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Using Number Talks to Foster Mathematical Creativity

As number talks become a more common practice in classrooms, I encourage teachers to seize on the opportunities that engaging students in what number talks offer in terms of nurturing students' mathematical creativity.

What is a Number Talk?

A number talk refers to a routine during which teachers present a mathematical expression or representation for students to consider, evaluate, and discuss solution strategies. Therefore, intentionally designed number talks can engage students in developing number sense and computational fluency through mental math and strategy discussion (Humphreys & Parker, 2015; Parrish, 2014). Number talks can range from counting tasks with dot cards or ten frames to operations with whole numbers, fractions, or decimals, thereby making them applicable to a wide range of grade levels.

While every teacher will establish a Number talk routine that works for them and their students, commonly the steps involved in a number talk are for the teacher to:

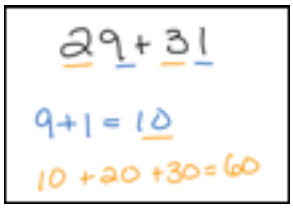
- Gather students in a class meeting/discussion space and present a mathematical expression or representation for students to evaluate.
- Provide think time for students to consider the representation/expression and determine a numerical solution.
- Solicit, accept, and record all student solutions (both correct and incorrect without commenting on the solutions).
- Ask students to justify and discuss the process and/or strategies they used to determine the solution while the teacher records students' thinking for all students to see.
- Lead the students to come to consensus as to the correct solution/answer based on the strategy explanations.

An Example of a Number Talk

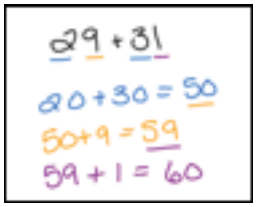
A teacher presents the following expression for second-grade students to evaluate and determine the value of the expression using mental math:

$$29 + 31$$

Upon students demonstrating they are ready with responses, the teacher would ask for students to provide their solutions and record all of them on a board or chart paper. The teacher then asks for students to justify how they determined the value of the expression to be 60. As students explain their strategies, the teacher would make the students' thinking and explanations visible by representing the students' ideas. Examples might be as follows:



"I made a 10 with the 9 ones and 1 one. Then I added the 10 to the 20 and 30, to get 60."



"First I added the 20 and 30, which is 50. Then I added the 9 to the 50, which is 59, and then added the 1 to get 60."

The teacher would continue recording other students' solution strategies for the class to see and evaluate until all student solution strategies had been discussed.

Mathematical Creativity

In the field of mathematics, creativity is considered to be the expression of mathematical ideas that demonstrate originality, fluency, and flexibility (Balka, 1974). Original ideas would include a mathematically accurate idea or strategy that has not been previously expressed or discussed.

Fluency of ideas refers to the ability to think of many ideas related to a topic, problem, or situation. Within a mathematics classroom, a student might display fluency of ideas by being able to think of a "number of different correct answers, methods of solution, or new questions" (Sheffield, 2000, p. 419). Flexibility refers to ideas that are different or varied, applying ideas and strategies in multiply situations or explaining how strategies can apply across a wide range of problem contexts.

Fostering Mathematical Creativity through Number Talks

Number talks can also be used to foster students' mathematical creativity by encouraging students to think about origi-

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er educator for licensure programs, I have access to tons of writing that could produce fruitful learning and fruitful research. But I have to confess that I like learning about reflection best. I have seen so many teachers light up as they read to their trusted group, so many coming to career-altering epiphanies and examining their unspoken notions and underlying assumptions; it is simply the best part of my research day when I discover along with them. In a world that seems to be slouching ever more closely toward valuing isolation over connection, and in a profession that is characterized too often by the closing of the classroom door, the community and care and confidence that reflection breeds is not only one of the best but the most enduring of the myriad tasks our teachers take on daily. May it always be so. **THP**

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Editor's Note: *This article references the 2010 NAGC Gifted Programming Standards. Since acceptance and publication, a new updated and revised version of these standards was released. Visit nagc.org for more information.*

curriculum café

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viewed as qualitatively (rather than quantitatively) different from the basic curriculum; it results from appropriate modification of content, process, environment, and product in response to the learner's interests, readiness, and learning profile (Tomlinson, 2012). Moreover, current research on learning, such as domain-specificity or expertise, informs our thinking about curriculum for the gifted. Expertise studies have shown that experts and novices differ in metacognitive and executive control of cognition (Bereiter & Scardamalia, 1993). The application of curriculum differs across states, local school districts, and even within school districts, schools, and grade levels. Curriculum for the gifted and advanced students should contain accelerative and enrichment components. It should blend general education emphases while customizing to the learner. **THP**

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nal ideas, many ideas (fluency), and flexibility of ideas. These aspects of mathematical creativity might be made visible during the number talk discussion of students' strategies.

A student might demonstrate originality by explaining a mental math strategy not previously discussed by the teacher or other students in the class. In some cases these may even be ideas that the teacher might not have considered before. Using the example from above, a student could say that the solution is 60 because they knew 30 is the middle number between 29 and 30, so they could add 30 plus 30.

A student who demonstrates fluency might come up with several strategies that could be used to determine the numerical value. Flexibility would be demonstrated by a student who elaborates on a how a previously learned strategy, such as compensation or "making a ten," can be applied to a situation for which that strategy might not be immediately evident. Additionally, a student demonstrating flexibility might pose additional expressions for which a specific strategy could be applied.

Teachers can encourage students' mathematical creativity throughout the number talk process by prompting students to think in ways consistent with originality, fluency, and flexibility. To prompt original thinking, teachers might ask students to try to think of a strategy that they think no one else in the class will discover. In this way, students might determine the value of the expression in several ways (also demonstrating fluency) and then evaluate "how likely" they think other students would be to use the same strategy. To prompt fluency of ideas, teachers can asks students to use and share multiple solution strategies. To prompt flexibility of ideas, teachers can ask students to think about strategies they have used before that might also work for the current number talk situation or how they can apply a specific strategy to other operations or expressions. **THP**

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