

Sample Math Ed Qualifier Exam Question

In a sequence of articles—*Talking About Rates Conceptually, Parts I and II*—authors Thompson and Thompson (1994, 1996) report on a sequence of lessons involving interactions between two teachers (Bill and Pat) and a middle school student (Ann). These interactions occurred in the context of a protracted effort to help Ann develop an understanding of speed as a rate. The authors made the following statement in both articles:

“The image of speed we intended students construct through this unit is composed of these items, which themselves are constructions:

1. Speed is a quantification of motion;
2. completed motion involves two completed quantities—distance traveled and amount of time required to travel that distance (this must be available to students both in retrospect and in anticipation);
3. speed as a quantification of completed motion is made by multiplicatively comparing distance traveled and amount of time required to go that distance;
4. there is a direct proportional relationship between distance traveled and amount of time required to travel that distance. That is, if you go m distance units in s time units at a constant speed, then at this speed you will go $a/b \times m$ distance units in $a/b \times s$.” (Thompson & Thompson, 1994, p. 283)

- a) Briefly interpret each of the items above (i.e., describe what they mean).
- b) Describe two arguably distinct ways in which the authors used the above scheme of ideas in their research study.
- c) Discuss how the authors’ use of this scheme is related to what Thompson (2008) writes about in his later article *Conceptual analysis of mathematical ideas: Some spadework at the foundation of mathematics education*. In particular, discuss this relationship with regard to the ideas of coherence and meaning elaborated in the later article.