1056-P5-1568   **Carlos W Castillo-Garsow*** (`cwcg@asu.edu`), Arizona State University, RIMSE, PO BOX 873604, Tempe, AZ 85287-3604. *Learning the phase plane: How two students' understandings of time and rate affected their learning of exponential functions.*

The exponential property, that a quantity's rate of change is proportional to the value of the quantity, can be graphed as a phase plane diagram. In a phase plane diagram, time is implicit, and the diagram itself describes the relationship between a quantity and its rate of change. In order to use a phase plane diagram to describe the relationship of the quantity to time, a student must bring to the diagram their understandings of the interactions between time, the quantity, and the quantity's rate of change.

Derek and Tiffany are high school Algebra II students. Tiffany thinks about time passing in "chunks." For her, a month is an interval of time made up of 30 days. Her understanding of 60 miles per hour is that an hour passed and the car drove 60 miles. Derek thinks of time as continuously changing. His understanding of 60 miles per hour is that distance and time are always changing, and that they are always proportional.

This paper will discuss how Derek and Tiffany's understandings of time and rate affected their reasoning about the phase plane diagram when asked to use that diagram to make a graph of the quantity with respect to time, as well as potential ramifications for teaching the relationship between the exponential property and exponential growth. (Received September 22, 2009)