CONSTRUCTING TASK: What the Heck is Rekenrek?

The Rekenrek can be used throughout the year and incorporated in a variety of tasks to enforce concrete representation of numbers and strategies. Adapted from
www.k-5mathteachingresources.comhttp://www.k-5mathteachingresources.com

STANDARDS FOR MATHEMATICAL CONTENT

MGSEK.CC.1. Count to 100 by ones and by tens.

MGSEK.CC.2. Count forward beginning from a given number within the known sequence (instead of having to begin at 1).

MGSEK.CC.3. Write numbers from 0 to 20. Represent a number of objects with a written numeral 0-20 (with 0 representing a count of no objects).

MGSEK.CC.4 Understand the relationship between numbers and quantities; connect counting to cardinality.

   a. When counting objects, say the number names in the standard order, pairing each object with one and only one number name and each number name with one and only one object. **(one-to-one correspondence)**
   b. Understand that the last number name said tells the number of objects counted **(cardinality)**. The number of objects is the same regardless of their arrangement or the order in which they were counted.
   c. Understand that each successive number name refers to a quantity that is one larger.

MGSEK.MD.3. Classify objects into given categories; count the numbers of objects in each category and sort the categories by count.

STANDARDS FOR MATHEMATICAL PRACTICE

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

BACKGROUND KNOWLEDGE

The Rekenrek is a math tool created by Adrian Treffers at the Freudenthal Institute in Holland. Translated to English, Rekenrek means "counting rack". The Rekenrek is composed of 20 beads in two rows of ten with five red and five white on each rod. Although the Rekenrek may look similar to an abacus, it differs because its structure is based around fives as opposed to tens. The five-structure represents the five fingers on each of our hands and five toes on each of our feet. Tournaki et al (2008) concluded that the structure of five utilized by the Rekenrek was extremely helpful in the advancement of students' number sense. In addition to increasing number sense, Tournaki et al (2008) recognized that the Rekenrek acted as a facilitator of knowledge as students develop efficient thinking strategies. Gravemeijer (1991) stated that materials themselves cannot transmit knowledge to the learner; however it can make numbers and relationships accessible to students to later obtain fact mastery and fluency. More information on the Rekenrek can be found at http://www.mathlearningcenter.org/media/Rekenrek_0308.pdf.

Gravemeijer, K. (1991).*An Instruction-Theoretical Reflection On The Use Of Manipulatives.* Tournaki, N., Bae, Y., &Kerekes, J. (2008).*Rekenrek: A manipulative used to teach addition and subtraction to students with learning disabilities.*

For more information about common misconceptions, please refer to the unit overview.

ESSENTIAL QUESTIONS

- How can we show numbers in different ways?

MATERIALS

- Cardboard
- 2 Pipe Cleaners or beading elastics
- 20 Beads (10 red/10 white)
- Rekenrek Recording Sheet (optional)

GROUPING

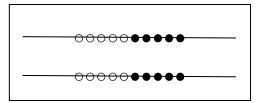The Rekenrek can be used whole group, small group, partner task, and/or individually.

TASK DESCRIPTION, DEVELOPMENT, AND DISCUSSION

Making the Rekenrek:

- Poke two small holes at each end of the cardboard, about 1in. in from the side.
- Cut two 5in. lengths of elastic or use pipe cleaners. Place one end of each piece of elastic into the holes at one end of the board and tie in a knot at the back or poke a pipe cleaner through the hole and bend it.
- Place five white beads and five red beads on each length of elastic or pipe cleaner.
- Once all the beads are on, thread the elastic through the holes on the other end and tie securely so that the elastic is pulled tight, or put the other end of the pipe cleaner through and bend.

Tasks:

- **Make It:** teacher says or shows a number as students model the number using their Rekenrek. It is important for students to share the different ways they modeled the number. (SMP 2, 3, 4, 5, 6, 7, 8)

- **Flash It:** teacher flashes a teacher made Rekenrek with a particular number and students model what they saw. To extend student thinking, reduce the amount of time the teacher Rekenrek is shown to students. The students could also have to model the number a different way from the way that is flashed on the teacher Rekenrek. (SMP 1, 2, 3, 4, 5, 6, 7, 8)

Comment:

Rekenrek Norm Setting: When looking at the Rekenrek, the beads should be pushed over to the 'Start Position' (the right hand side), with the white beads farthest right and the red beads next to them on the left. Note that the start position has the beads on the right so that when a student pushes the beads over they can 'read' the quantity on the Rekenrek from left to right.

Students can record their thinking and modeling of the Rekenrek on the recording sheet. Once students are familiar and comfortable drawing a pictorial representation with the recording sheet, have them record/represent directly in their math journals.

Many of the activities with dot cards, Rekenreks and ten frames are interchangeable. The use of multiple manipulatives to show number and quantity further reinforces a student's understanding of number which in turn increases number sense.

TEACHER REFLECTION QUESTIONS

- Are students able to model a given number on the Rekenrek?
- Are students able to model a given number in more than one way on the Rekenrek?
- Are students able to draw a pictorial representation on the recording sheet?
- Are students able to identify which benchmark/anchor of 5/10 their number is closest to?

FORMATIVE ASSESSMENT QUESTIONS

- What number have you modeled?
- What did you see? How do you know?
- How many fives/tens do you see?
- How many more do you need to make ten?
- Which benchmark/anchor of 5/10 is your number closest to?
- Can you build the number a different way?

DIFFERENTIATION

Extension/Invention
- Differentiating with the Rekenrek can be achieved through a variety of techniques which are controlled by the teacher:
    - The amount of time the Rekenrek is shown or flashed to students.
    - Increasing or decreasing the quantity made on the Rekenrek can help with differentiating.

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TECHNOLOGY

Number Rack (Rekenrek): http://www.mathlearningcenter.org/web-apps/number-rack/
Students use the number rack to develop an understanding of number and quantity.

Five Frames: http://illuminations.nctm.org/ActivityDetail.aspx?ID=74
Students manipulate objects to fill and answer the question "how many" in a five frame.

Ten Frames: http://illuminations.nctm.org/ActivityDetail.aspx?ID=75
Students manipulate objects to fill and answer the question "how many" in a ten frame.

My Rekenrek Recording Sheet   Name:_____

My number sentence:_____

My number sentence:_____

My number sentence:_____