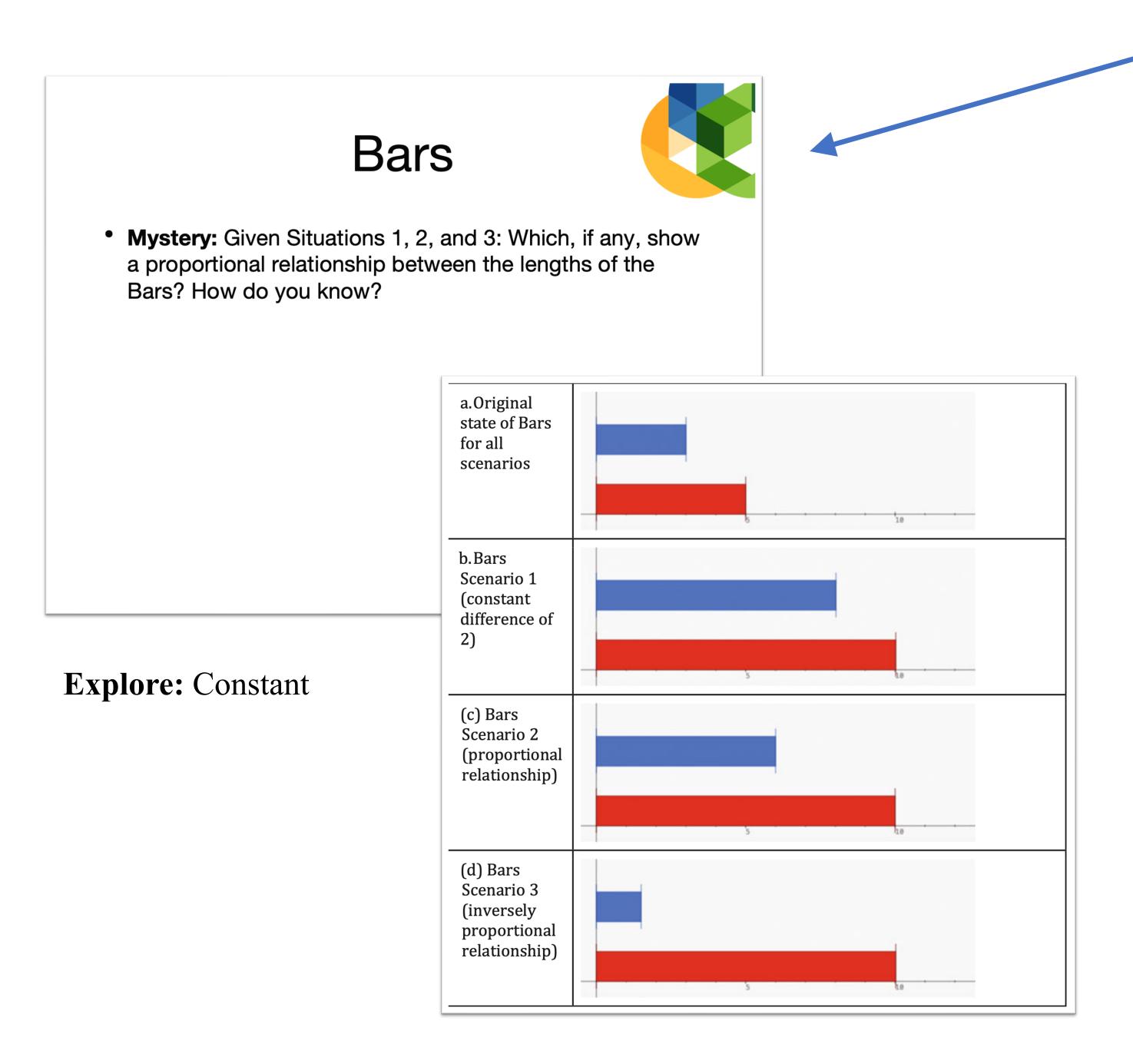
## **Project Description**

In this design-based research project, we are refining a model for mathematics professional development. We engage middle grades teachers in playful, discussion-based exploration of fractions and proportions through tasks and dynamic "toys" as well as planning for classroom implementation. We are now adding "Connections", designed to support participants in transitioning from learners to teachers during the PD. For one group, Connections are reflection on paper, for the other, they are part of the PD discussion.



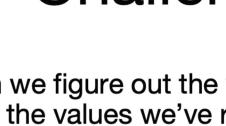


The work reported here was supported by the National Science Foundation under grant DRL-2201125, 2201126, 2201127. The opinions expressed here are those of the authors and may not reflect those of the NSF.

## Rational Numbers Playground: Applying and Refining a Model for Dynamic, Discussion-Based Professional Development Pls: Chandra Orrill – Rethink Learning Labs – chandra.orrill@rethinklearning.com Rachael Brown – Penn State Abington – reb37@psu.edu Allan Cohen – University of Georgia – acohen@uga.edu

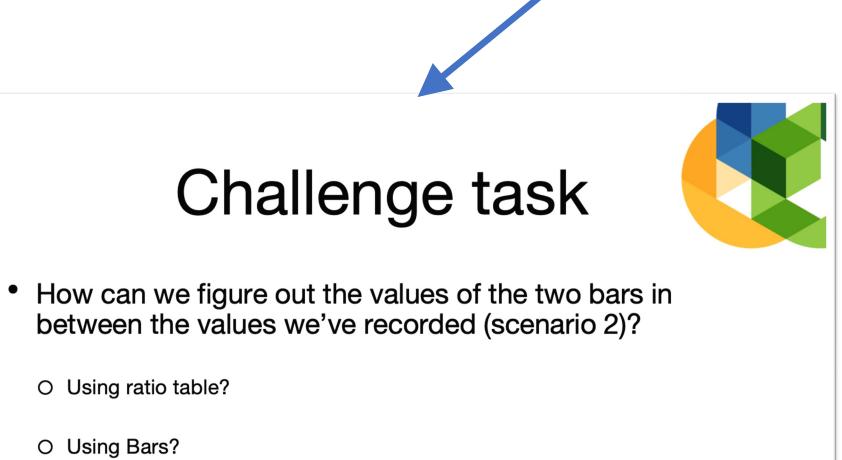
## **Emerging Model of Coherent Learning for Teaching (MCLT)**

Stage	Explore	Connect	Apply
Activity	Playing	Representing	Planning
Activity Types	Conjecture testing, Mathematical argument, Sensemaking	Connection making, Pattern finding, Making sense of structures	Editing, Genera Applying
Driving Questions	How do we play with math?	How do we connect playfulness in math to traditional representations and standards?	How do we sup with content? representation ways?
Roles	Participants: generate discussion Facilitators: Focus discussion on key mathematical values through questioning and highlightir		



- O Using ratio table?
- O Using Bars?
- O How does the Bars Toy help us answer this task?
- thinking about the invariant relationship in a proportion?
- classroom?

**Connect:** Quantities covary at a constant rate. The relationship between the quantities is constant while the magnitude of the quantities changes. Covariation is the restriction on this relationship. We intend this to be used to tie to ratio table representation and to think about the relationship between ratio tables and Bars as well as the affordances of each representation.



O How does finding the values in between the whole numbers help promote

O How does the Bars Toy compare to other representations you use in your



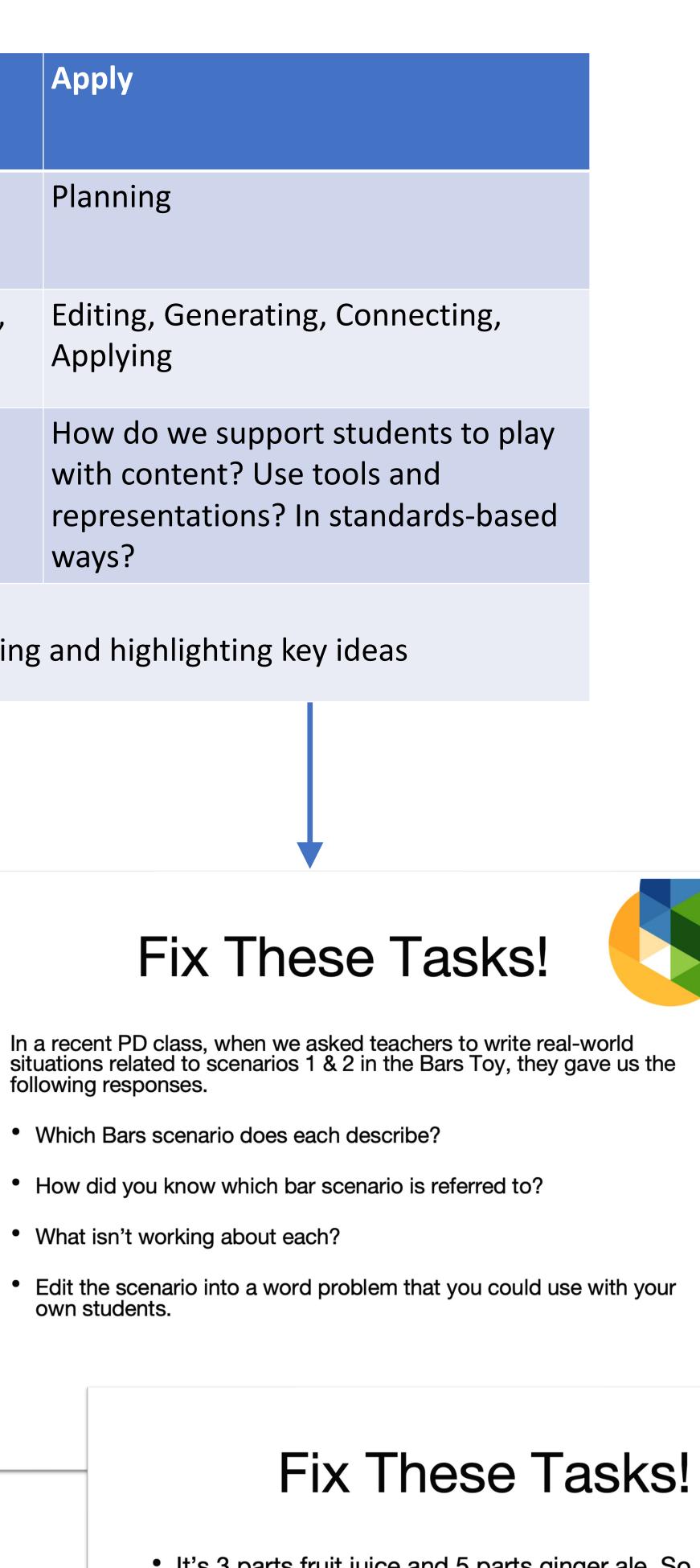
following responses.

- What isn't working about each?
- own students.

Apply: Thinking about constant, covariation, and quantity, thinking about how situations need to be expressed for students to understand them, matching models to stories.









 It's 3 parts fruit juice and 5 parts ginger ale. So, for whatever recipe you want to do, it's a ratio of 3 to 5.

• They're both racing at a constant speed, but red is moving faster than blue. So, we could ask questions about how far this person has gotten at different times.

• It's like when you go into the <u>carnival</u> and you pay 25 cents to get in then you pay for each ride.