Classroom Connectivity, Personal Identity and Expressive Use of Mathematical Notations
Participatory
Aggregation
Mathematical
Performance
Leverage classroom social structures to tap into student personal identity & interests
Introducing Participatory Aggregation: Your Personal \[ Y=mX+b \]

- Breaking into numbered groups & counting off.
- Staggered Start, Staggered Finish: Varying \( b \) by Group
  - Make \( Y=mX+b \) where \( b \) is your group #
  - We collect all your functions
  - We display, animate and investigate your functions
Staggered Start, **Simultaneous** Finish: The Pedagogical Power of Aggregation

- For the same Group Structure, start at 3 times your Count-Off Number and **finish in a tie with A** \( (Y=2X) \)
  - Now you must determine what speed is needed to get you to 12 in 6 seconds - either a speed or a slope calculation.
  - Somebody \( (\text{with CO } # = 4) \) starts at the Finish Line!
  - Anybody \( (\text{with CO } # > 4) \) starts to the right of the Finish Line and goes backwards!

- **What does the Participatory Aggregation buy us here?**
  - The personalization of your mathematical construction and display in a shared public space
  - Contextualization of each formula in a family
  - Contextualization of troublesome special cases (e.g., \( Y=12 \))
Introducing Mathematical Performance and Display of Student Constructions

- Teacher demo of Exciting Sack Race in CMW
  - Introducing graphical editing of piecewise varying Position vs. Time functions
- Make your own Exciting Race & Story
  - We collect, display, animate and use the Display Matrix to highlight particular races
- We select & broadcast a particular race to make stories for, OR perhaps as the A-function to interact with
- Reflections on the teacher’s pedagogical role
  - Traditional choices, but amplified & more visible, effects
  - New kinds of choices & opportunities - new things to build
Figure 1: Exciting Sack Race
• A and B start off at the same time, but B falls behind.
• Suddenly, B gets a burst of energy and flies past A.
• B was moving so fast that he tripped and fell down!
• B gets up but is confused and runs backwards!
• B realizes his mistake, turns quickly and runs forward to the finish, tying with A.
More Sack-Race Aggregation Scenarios

- Students are given **QUALITATIVE CONSTRAINTS** for a race and asked to make one that fits (e.g., B starts faster than A, but slows down to finish in a tie with A). They are then uploaded and aggregated to see what graph features they all share. This illustrates the power of AGGREGATION AS A MEANS OF GENERALIZATION.

- Students are given **QUANTITATIVE CONSTRAINTS** for a race and asked to make one that fits (e.g., B starts slower than A for 2 seconds, but must pass A at 5 seconds, and then lead A by 2 m for the rest of the race). They are then uploaded and aggregated to see what graph features they all share. This illustrates the power of AGGREGATION AS A MEANS OF GENERALIZATION.
Exploiting Personal Identity: Where Are You?

- **Staggered Start, Staggered Finish with Fans: Varying b by Group and m by Count-off Number**
  - Make $Y=mX+b$ where $b$ is your group number and $m$ is your count-off number
  - We collect, display, animate and investigate your functions

- **Ask: Where Are You?** (find yourself in the crowd).
  - The act of “finding yourself” taps into your personal identity while simultaneously eliciting exactly the kinds of thinking and coordination of information we want, but in the richness of the social space rather than in a private interaction with a single device