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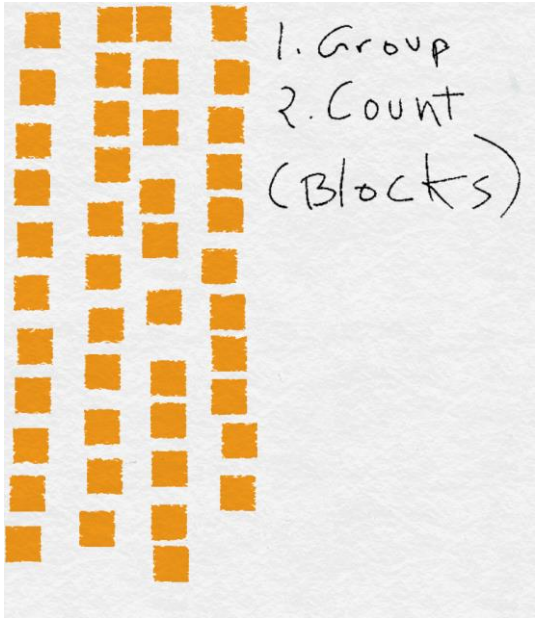
Date: 3/21/2021

Video Analysis		
Mathematical Task (Note the task and key mathematical ideas)	Representations/Methods	Analysis and Connection of Representation
Mathematical task Solve the following problem: *You bought 4 seed packets from the store. Each seed packet has 11 seeds in it. How many seeds did you buy in all?* Work in groups or alone. Use any tools in the room that you need. **Notes:** students were actually shown seed packets previously (which is important for pre-operational stage students), and were told to think about what "strategy" they would use to solve the problem. The teacher also played the role of a facilitator, making important decisions about when and when not to help specific students. **Mathematical Ideas** At its core, this problem requires students **to represent** and combine groups of numbers using **concrete, semi-concrete, or abstract representations**. So, it has a problem solving and representational	**Representation I**  	In this representation, the student first created four groups of eleven blocks to model the problem, then counted the blocks altogether in a sequence. This representation is similar to the second one in that it involves creating three groups and counting on past each group to get to the total. However, unlike the second type of representation, it does not keep track of a running total for each group, and relies on concrete objects. To start using repeated addition for multiplication, students using this strategy might first need to move to semi-concrete representations, and learn how to keep track of a running total (using their fingers or by writing down numbers).

Goldsmith, L. T. and Seago, N. M. (2013). *Examining mathematics practice through classroom artifacts*. 88-96, Boston. MA: Pearson.

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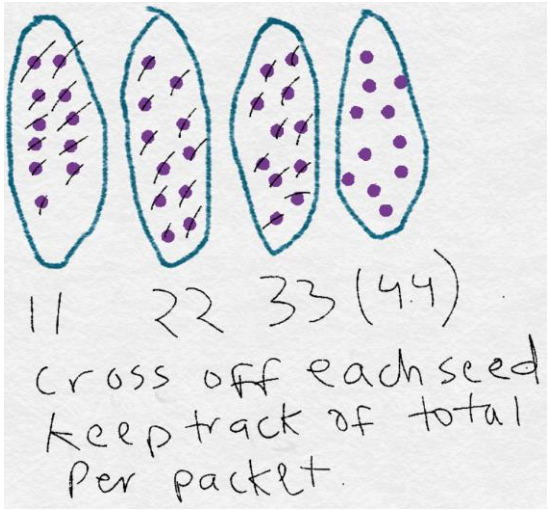
element to it. The teacher's approach also brings out a communicative aspect to the challenge. Mathematically, the problem is the simplest type of multiplication problem – an equal groups problem – which easily lends itself to solutions that involve repeated addition. **Repeated addition** is one of the earliest strategies that children use to multiply, so it makes sense to introduce a problem like this to students who have not yet learned how to multiply. To solve this problem, students must be rational counters who have mastered the ability to count up to 44, and understand the idea that "altogether" requires counting objects in separate groups together. However, their solving strategies can also reveal the level of abstraction that they can use when dealing with groups, and their understanding of the idea that a number "grows by a certain amount" each time you add a group (repeated addition). Student approaches can also reveal the development of strategies that are used for **addition**, like counting on, doubling, and regrouping.	**Representation II**  |||	In this representation, the student first drew 11 seeds each in 4 packets. She then crossed off each seed that she counted, and wrote the total that she had counted so far after each packet. She knew that the bottom number showed the total for all the packets at that point, not the packet that she had just finished counting. This representation is a tiny step away from repeated addition – in fact, almost all the conceptual pieces are there (all the teacher might have to do is show that the difference between each total number is 11). The representation also seems very accessible for students who have used concrete representations for either the groups or the counter. It could be used as a bridge to develop their understanding before introducing repeated addition as a multiplication strategy. One strategy that no students used in this problem was to regroup the seeds into 4 tens and 4 ones – this might be due to the nature of the problem, or it might be due to a lack of understanding of the commutative rule for addition. Something to consider before moving on to multiplication.

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