

distinguish among students who have the two models presented by John and Derrick would have to create an assessment item that used negative velocity as its context. As shown, a positive velocity question would not indicate a student's individual model of acceleration. We credit our ability to achieve understandings of both models extending beyond their likely item response to the attempts made by John and Derrick to share the details of their thinking with the group. Thus, we are able to assert that their reasoning is, in fact, dissimilar.

VI. CONCLUSIONS

Acceleration remains a difficult concept for students to master even at the college level [9,10,11], and we observe teachers also struggling in this area. A complete understanding of the topic requires a solid grasp of vectors, coordinate systems, displacement, and velocity, ideas that are not often fully developed in the science classroom [9,10,11]. Thus, it is critical to provide students with guidance as they develop an understanding of these abstract concepts. Time constraints compound the difficulties in helping students achieve mastery.

In our study, teachers designed an item that was successful in providing insight into a student's understanding of uniform versus non-uniform motion. However, despite the fact that the primary goal was to assess student understanding of positive and negative acceleration, the item investigated in this study lacked the ability to discern between two models of acceleration as

described by two different teachers. We attribute this limitation to an incomplete conceptual understanding held by the teachers.

The potential for students to provide a correct answer for the wrong reason disrupts the feedback loop between teachers and students meant to providing learning opportunities to meet students' needs. These false positive responses promote an invalid interpretation of student performance that suggests an inflated sense of mastery and does not allow teachers to accurately resolve a student's particular conceptual model. Thus, teachers would neither be able to provide adequate feedback to students, nor could they use response data to inform successive instruction based on a specific conceptual difficulty. This limitation undermined the utility of the item as a tool for formative assessment to ascertain and respond to student ideas during the process of developing an understanding of acceleration.

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