

# FOSTERING DISCOURSE THROUGH EXPLORATION WITH TECHNOLOGY

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# WHAT IS DISCOURSE?

- NCTM Professional Standards
  - “Representing, thinking, talking, agreeing & disagreeing”
- Key Questions (slightly modified)
  - What makes something true or reasonable?
  - When does something make sense?
- Key Characteristics
  - Conversations
  - Formulating & testing conjectures
  - Criticizing others’ mathematical arguments

# THE ROLE OF DISCOURSE

- Makes mathematics meaningful
- Deepens learning far beyond rote procedures
- Engages students as mathematicians with teacher guidance
- Puts locus of control where it belongs—with the students
- Provides experiences that will allow students to handle new situations

# ROLE OF TECHNOLOGY

- Powerful opportunity for exploration
- Connection of tabular, graphical, and algebraic representations
- Access to complex algorithms (e.g. regression)
- Capability for “What if?” scenarios
- Reduction of cognitive load

# GROWING TALL

(adapted from Fostering Mathematical Thinking in the Middle Grades)

Aleisha and Bernice are friends, but very competitive. Aleisha's plant is 60 mm tall, but in a month, it will be 100 mm tall. Bernice's plant is 25 mm tall; in a month it will be 50 mm tall. Each claims that her plant is growing faster.

- Provide a convincing argument that Aleisha's plant is growing faster than Bernice's.
- Provide a convincing argument that Bernice's plant is growing faster than Aleisha's.
- Summarize mathematically why both have a legitimate claim. If you had to choose which plant is growing faster, which one would you pick?

# GENERATING DISCOURSE

- What questions would you ask?
- What type of representations would you expect?
- What assumptions must students make?
- How would you guide the students?

# LET'S TRY ANOTHER: BIKE COMPETITIONS

Briana is a strong bike rider and an excellent mathematician. In planning her races, she determines ahead of time what speeds she must average on the different sections of the course.

- Briana's next race is a 20-mile race over some hilly areas. There are 10 miles going uphill and 10 miles going downhill. Briana believes an average speed of 20 miles per hour (mph) will win.
- If Briana averages 10 mph on the uphill, what will her average speed have to be on the downhill to win? Explain your thinking in multiple ways.

# BIKE COMPETITIONS (cont'd)

- Suppose Briana averages 8 miles per hour (mph) on the uphill and 30 mph on the downhill. What is her average speed for the race? Explain your results in multiple ways.
- If Briana averages 12 mph on the uphill sections, what will she have to average on the downhill sections to obtain her 20 mph average? What do you think her chances are of winning if she averages 12 mph on the uphill sections?
- She next plans to compete in a 60-mile race, of which 20 miles are uphill, 20 miles are downhill, and the 20 miles are on level ground. She hopes to average 10 mph on the uphill, 30 mph on the downhill, and 20 mph on the level part. What will her average speed be for the race?



# LEADING THE DISCOURSE

- How would you scaffold this investigation to differentiate instruction?
- How might different students approach this?
- What mathematical concepts would you want students to learn from this investigation?
- How will you go about generating meaningful discourse in your classroom?

# CONTACT INFORMATION

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