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Conceptualizing the Teaching Practice of Building on Student Mathematical Thinking

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Supported by
Leveraging MOSTs: Developing a Theory of Productive Use of Student Mathematical Thinking
a 4-year collaborative research project funded by the US National Science Foundation (DRL-1220141, DRL-1220357, DRL-1220148)

Using Student Mathematical Thinking in Instruction

Mathematical Opportunities in Student Thinking

- The mathematics education community has long encouraged instruction that uses students' mathematical thinking (e.g., NCTM, 1989, 2000, 2014)
- Not all student thinking has the same potential to support student learning (Leatham, Peterson, Stockero, & Van Zoest, 2015)
- The field does not have a common understanding of what it means to "use" student thinking (Leatham, Van Zoest, Stockero, & Peterson, 2014)
- The benefits of using students' mathematical thinking in instruction have been well-documented in certain areas (Fennema, et al., 1996; Franke & Kazemi, 2001; Smith & Stein, 2011; Stein & Lane, 1996)
- Incorporating in-the-moment student thinking into instruction has been understudied and has untapped potential

Principles Underlying Productive Use of Student Thinking

Mathematical Opportunities in Student Thinking

- Student mathematics is at the forefront
- Students are positioned as legitimate mathematical thinkers
- Students are engaged in sense making
- Students are working collaboratively

~aligned with NCTM, 2014, *Principles to Actions*

We see the *teaching practice of **building*** as simultaneously enacting these principles in response to student thinking.

Definition of Building

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Building

To make student thinking an object of consideration for the class in order to engage the class in making sense of that thinking to better understand an important mathematical idea.

Basic building blocks

Mathematical Opportunities in Student Thinking

- an **instance of student thinking**: an observable student action or small collection of connected actions (such as a verbal expression combined with a gesture)

- **student mathematics (SM)**: the articulation of a reasoned inference about what the student is saying mathematically in the instance

- **mathematical point (MP)**: the articulation of the most closely related mathematical idea that can be gained from considering the instance of student thinking

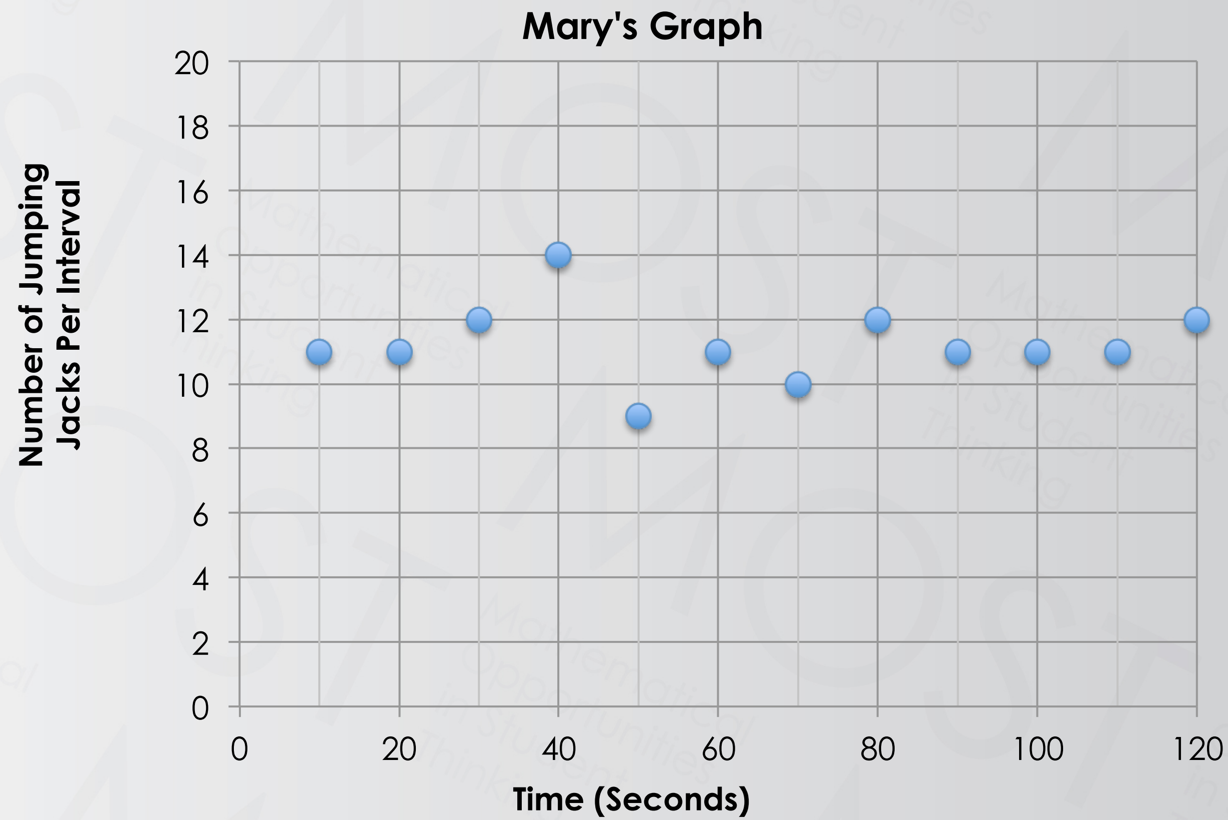
The MOST framework (Leatham et al., 2015) identifies instances of student thinking worth building on

Building …

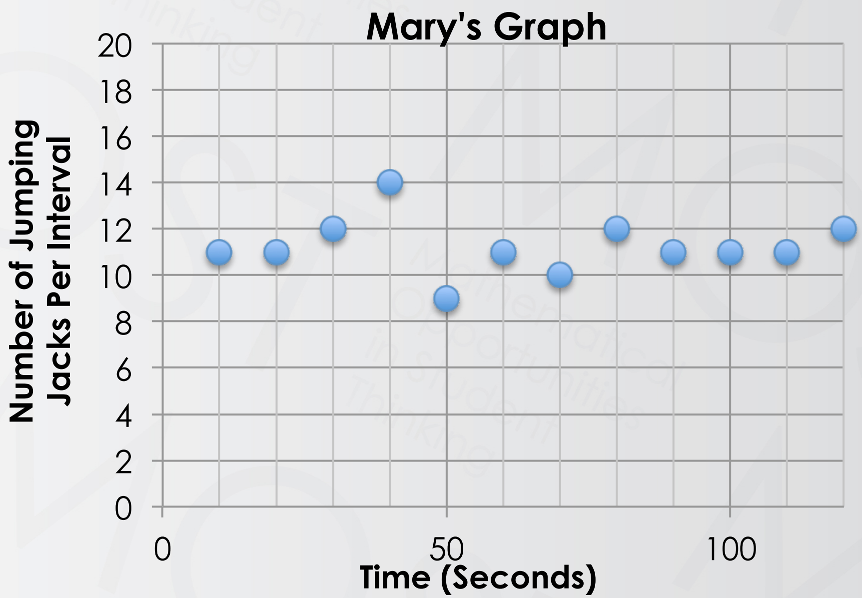
- is a complex practice
- is not a single move
- a collection of moves

What does building look like in action?

Jumping Jacks



Jumping Jacks



Teacher: It says it on there—'per interval'—but what does that mean?

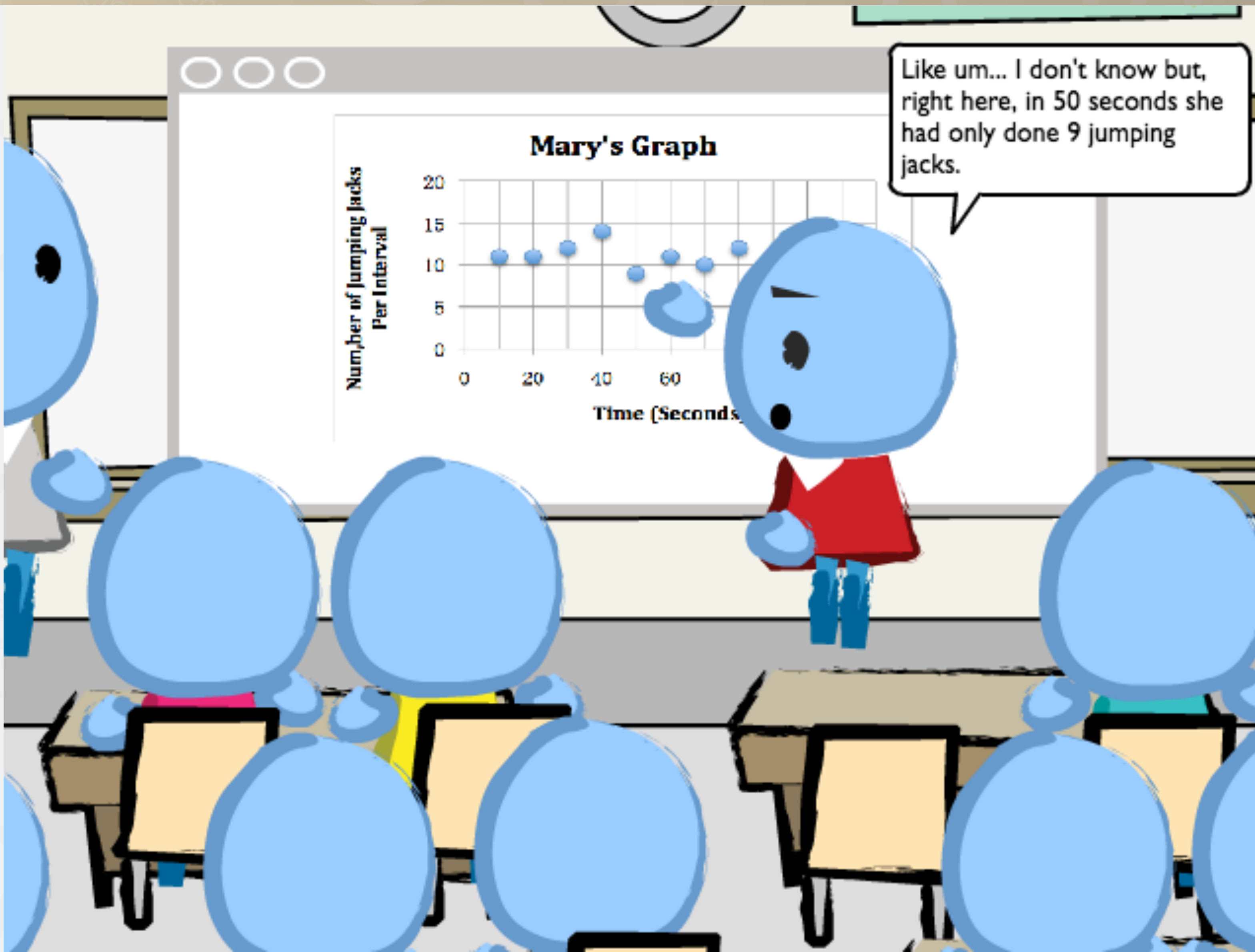
Student: Like um... I don't know but, right here, in 50 seconds she had only done 9 jumping jacks.

SM: The point (50, 9) on the graph means that in 50 seconds Mary had only done 9 jumping jacks.

MP: When measuring a quantity 'per interval' the dependent variable tells you how many units per interval (a rate) and not the total number of units.

Example

Mathematical Opportunities in Student Thinking



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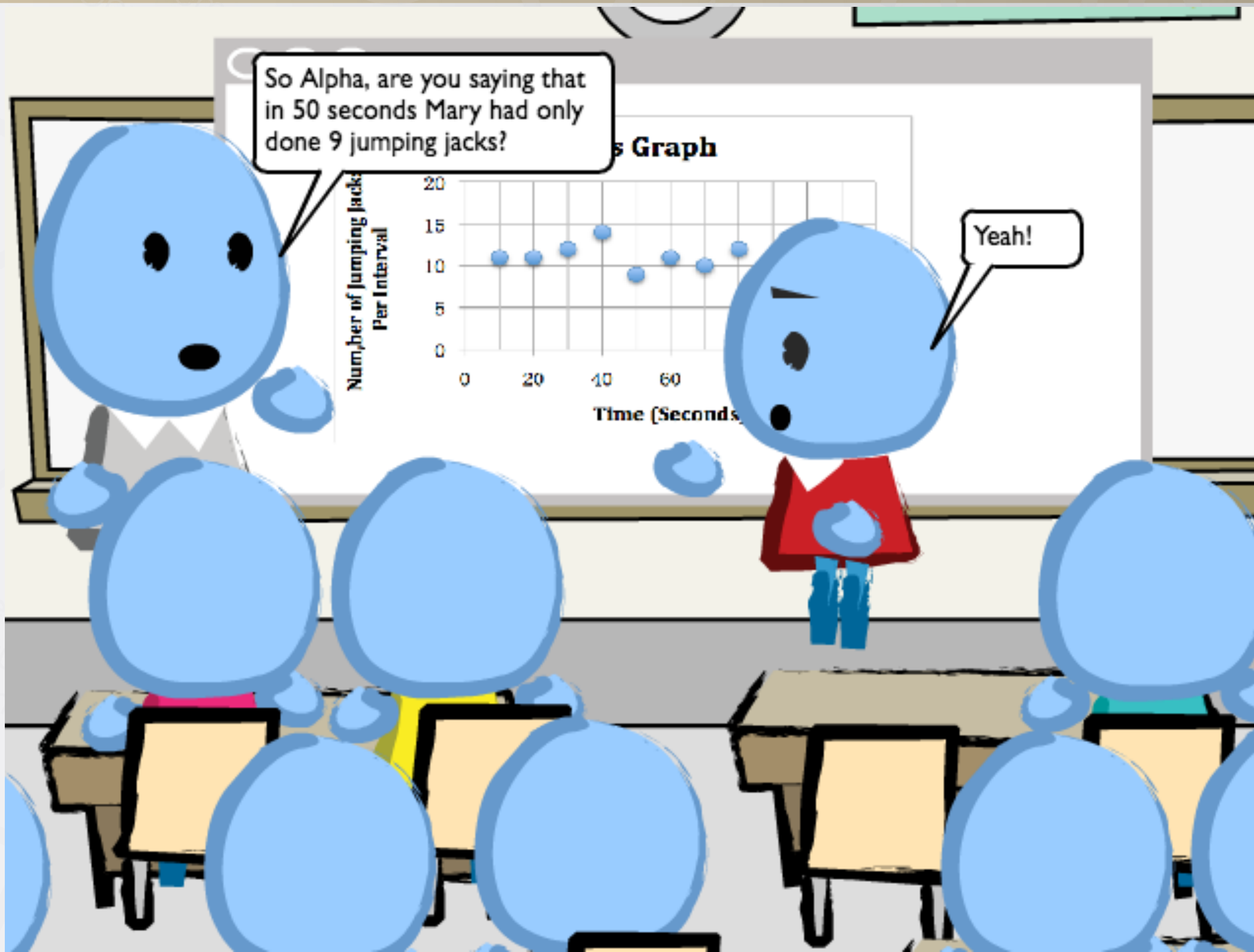

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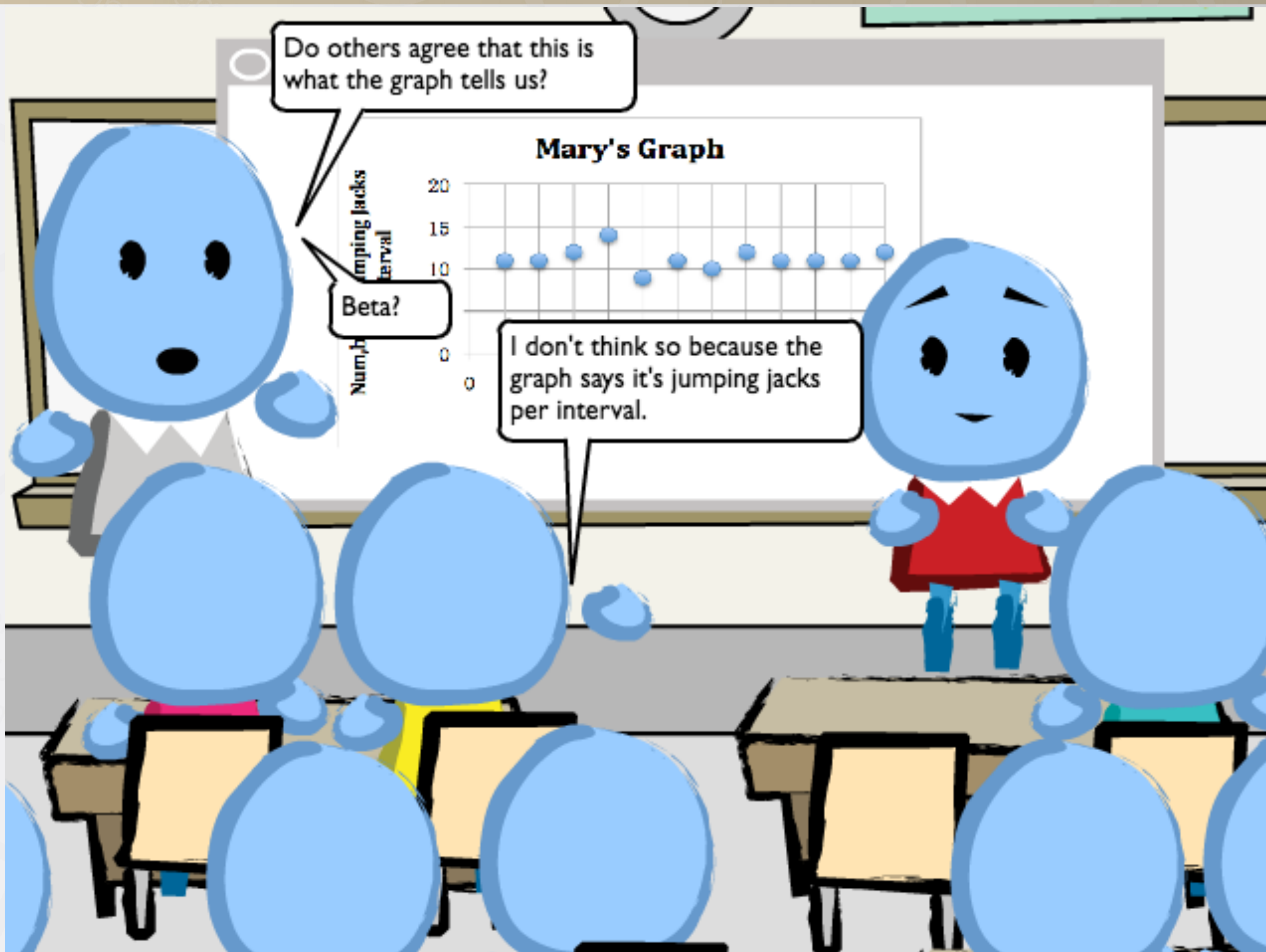

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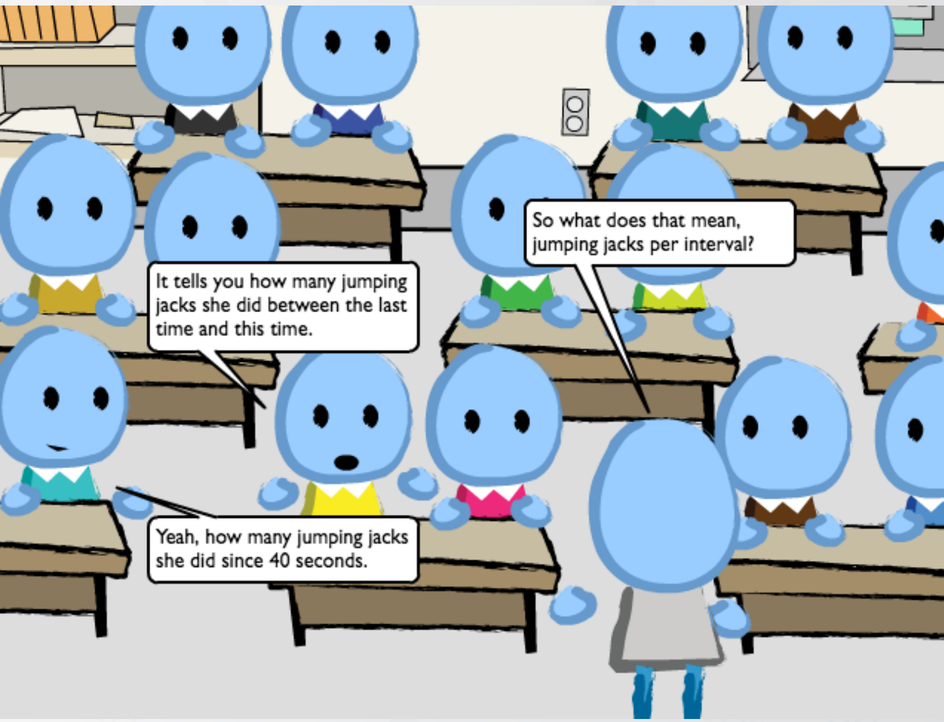
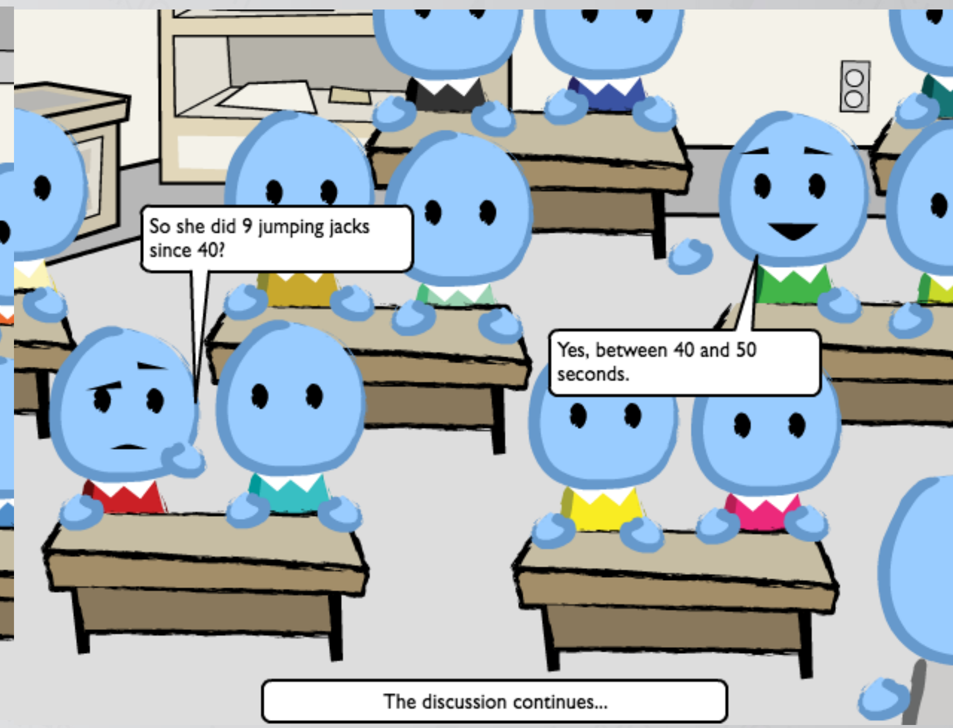

So what does that mean, jumping jacks per interval?
It tells you how many jumping jacks she did between the last time and this time.
Yeah, how many jumping jacks she did since 40 seconds.


So she did 9 jumping jacks since 40?
Yes, between 40 and 50 seconds.
The discussion continues...

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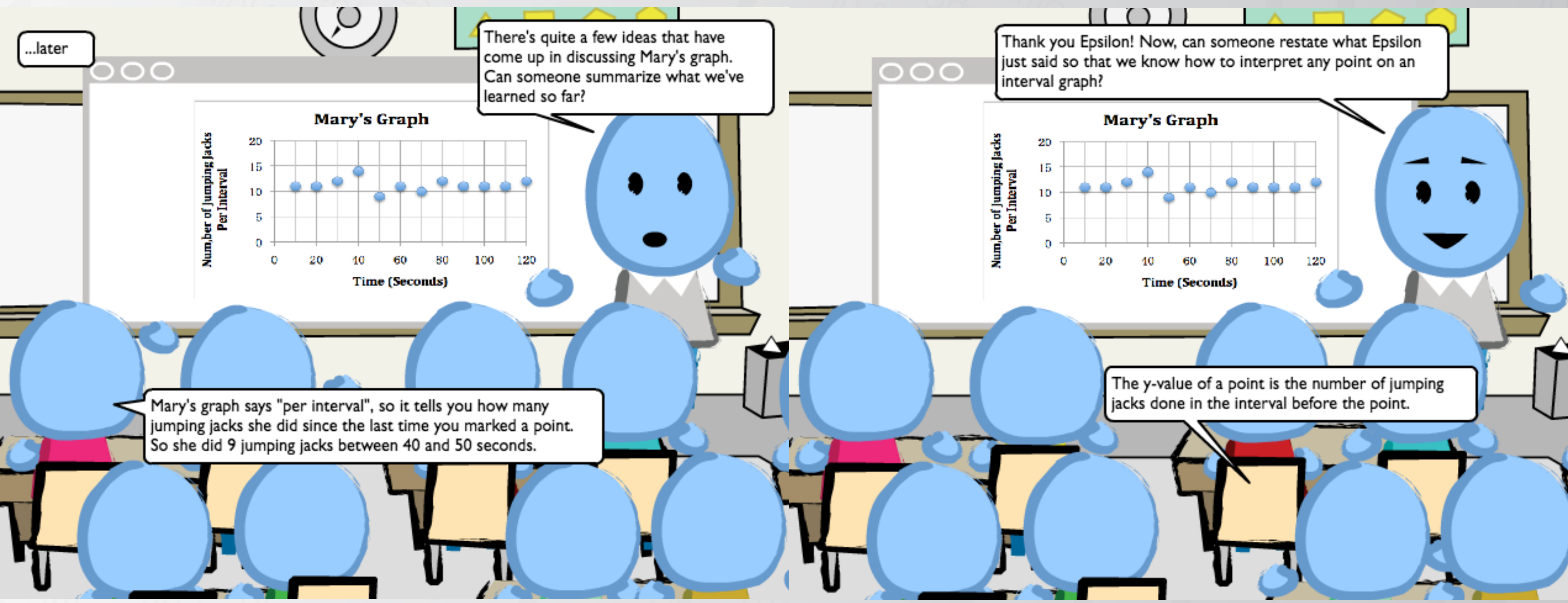

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Questions/Discussion

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The Teaching Practice of Building

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Contact Information

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