Summarize today’s lesson. Say: *Today we learned that mathematicians ask questions. Each time you asked a question, you learned more information. By asking many questions, you were able to name your partner’s mystery object. Mathematicians ask questions and listen carefully for the answers.*

**Additional Activities (optional)**

* Find opportunities throughout the school day to compare sizes of items in the school.
* Draw attention to an image or scene in the school. Ask students to share the first questions that comes to their minds. For example: When shown a bucket of attribute blocks, a student might ask about the amount of yellow blocks in the bucket.

**Evaluation of Student Understanding**

Informal Evaluation:

* Student correctly ***taller****,* ***longer***, and ***shorter*** when playing “*I Spy Measurement”*.
* Student correctly generates questions and listens to partner.

**Meeting the Needs of the Range of Learners**

**Intervention:**

* As this was an introductory lesson on comparing sizes of objects, it is not expected that students are proficient naming size words or correctly solving the mystery.
* Asking questions and listening carefully for answers was a primary goal for this lesson. Continue to provide opportunities for students to work together, ask questions, and listen to each other.

**Extension:**

* Find opportunities for students to provide the clues for “I Spy Measurement”. Encourage them to play in different parts of the school and on the playground.
* Introduce students to extend the central concept by asking questions, listening for answers andusing measurement words in everyday life.

**Possible Misconceptions/Suggestions:**

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| **Possible Misconceptions/Errors** | **Suggestions** |
| Student may confuse *shorter, longer* and *taller* due to difficulty in determining inferred directionality. | Have students practice hand signals for taller (up  and down), longer and shorter (hands spread side-to-side). Note that longer and shorter can be  interchangeable without changing meaning. |

**Special Notes:**

* The words ***long*** and ***tall*** are introduced in this lesson. ***Tall*** is used to describe an object’s vertical measure, the distance between the floor and the top of the object. ***Long*** is used to describe a horizontal measure, the distance from one side to the other.
* The primary goal of this lesson is to have students engage in asking and answering to build a mathematical community. The content standards (NC.K.MD.1 and NC.K.MD.2) should be revisited in a more formal manner later in the year. By the end of the year, students should be able to use many size words to describe measurement and compare items without actually measuring.