Writing? But This Isn't "English" Class!

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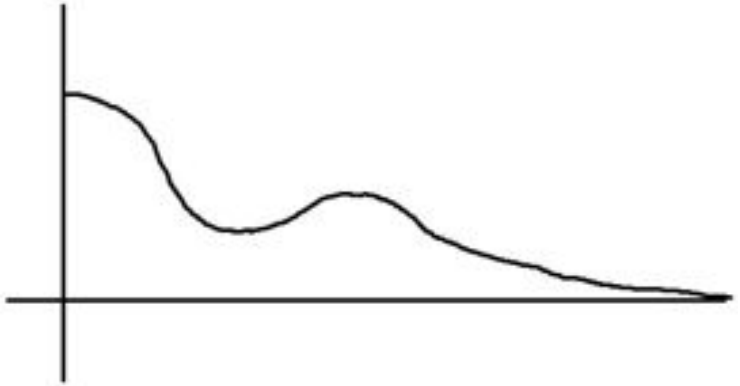
Embodiment: Walk the graph

An object is moving back and forth along a number line.

The graph to the right represents the position of the object with respect to time, t.

At your tables determine the movement of the object as time passes:
Forward vs Backward
Faster vs Slower



Writing: Now write a story that matches the graph!

What do you think students would write?

Writing: Sample (Calculus I) student stories

Position stories:

1. A ball is rolling down a hill, then it goes up a smaller hill then it rolls down some more.
2. A skydiver jumps out of a plane and opens the parachute.
3. I drive home but hit road construction so have to turn back and take an alternate route then can continue home.

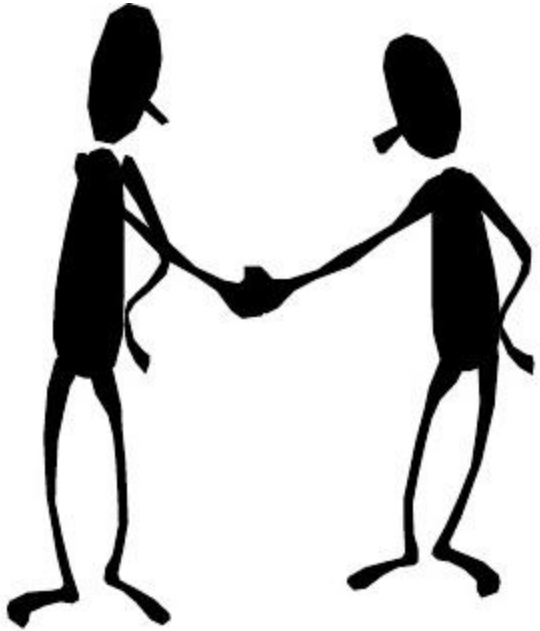
Velocity stories:

4. A ball is rolling down a hill, then it goes up a smaller hill then it rolls down some more.
5. I was running away from zombies, and I was getting tired so I was running slower and slower. Then I noticed that the zombies were getting closer, so I started running faster. Then a zombie caught me and bit my leg off, and I fell down and crawled until I could crawl no longer.

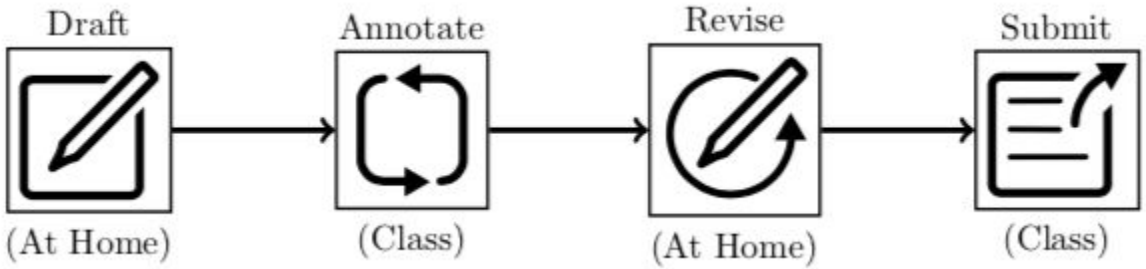
How well do you drive?

“Expert” Feedback

Peer Feedback



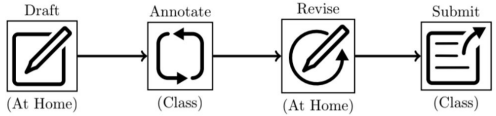
PAR = Peer Assisted Reflection (Reinholz, 2016)



Your turn!

1. Read the following problem. (also provided on handout)
2. **Work quietly on your own for a few minutes.**
3. Come up with a solution to the problem - think about what your students might do…
   a. How would it be organized?
   b. Would all parts of the question be answered?
   c. Would the solution be complete?

Class: Name:
Initial Solution Due: Instructor:
Final Solution Due: Class Time:



Write your DRAFT solution in the left column. The right column is used for feedback from your peer, which is to be done during class on the Initial Solution due date. After class, you will revise and write up your Final Solution on the SUBMISSION page. In your Final Solution, use the annotation column to explain how you did (or did not) respond to peer feedback.
(Developed from D. Reinholz's work on PAR. https://newscenter.sdsu.edu/education/crmse/daniel_reinholz.aspx)

"Three runners are competing in the 100-m dash. Runner A is faster than Runners B and C. Runner B is new to the sport, and the other runners have agreed to give him a head start in the race. Thus, Runner B starts the race at the head start line rather than the start line. The first runner to pass the finish line wins the race. In previous races, Runner A finished the 100-m dash in about 10–11 seconds. Runner B, on the other hand, has generally taken 12–13 seconds to run this same distance."

1. Compute the speeds of Runners A and B.
2. Define a "fair" head start for Runner B.
3. Determine which runners finished in first, second, and third place
4. Plot each runner's position as a function of time.

http://bit.ly/2HWYgpO

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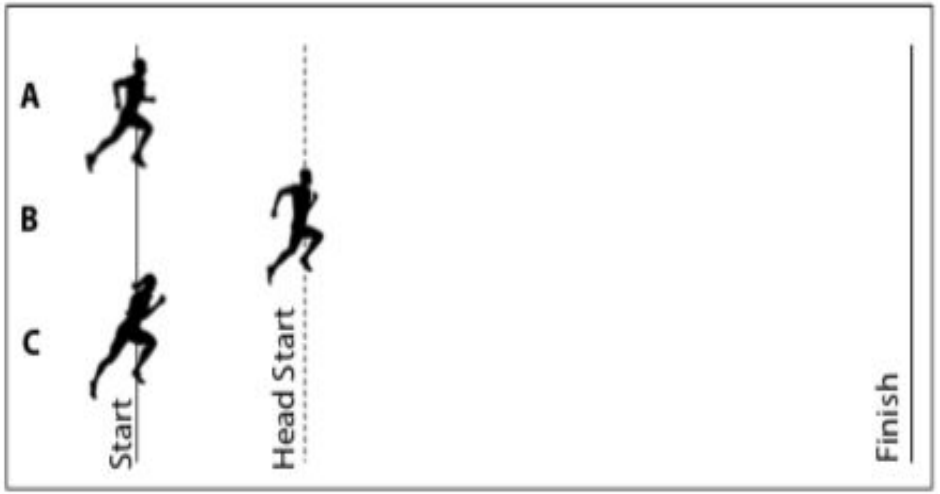
1. Which runners would finish in 1st, 2nd, and 3rd place? What assumptions are you making?
2. Based on the given info, how fast do you think Runners A and B will run this race?
3. What would be a fair head start for Runner B?
4. Plot each runner’s position as a function of time.



Now that you have had some time to work...

1. Trade your draft solution with a partner.
2. Quietly read their work.
3. Quietly make notes and provide feedback.
4. Discuss after

Benefits and challenges of the PAR process

Benefits:

1. Bring in writing expert to talk about importance of writing and then step in as the math expert
2. Build relationships with each other and provide feedback outside of class

Challenges:

1. Teaching 9th graders in NYC and it would be really challenging to have them take the work home and work on it
2. (Benefit/challenge) Scaffold language structures and establishing norms about discussing writing and clarity

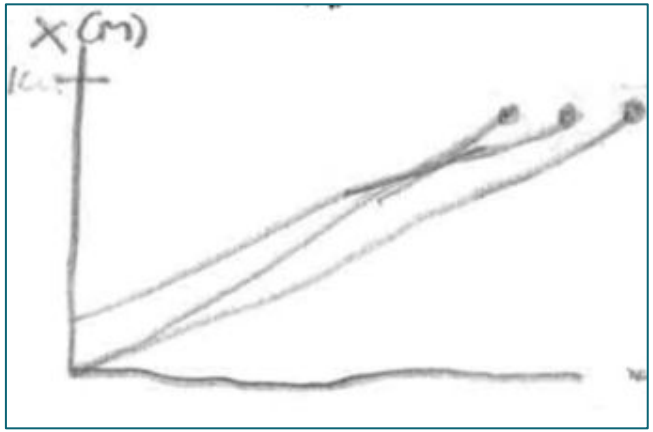
Do you think students can give each other good feedback?

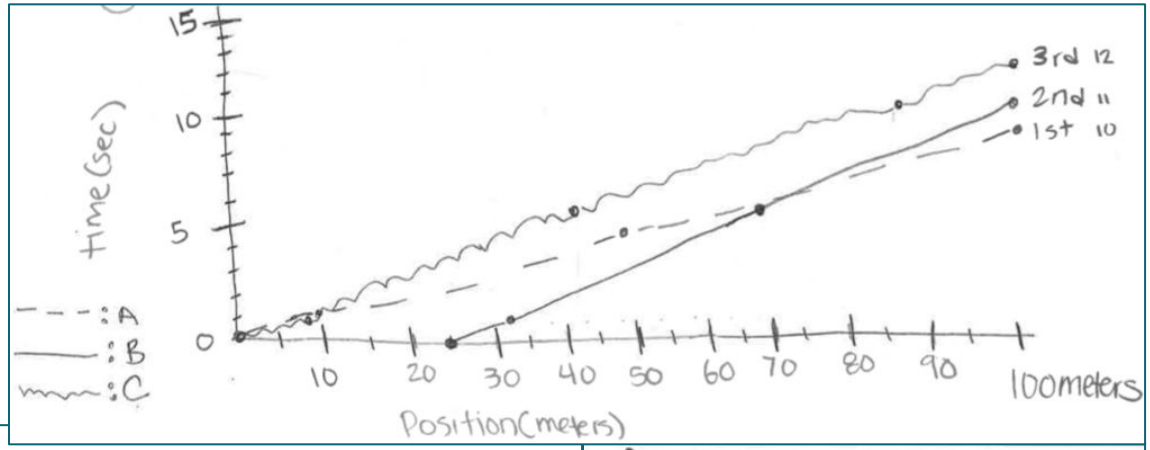
- This is a good equity question because even the students that are not as strong in math can still provide an argument for their ideas
- How can you get students to provide good feedback?
  - Have students annotate revisions
  - Have mathematical structures such as “if → then” structures
- Giving credit for feedback
- Good to model feedback but be subtle enough so that students are not constrained to a certain method of giving feedback

Examples of student feedback:

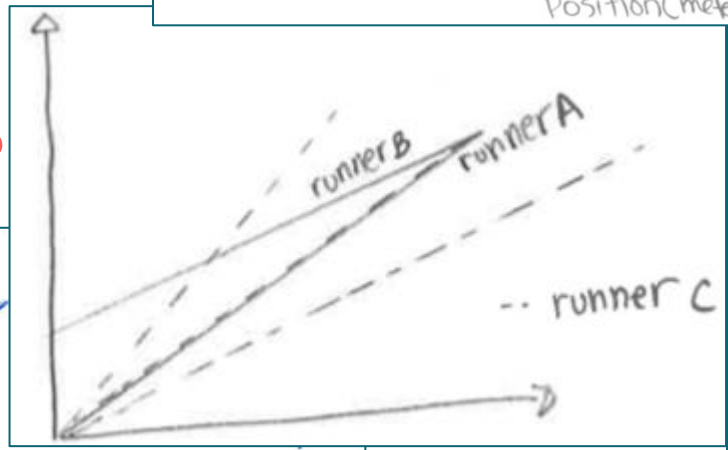
- Maybe mentioning the significance of the “10m” head start? Also, you rarely mention Runner C, so maybe when talking about your conclusion, also mention Runner C.
- It was unclear how you got the numbers for part b. You didn’t state that the head start you were using was 10m until part C. Overall you were very clear and precise with your explanations. It was easy to follow.
- I think it was a clever move to categorize the assumptions and known facts the way you did, it was clean and organized :)
- I’m not sure that the math for the head start is correct. Please clarify if possible.
- The first sentence in part (c) is difficult to understand because it seems like you forgot a few works. Please improve by checking grammar.
- In part (c) explain more what the math is showing.
    - I am confused that they will finish at the same time.
    - Show how you got 17 meters.

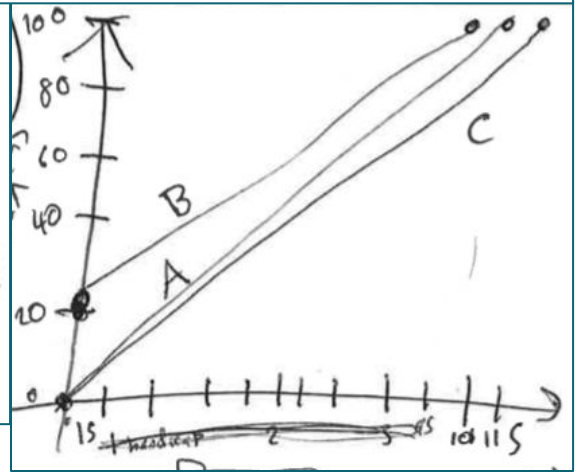
Take a moment and reflect on writing and the PAR process. Discuss at your tables.

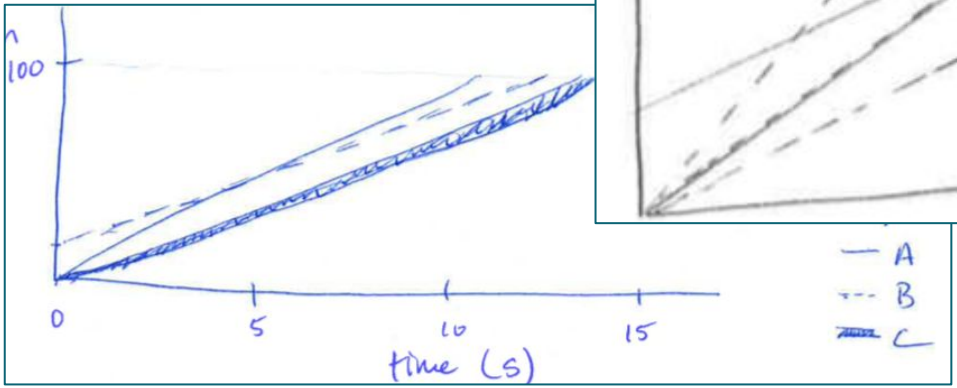




What do you notice? Wonder?







Using the 5 Practices (Smith & Stein, 2011)

How might the 5 Practices be employed in conjunction with PAR?

1. Anticipate
2. Monitor
3. Select
4. Sequence
5. Connect

Connections to the SMPs? (CCSSI, 2010)

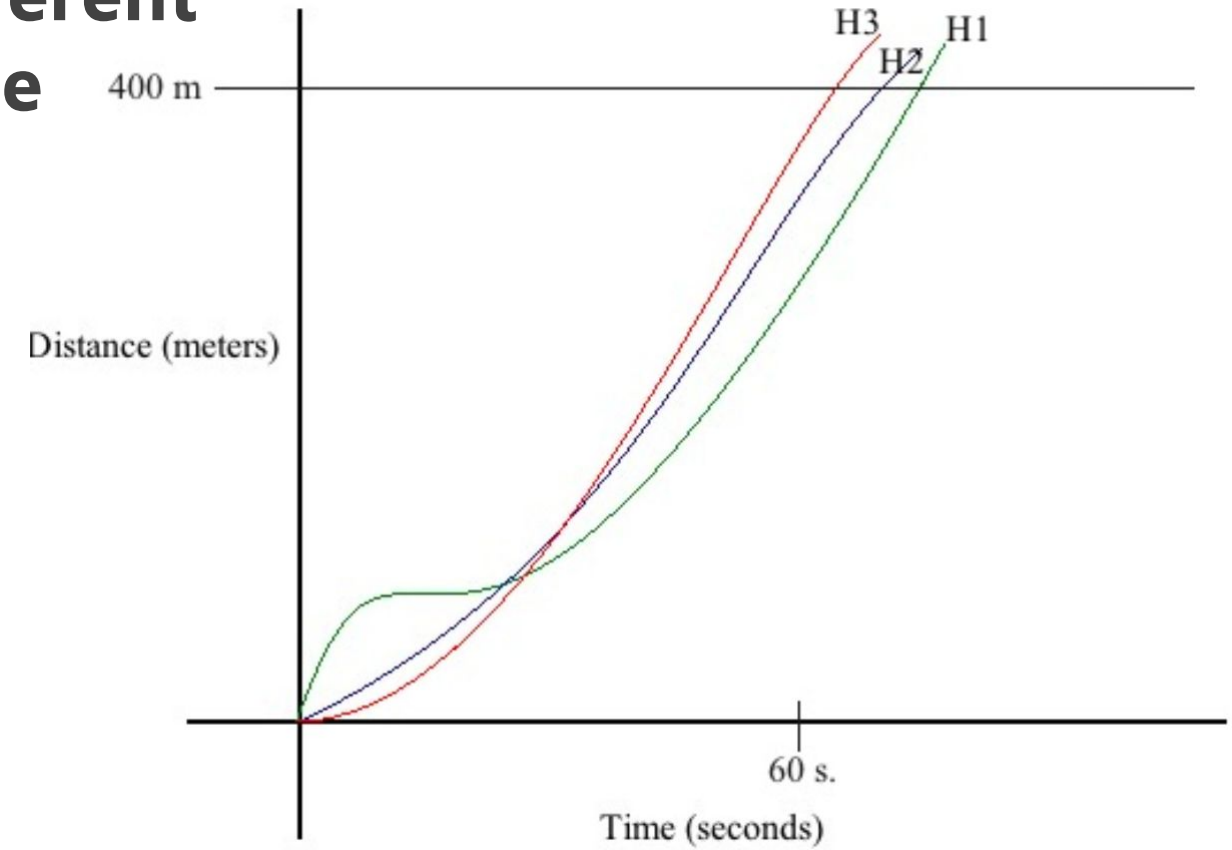
Mathematical Practice

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

Are there other ways to frame the Hurdle Race problem?

Looking at a task from a different perspective

Write a story that describes the hurdle race.



THANK YOU!

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References

1. Common Core State Standards Initiative (CCSSI). 2010. Common Core State Standards for Mathematics. Retrieved from http://www.corestandards.org/wp-content/uploads/Math_Standards.pdf
2. Reinholz, D. L. & Dounas-Frazer, D. R. (2016). Using peer feedback to promote reflection on open-ended problems. *The Physics Teacher*, 54(6), 364-368.
3. Smith, M. S., & Stein, M. K. (2011). *Five Practices for Orchestrating Productive Mathematical Discussion*. Reston, VA. National Council of Teachers of Mathematics.