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New Jersey STEM Innovation Fellowship Overview

The New Jersey STEM Innovation Fellowship is an exciting teacher-leadership program open to experienced elementary teachers and coaches working in New Jersey public schools. Educators accepted to the fellowship will receive a \$5,000 stipend and join a supportive learning community where they will learn about a research-based, innovative math teaching routine alongside talented educators from other New Jersey districts and schools. The program is based on Math for America's (MfA's) fellowship model developed in NYC that has been successfully adapted in other cities and states.

FELLOWSHIP AT-A-GLANCE:

- **Fellowship duration:** One-year renewable fellowship
- **Eligibility:** Currently licensed K-5 math teachers and coaches, with 4+ years of experience, working in a NJ public school
- **Activity:** Educators implement and reflect on an innovative math teaching routine
- **Time commitment:** Summer institute + monthly after-school meetings
- **Locations:** Montclair State University, Princeton University, Rowan University
- **Benefit to fellows:** \$5,000 stipend; high-quality professional learning experience
- **Benefits to schools/districts:** Increased capacity for high-quality math instruction

THE INNOVATION: NUMBER STRINGS

A number string is a brief (10 minute) routine in which a teacher presents a carefully designed sequence of math problems that students solve mentally. Fellows will implement this brief routine in ways that support and enhance the existing math curricula at their school. Number strings can be implemented as a warm-up during the math instruction period, or as a stand-alone activity any time during the school day.

Number strings help students develop computational fluency by deepening their conceptual understanding of fundamental mathematical procedures. Teachers who implement number strings improve their ability to facilitate mathematical discussions and boost their students' mathematical ability and confidence.

Number strings boost student learning: one study found that teachers using number strings in a high-needs, underperforming district were able to approach statewide averages within one year (Fosnot, 2010).

For more information about number strings, see <https://numberstrings.com/>.



FELLOWSHIP ACTIVITY

Summer 2021: Fellows attend a two-day summer institute (late August) at Montclair State University (or remotely) where they will meet other participants and learn about number strings and how to implement them from a nationally renowned expert. (Fellows that live far from MSU will be provided accommodation during the institute).

School year 2021-2022: Fellows implement number strings during their math instruction and attend monthly after-school meetings at a nearby university campus (or remotely) to discuss implementation successes and challenges with other fellows in a supportive learning community.

FELLOWSHIP REQUIREMENTS

To participate in the fellowship, fellows will be required to:

- Attend summer institute at Montclair State University (or remotely) in late August
- Implement number strings as a regular part of their mathematics instruction
- Attend supportive monthly professional learning community (PLC) meetings after school at a participating university campus or remotely
- Participate in blended learning activities with fellows across the state by interacting on an online platform with other fellows between PLC meetings
- Share and discuss artifacts including student work and classroom video* with other fellows in PLC meetings
- Provide data for program evaluation purposes. This data consists of classroom artifacts and completing three surveys over the course of one school year

***About the use of teaching artifacts in the fellowship:** All fellows are required to submit, once a month, teaching artifacts for use in the monthly meetings and program evaluation. These artifacts include, but are not limited to, video of instruction, images of student work, and lesson plans. Ideally, we will be able to collect videos of fellows' implementation of a number string at both the beginning and end of each school year. Video and other artifacts will be discussed in structured, safe, and supportive learning communities to support fellows in implementing number strings in their classrooms. Video will also be used by the fellowship evaluator to understand the educational value that implementing number strings has for educators in the fellowship and their students.

- Video will only be used for professional development and program evaluation purposes – it will not be shared beyond the fellowship without explicit, prior consent of both the educator and district officials
- All district regulations will be followed in the collection of video (e.g. obtaining requisite consent forms prior to filming)





MORE ABOUT NUMBER STRINGS AND THEIR USE IN THE FELLOWSHIP

Ambitious math teaching requires providing students with opportunities to struggle with important mathematics (Hiebert & Grouws, 2007), work on cognitively demanding tasks (Stein & Lane, 1996), and engage in discourse that requires them to formulate their ideas and make sense of the ideas of others (Yackel & Cobb, 1996). Teaching math this way is difficult – even for experienced instructors!

There are many reasons that ambitious mathematics instruction is difficult. However, one promising support for teachers seeking to make their teaching more ambitious is instructional routines (Lampert et al., 2013). Instructional routines create a structure that supports teachers in facilitating discourse, engaging students, and providing opportunities for productive struggle. The routine creates norms around patterns of discourse that allow teacher and students to concentrate on sense-making.

One especially helpful routine is number strings (Fosnot & Dolk, 2001). In **number strings**, a teacher gives students a series of problems, beginning with ones that they can do easily. The string of problems is designed to highlight a specific mathematical idea or structure. By doing increasingly complex problems and explaining how they are solving them, students develop techniques for doing calculations, but more importantly, they connect these techniques to larger ideas about the structure of operations and number system.

In the summer institute NJ STEM Innovation Fellows will learn about how number strings are created and what they are intended to accomplish. Fellows will watch videos of other teachers implementing number strings, and practice implementing in simulated classroom environments with their peers.

To further explore the ideas behind number strings, and see videos of teachers implementing them, see: <https://numberstrings.com> or <https://tedd.org/number-strings/>.

Each fellow will receive a book of high-quality number strings crafted for the grade and content that they teach during the year. Fellows will implement these number strings in the classroom throughout the year, and discuss successes and challenges related to student learning with their peers in the program during monthly cohort meetings. Fellows will also interact and share with one another online.

References:

- Fosnot, C. T. (2010). *Models of Intervention in Mathematics: Reweaving the Tapestry*. National Council of Teachers of Mathematics; Reston, VA.
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- Hiebert, J., & Grouws, D. A. (2007). The effects of classroom mathematics teaching on students' learning. In F. K. Lester (Ed.), *Second handbook of research on mathematics teaching and learning*. Charlotte, NC: Information Age Publishing.
- Lampert, M., Franke, M. L., Kazemi, E., Ghouseini, H., Turrou, A. C., Beasley, H., . . . Crowe, K. (2013). Keeping it complex: Using rehearsals to support novice teacher learning of ambitious teaching. *Journal of Teacher Education*, 64(3), 226-243.
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