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A Message From the Global Math Project Team

James Tanton *

Mathematical Association of America

The Global Math Project [1] team members and I (James Tanton) are honored that the Journal of Math Circles has devoted its inaugural issue to the theme of their work. The Global Math Project is known for bringing Exploding Dots to the world. (See [2] and [3] for an overview of this mathematics and see [4] for an overview of the Project's history.) This mathematical play is used in classrooms, math clubs, and Math Circles all over the world. In fact, the Exploding Dots web app [2] alone recorded that by the end of Global Math Week in October 2019, over 5.1 million students from over 170 countries and territories had played with this mathematics directly online.

The mission of the Global Math Project is simple: to bring joyous mathematics to everyone. In particular, we aim to bring joyous, curriculum-connected mathematics to everyone (while remaining curriculum agnostic). The Math Circle community is truly a global one. Together, we promote and practice the Math Circle core values.

The Global Math Project provides access to worthwhile mathematical tasks, like Exploding Dots. The story of Exploding Dots does just this. It begins with a visual play of place value, which then provides the framework to explore—and to continue to genuinely play with—grade-school arithmetic, high-school polynomial algebra, some infinite series, and more. The task also enables its participants to explore uncharted territories within the worlds of fractional bases, negative bases, 10-adic numbers, for instance, all in one fell-swoop accessible to all. Open research questions are right at the door.

The Global Math Project additionally fosters problem-solving habits of mind. The ultimate goal of our work is to help bring a joyful attitude to mathematics doing and playing for one and all, coupled with the permission to flail! Problem-solving is hard. It requires toil. It requires flailing. But we

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can teach the world to flail with joy and find success through persistence. As Erick Mathew Kaaya, a GMP Ambassador for the Project, says, it is about “working smart and trying and trying.”

The Global Math Project builds a global community of mathematical thinkers and problem solvers. I (James Tanton) am personally honored that Erick Mathew Kaaya has shared his thoughts and perspectives on how our—and all our ambassadors’—efforts naturally unite with the hard, dedicated work of Math Circle practitioners across the nation and globe. Erick has single-handedly brought the mathematics of Exploding Dots to the northern Tanzania school districts of Arusha and Kilimanjaro and thereby introduced a new paradigm to what mathematics learning and doing could be for those classroom communities. He is transforming global effort to local ones.

As far as I am aware, the notion of a Math Circle is foreign to Tanzanian communities. But the words Erick shares demonstrate to Math Circle workers across the world the necessary, hard, face-to-face, ground-level work that must be done to overcome barriers to what is perceived as “new” and mathematically different: the value of being persistent and always gently present; the joy making sense of mathematics brings to one and all; and ultimately, how universally receptive students and teachers are to playing with, probing, and exploring genuine mathematics.

Several pieces of concrete advice are apparent from Erick’s essay and are worth listing overtly. First, it might very well be a cultural classroom norm for many students not to ask questions about mathematics. (Erick describes my “insisting on participation.”) Math Circle leaders need to be cognizant of this possible (unspoken) cultural barrier to circle work. Second, conducting mathematics in a non-traditional way can be liberating and exciting, but it can also be disquieting to many. Erick once shared this story with me:

A teacher was doing a long addition problem on the board for a large class of secondary school students. She conducted the problem in the traditional way from right to left and asked the class if they understood. “Yes Ma’am” was the reply in unison. She then asked: “Did you notice I computed this by going right to left?” “Yes Ma’am” replied the chorus. And then she turned and directly faced the students and asked “Why? Why do we go right to left?” The body of students looked stunned. And then they giggled. It seemed they had never been asked a why question before. And the teacher then went back to the board, computed the same sum from left to right and got the same answer. And the class was set. They went on to explore and explain mathematics and not just perform it.

Although U.S. mathematics students might be more accustomed to non-traditional classroom environments, the act of “breaking the norms” of standard mathematics tasks should be conducted with gentle ease and coy humor. The in-person groundwork of visiting classrooms and clubs is vital as one works to start a Math Circle program for a community: there needs to be a human face to the work. Also, chatting directly with folk in their local surrounds can naturally lead to local opportunities: individual school administrative programs of possible support, existing clubs to connect with, and parents and teachers to work with, for instance. Further, one should consider alternative ways to enhance communications and participation in a community. Erick started a WhatsApp channel for his teachers and sought to translate materials into another language. And Erick listened to the teachers and their students—he realized that even quick and simple feedback forms at the end of a session can be incredibly informative. Erick thinks big!

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