



4.5 Noticing Student Thinking: Three Animals Race

High school students engaged in the Three Animals Race Task. The task was used as an introduction to describe different types of rates of change. Specifically, it was intended to address the following learning and performance goals:

- Students will understand that not all contexts can be described as changing linearly or exponentially.
- Students will explain the difference between the three animals in the race using their rates of change. Specifically, the turtle is moving away from the starting line at a constant rate (linear), rabbit is moving away from the starting line at a constantly additive rate (quadratic), and alligator, after holding still for a while, is moving away from the starting line at a constantly multiplicative rate (exponential).
- Students will model the race and determine a winner by building a table in a spreadsheet using what they know about the animals' rates of change and distance from the starting line.



[Three Animals Race Task](#)

In this video clip you are going to see Fiona and McKenzi working on the Three Animals Race task. The clip begins with their prediction of who will win the race and then you will watch portions of their work as they use the simulation and spreadsheet to determine a winner of the race. While watching the video, focus on the students' language, what they do with the technology, and what they see as a result of what they do.



[Fiona & McKenzi Engaging with the Three Animals Race Task](#)

Q1. Attend to how Fiona and McKenzi reasoned about Turtle, Rabbit, and Alligator's distance from the starting line during the race.



Q2. Interpret the students' current understanding of the rate of change for each of Turtle, Rabbit, and Alligator. Provide evidence from the video (including both what students verbalize and the way they engage with the technology) to support your claims.

Q3. In what ways did the technology tools the students used (e.g., the simulation applet, the spreadsheet tools) inform (or not) the students' thinking about the race? Explain.



Next, watch Gibson and Will as they reason about the Three Animals Race. Like Fiona and McKenzi, the clip begins with their prediction of who will win the race and then you will watch portions of their work as they use the simulation and spreadsheet to determine a winner of the race. While watching the video, focus on the students' language, what they do with the technology, and what they see as a result of what they do.



[Gibson & Will Engaging with the Three Animals Race Task](#)

Q4. Attend to how Gibson and Will reasoned about Turtle, Rabbit, and Alligator's distance from the starting line during the race.

Q5. Interpret the students' current understanding of the rate of change for each of Turtle, Rabbit, and Alligator. Provide evidence from the video to support your claims.



Q6. In what ways did the technology tools the students used (e.g., the simulation applet, the spreadsheet tools, the graphing calculator tools) inform (or not) the students' thinking about the race? Explain.

Q7. We often focus on equations and graphs when modeling situations mathematically. Here, the students were “forced” to use tables as one of the animals could not easily be modeled using a function that they are familiar with (i.e., alligator). In what ways might focusing on tables to represent the situation prior to creating graphs have supported their thinking about rate of change? Explain.