Teachers' Conflicting Conceptual Models and the Efficacy of Formative Assessments

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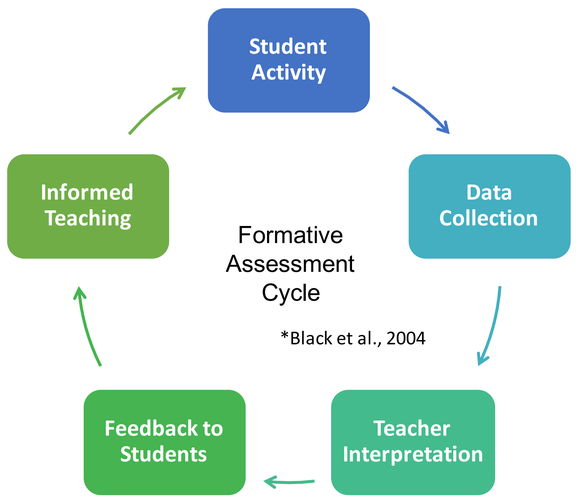
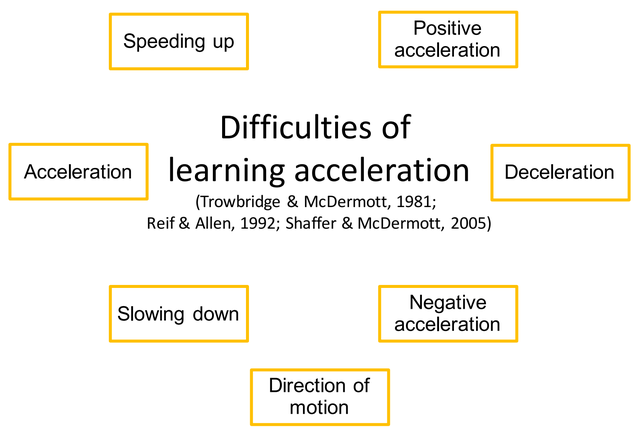
Context

- A group of four 8th grade teachers
- Creating common assessments
- Force and motion unit: Acceleration





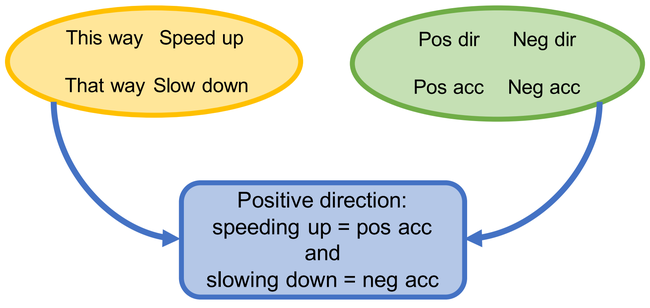
Two models were held by the teachers

While discussing the assessment design, we observed two different interpretations held by the teachers.

Speeding up = positive acceleration	Direction are independent
"Positive" is speeding up, and I think we've always used "negative" is slowing down.	The problem is that it's accelerating in that direction, but it doesn't necessarily mean that you're moving in that direction.

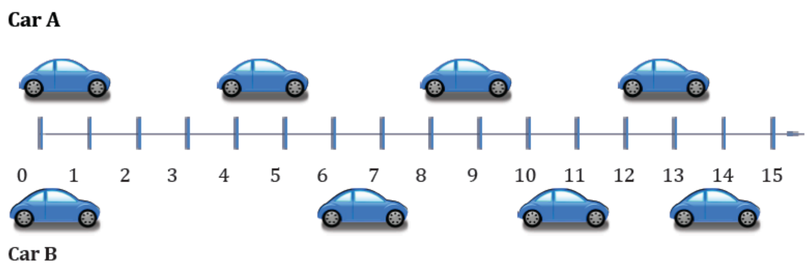
How do teachers' conflicting conceptual models affect the efficacy of formative assessments?

Parallel Agreement



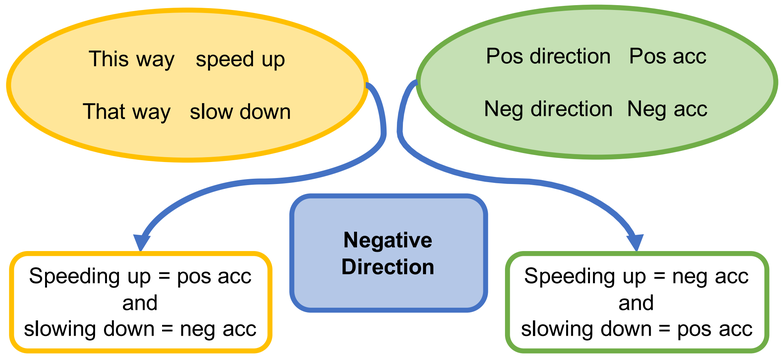
Teacher-Generated Assessment Item

4. The image below represents two cars riding next to each other. A picture is taken every second to show the cars position. The number line represents the position in meters. Use the image to answer the questions that follow.



Model	"Speeding Up = Positive Accel."	"Directions are Independent"
Inferred Response	Car B has a negative acceleration because it is slowing down.	Car B has a negative acceleration because it is slowing down in the positive direction.

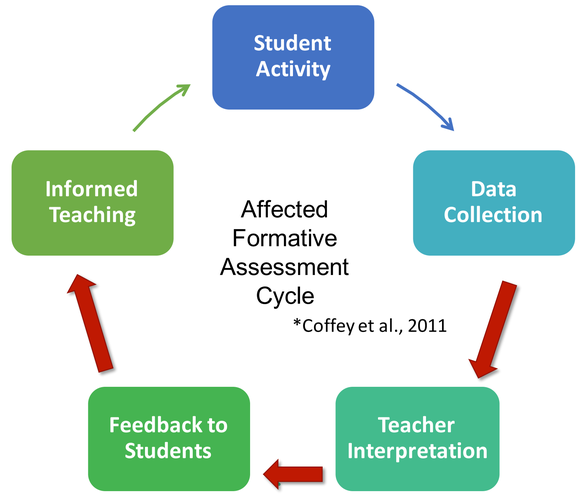
Model Contention



Resolution Due to Time Constraints

"As long as…you're moving in a positive direction, positive acceleration = speeding up, and negative acceleration = slowing down."

Situation	"Speeding Up = Positive Accel."	"Directions are Independent"
v positive, increasing	$a > 0$	$a > 0$
v positive, decreasing	$a < 0$	$a < 0$
v negative, increasing	$a > 0$	$a < 0$
v negative, decreasing	$a < 0$	$a > 0$

Conclusions

The potential for false positive student responses did not allow teachers accurately resolve a student's particular conceptual model. Thus, teachers were neither 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 formative assessment tool to attend and respond to student ideas during the process of developing an understanding of acceleration.