

Learning & Teaching

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Mission Statement

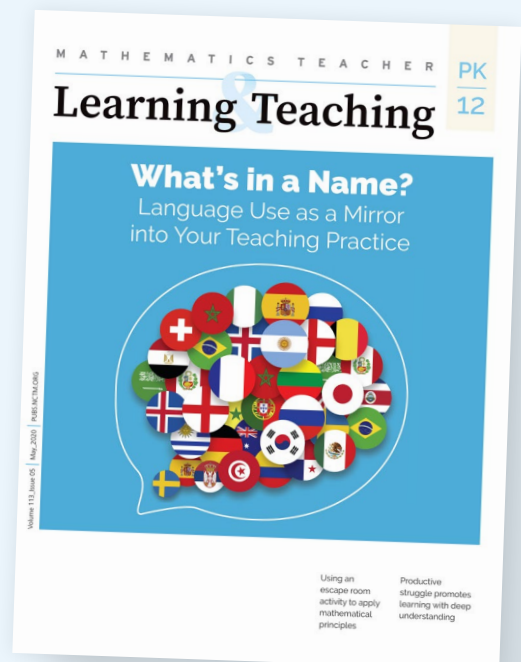
The National Council of Teachers of Mathematics advocates for high-quality mathematics teaching and learning for each and every student.

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NATIONAL COUNCIL OF
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The Fire & Wire Way

Julie Russo, Valerie Faulkner, and Stacy Eleccko

Our collective experiences as teachers of mathematics have guided us to recognize the importance of building students' networks of ideas around number and arithmetic. In our own teaching, we found that attacking number sense directly, daily, systematically, and rigorously impacted our students' success. So, we set out to help teachers create the conditions that would allow their classrooms to buzz with excitement. We knew our approach had to be rewarding to implement, take only a few minutes a day, and deliver results.

Two things drew us together as colleagues: excellent mathematics instruction and issues of equity. To us, it is a problematic proposition to address issues of instruction and achievement by separating students into groups with access to different curricula. Student needs are overwhelmingly predictable and when we focus on deep thinking, rigorous ideas,

and daily repetitions to develop all minds, we can meet the needs of all students in one setting. Instead of a classroom focus on different things for different students, we argue for 'same-ation' (see Figure 1). We want our teaching community to think of developing the same lesson for all students, rather than different lessons for different students. In this way, the teacher's lesson becomes the focus of attention and adjustment. We have found that when we build number sense daily with all students, our pool of strong mathematical thinkers grows, and outcomes improve.

We have spent over three years writing *The Fire & Wire Way: Daily Routines to Systematically Build Foundational Number Sense* (Eleccko et al., 2024). It contains 150 days of routines, each intended to be 6–10 minutes. The routines emphasize the importance of learning at the level of the synapse and are

designed to fire and wire networks in the brain associated with mathematical ideas. While designed to develop number sense that aligns with early elementary curriculum, these routines are pertinent for all students who have an underdeveloped sense of number and arithmetic. The routines systematically build number sense, each one laying critical foundations for the next. Our book, the companion set cards, and digital resources can be found at firewiremath.com (link online).

The Fire & Wire routines are systematic, explicit, visual, structural, and fun. They focus on a few key ideas, such as

- Composing, decomposing, and recognizing sets
- Comparing set values
- The critical importance of the unit
- Base-ten as an anchor
- The line of equality
- Language development

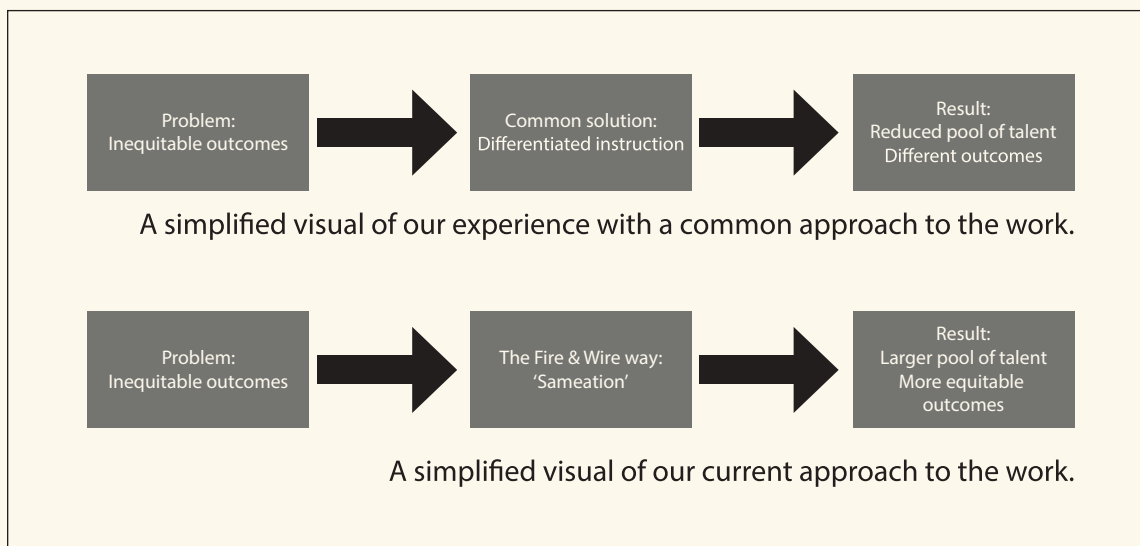
Within these routines, every day, all students have access to a powerful 2–3 minutes of subitizing that is focused on developing specific mathematical language as well as fluency in processing set values—and operations on sets—with meaning. Fire & Wire subitizing routines are fast and fun. Children learn to consider both the unit and the groupings of units to process set values with language and meaning.

For instance, students learn to respond to set cards with both a “speed” response (quantity only: “three”) and a “regular” response (quantity + unit: “three circles” or “four circles and one mouse;” see Figure 2).

Fire & Wire routines build over the course of the year with great attention to repetition and generalization. Beginning with 0–3, mathematical ideas are embedded, practiced,

and discussed. This includes processing structured and unstructured sets, listening to and engaging in rapid responses, and processing and verbalizing critical ideas. While perceptually subitizing sets of four and fewer, students begin to explore the idea that two sets can look different and have the same value. In addition, Fire & Wire routines include opportunities to understand the importance of organization

Figure 1 Common Approach and Our Approach



Julie Russo is a K–5 math consultant and the creator of Structures of Equality (www.structureofequality.com), a reading comprehension tool that helps students understand number stories. She supports the teachers, staff, and students at Savanna-La-Mar Inclusive Infant Academy in Jamaica through the delivery of professional development and needed math resources.

Valerie Faulkner is a retired teaching professor (NC State) and the lead author of *The Stories We Tell: Math, Race, Bias, and Opportunity* (2019). She has published numerous articles on topics such as subitizing, early number sense, equality, and equity.

Stacy Eleccko is a K–8 math consultant with a passion for equity in mathematics. She has served as a classroom teacher, math intervention teacher, and instructional math coach.

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by fives and tens as a habit of thinking.

Students then engage in a guided exploration to further develop their number sense and the language that organizes that sense. For instance, notice in this example Explore activity (Figure 3) how the student has access to visual structures, including the

line of equality, and access to complex language and thought processes.

We have experienced the power of integrating these practices into daily instruction. We are excited to share and discuss with others how these routines establish the groundwork needed for rich mathematical habits

that support an equitable learning environment. Sticking with these routines, students will be rewarded by having their brains wired to conceptually understand our base-ten system, and teachers will be rewarded with a classroom filled with excitement, rich discussion, sense making, and critical thinking. —

Figure 2 Example Fire & Wire Companion Set Card Images

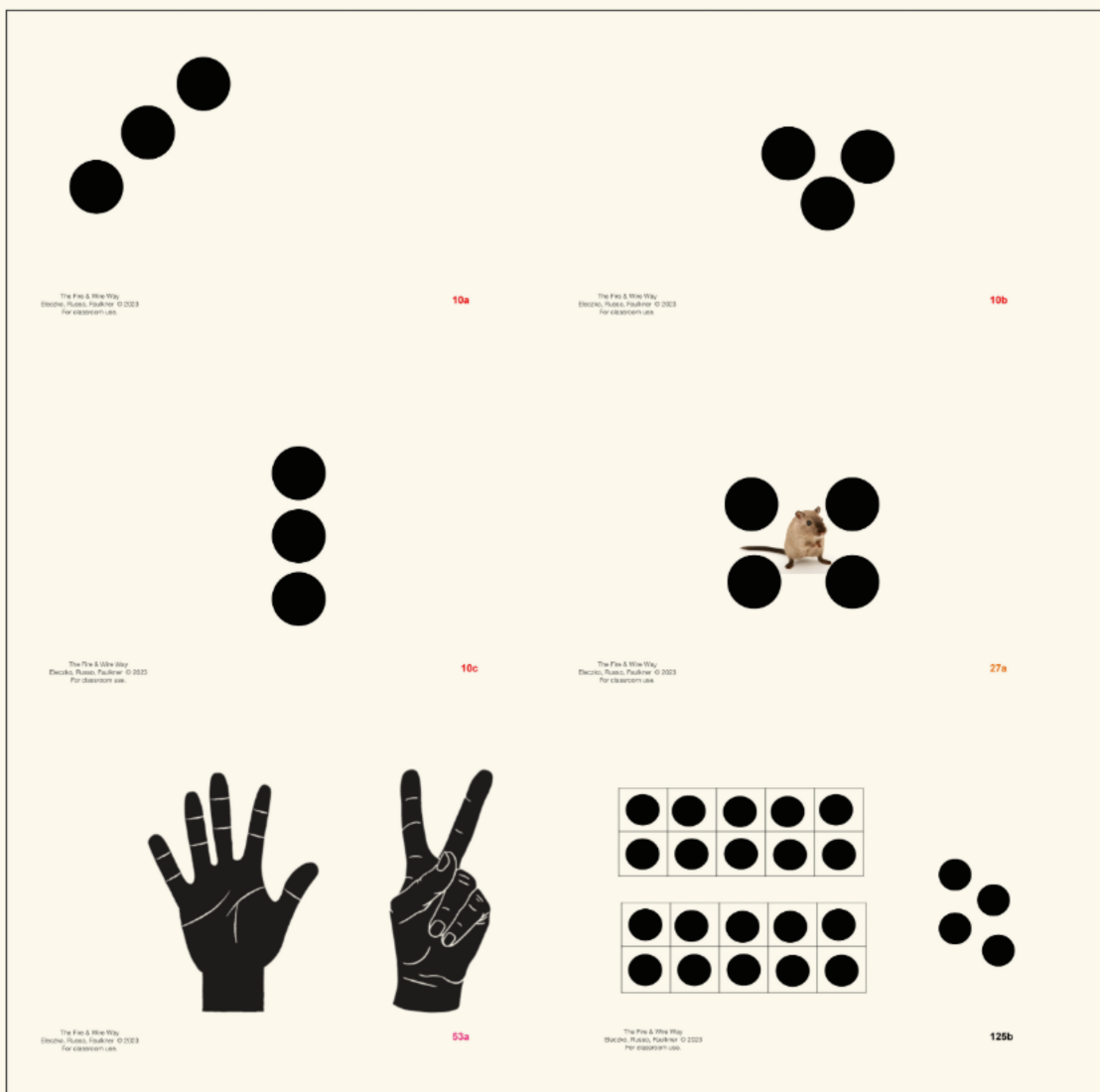


Figure 3 Example Explore Routine

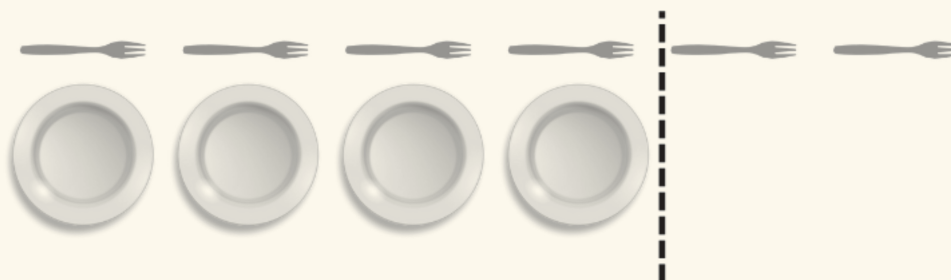
Let's pretend I need to set the table again, but this time we are having dessert. Sometimes when people set the table for dessert, they place the fork above the plate. 4 people are coming for dessert. I have 4 plates and 6 forks.

Hold up 4 plates and 6 forks. *Do we think there are enough forks and plates for 4 people? (wait time) If you think there are enough, put a thumb up in front of your chest. If you don't think there are enough, give me a thumbs down. Scan and hold students accountable for total participation. Will we have any extra plates or forks? Provide wait time, then ask for total participation with thumbs up or down.*

Set the table, like the picture below. *Did every fork get a plate?*

I can decompose my forks into the number of forks that have a plate and the number of forks that don't have plates. Call on students who have struggled with this concept the past few days. Provide sentence frames if needed, such as “ ___ forks got a plate.” As students respond, invite them to the table to count and prove or disprove their thinking.

- *How many forks got a plate? How could we prove that?*
- *How many forks did not get a plate? How could we prove that?*
- *Do I still have 6 forks? How could we prove that?*



REFERENCE

Eleczko, S., Faulkner, V., & Russo, J. (2024). *The fire & wire way: Daily routines to systematically build foundational number sense.* <https://firewiremath.com/>