

## Learning Arc

3-stage process by which students use discourse as a means to achieve a consensus that resolves a concern with minimal to no direct input from the instructor.

The stages:

1. Concern is expressed
2. Students participate in concern-resolving discourse
  - Takes the form of an apprenticeship [1,2]
  - More-knowing student is the micro-expert
  - Less-knowing student is the novice
3. Concern is resolved (among the students)
  - Reach a consensus which appeases all parties

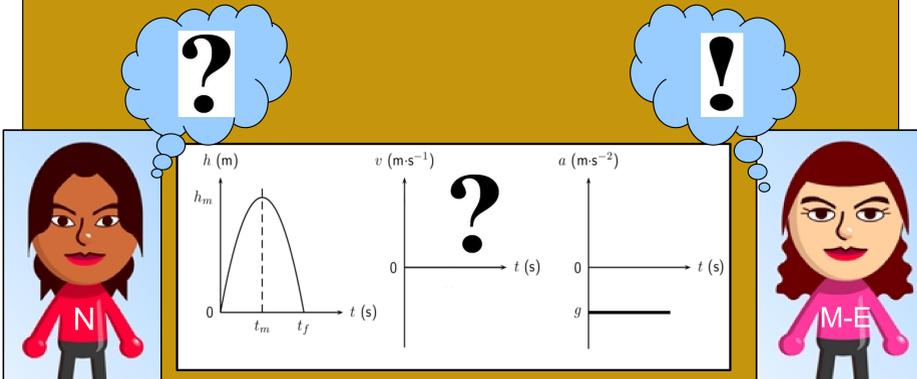
## Background/Set-up

- Group of three students (one is working independently) in a reformed Physics I classroom
- Working on activity involving plotting position, velocity and acceleration versus time graphs
- Throughout the clip, there is no direct instructor input

## Stage 1: A Concern Is Expressed

**Marta:** And...the velocity is slowing down, right?

**Ameera:** Going down, right. Is it going to be this way? That's my confusion all the time. Is it going to be this way, or this way?



The concern is explicitly stated. Ameera is confused about how the velocity versus time graph should be drawn.

## Stage 2: Concern-Resolving Discourse

**Marta:** And the way that I figure out from position, whether it's this way or that way, is I look at what's happening to it. Like, OK, the fact that it's going this way...  
**Ameera:** uh-huh.  
**Marta:** ...and like this way, instead of this way, means that you're just moving more away.  
**Ameera:** OK  
**Marta:** OK fine. And this way is you're moving closer.  
**Ameera:** Like, [give me a situation].  
**Marta:** Like...I'm driving away from you...

**Marta:** OK, so first think this, then decide what's happening... This looks like zero, so this is no acceleration...  
**Ameera:** No acceleration.  
**Marta:** ...so you're speeding up.  
**Ameera:** OK  
**Marta:** Right? This looks like zero...  
**Ameera:** mhmm.  
**Marta:** ...so you have to get smaller. Slope got smaller.  
**Ameera:** OK  
**Marta:** That means you're slowing down.

**Ameera:** Got it. OK listen, for this one let's say someone is coming towards me, right?  
**Marta:** OK  
**Ameera:** So it's gonna be this way?  
**Ameera:** draws on her paper.  
**Marta:** Right.  
**Ameera:** Right?  
**Marta:** Right.  
**Ameera:** From here, I need to decide here, like someone is...  
**Marta:** No. This is why you get confused, because look at how my lines are drawn. Like this one goes up, so these lines face like this.  
**Ameera:** OK



Novice

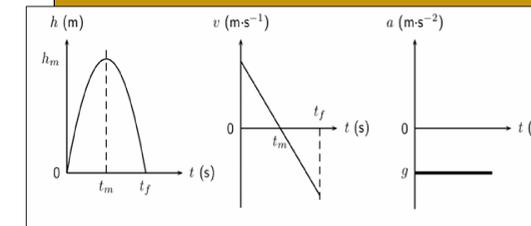


Micro-Expert

The concern-resolving discourse takes on the form of an apprenticeship [1,2]. In this case, Marta is the micro-expert and Ameera is the novice.

## Stage 3: Concern Resolution

**Marta:** Right. This one's going down, right, so my lines have to face like this...  
*Long pause (4s). Marta is drawing on her paper while Ameera observes.*  
**Ameera:** Ohh...yeah, yeah, I got it.  
**Marta:** Right?  
**Ameera:** So from there you decide. Here your slope is zero, and here your slope is zero.  
**Marta:** Right.  
**Ameera:** OK, I got it.  
**Marta:** So this is you speeding up, and this is you slowing down.



Ameera provides a recap of the consensus which appeases both Ameera and Marta, indicating the concern is resolved among the students.

## Conclusion and Discussion

- Once the Learning Arc has been completed, the students have reached a consensus, and thus resolved the concern among one another
- Correctness of consensus is irrelevant in the sense that the “Learning Arc” has been completed
- Consensus can now be referred to and applied in the future.
- Make apparent the most effective aspects of the concern-resolving discourse
- Compare to instructor-student interactions to format curricula in order to balance interactions to solve variety of concerns

## References

1. Rogoff, B. (1990). *Apprenticeship in thinking: Cognitive development in social context*. New York: Oxford University Press.
2. Jacoby, S. & Gonzales, P. (1991). The Constitution of Expert-Novice in Scientific Discourse, *Issues in Applied Linguistics*, 2(2).