Order of Operations: Lesson Using Manipulatives and a Document Camera

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*Standard:* Operations and Algebra Thinking 5.0A Students will write and interpret numerical expressions. They will use parentheses, brackets, or braces in numerical expressions and evaluate these expressions with these symbols. [[1]](#endnote-1)[[2]](#endnote-2)

*Objective:* Students will understand that mathematical expressions must be solved in a specific order: Parentheses, exponents, multiplication and division, addition and subtraction.

Materials: Document camera, timer for pair share, LCD projector to project the timer and the document camera image, enough counters or chips to provide sets of 30 for partners to work out the problem,

* Hook: a short 2 minute video of a woman demonstrating how to make bread, step by step in specific order.
* Connections: What prior knowledge do students have about order of operations? When did they last learn about the order of operations?
	+ Pair share partner A 20 seconds, and switch to partner B 20 seconds to describe what they know and where they learned it.
	+ The pair will take turns filling in a circle map, adding what they know ( in the circle area) and where they know it from (in the bracket area).
* Word problem: [[3]](#endnote-3) Emily had 30 cookies to bring to school for her birthday. Three students wanted two cookies each. Then, a new student came to the school that day and he wanted three cookies. Then, one of the three kids gave their two cookies back. Emily was still passing out cookies. How many cookies did Emily have left to pass out after the student gave her his back?
* Hands on activity: Students work with a partner. The partners are given 30 round counters, bingo chips, or similar object. The partners will role play the kids in the problem, and write down their method and findings.
* Students write each step on a separate post it, and place the post-its in order.
* Partners come to the document camera and demonstrate how they solve the problem by manipulating the counters, explaining their process and solution.
* Reflection: Students complete an exit ticket, answer: Why was order important in solving this problem?
* Differentiation and variations:
	+ More advanced students can make up their own word problem and show the steps necessary to solve it.
	+ Lower level of math skills students will be provided with 5 paper dolls to manipulate while solving the problem.
	+ Use Cheerios instead of counters.
	+ Film the students solving the problem and create a video for students to learn from peer modeling.
	+ Film the teacher demonstrating a similar problem for the students to watch before solving this one in class.
	+ For practice in solving order of operations with integers, provide students with worksheets. [[4]](#endnote-4)
1. Common Core State Standards for Mathematics [↑](#endnote-ref-1)
2. GRADE 5UNIT 1: Order of Operations and Whole Numbers Georgia Department of Education Dr. John D. Barge, State School Superintendent May 2012 [↑](#endnote-ref-2)
3. "Pemdas Word Problem." *Pemdas Word Problem*. N.p., n.d. Web. 12 Nov. 2012.

<http://www.tulyn.com/wordproblems/pemdas-word\_problem-1156.html> [↑](#endnote-ref-3)
4. "Evaluating Expressions: Order of Operations." *Evaluating Expressions: Order of Operations*. N.p., n.d. Web. 12 Nov. 2012. <http://www.helpingwithmath.com/printables/worksheets/equations\_expressions/5oa1expressions02.htm> [↑](#endnote-ref-4)