

Discussions, whiteboards and questioning



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for [STEMteachersPHX](#)

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Sokolma dixit.



Warning!

My goal is to make you feel like a student would in my class so prepared to be uncomfortable

A quick little thought problem for you...





What are keys to good student discussions?

- Take 3 minutes and in your groups come up with a list of factors/keys to having good discussions. Put your top 3-5 on a whiteboard and be prepared to share.
- My top factors are...



DM

- Developed to enhance a classroom through how it is managed.
- Designed to work with any PER based curriculum (it is a classroom management technique)
- Used in class sizes of 11-72 students
- Works best in classes of 18-30.
- Use with 7th graders up to Graduate Students



Discourse Management

- Deliberate creation of a cooperative learning community
- Explicit need for the creation of models and shared tools in science (epistemology).
Example
- Creation of shared inter-individual meaning
- Seeding
- Intentional lack of closure
- Inter-student discussion
- Formative evaluation



Question Quality: Makes or Breaks the Discussion

- In your groups answer the following questions
- What makes a good question for discussion?
- Are numerical answer problems bad for discussion?
- In a discussion who should be the focus?



Ok, lets talk

- Why do I arrange you like I do for the discussions?
- What rules have I made for the discussions either explicitly or implicitly?
- What has been my roll during the discussions?
- While you were getting ready for the discussions?



How do I get students to buy in..

- First week of class is about getting them to understand how the class is going to be run
- No physics content in first week(at least the students don't recognize it right away).
- Development of class rules that grow as they become needed.



Implementing

- DON'T go home and on Monday give your students a problem like the antelope problem! You will not like the revolt that occurs
- Whatever changes you make you must do from start of semester and be consistent
- Questions for me



Odds and Ends

- Resources for questions
- TIPERs, Friday at 1:15
- Textbooks... with modifications
- Any of my materials
- Spiral Physics (google it)



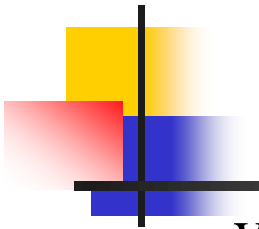
Tools for Problem Solving

- The better the tools students have the better questions you can ask
- Equations are not very good tools for students
- But, other than “problems” what kind of things do my students discuss? In other words what do my activities look like
- Going Further

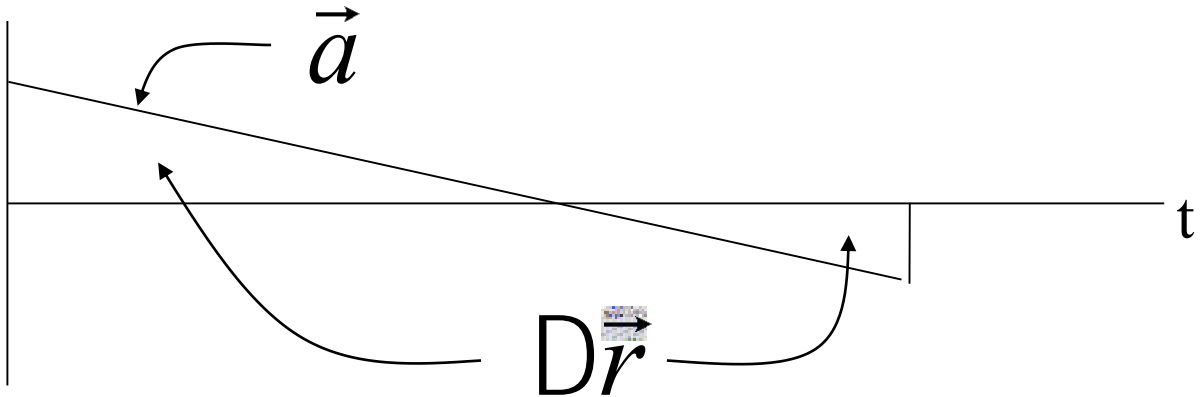


Graphs! We so undersell them!

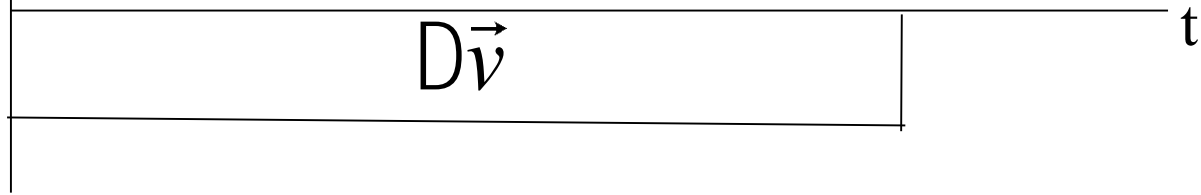
- As you might have seen from last activity I expect my students to reason and use graphs beyond lab...
- In fact I use them for all 1d problems only... i.e. I don't use the kinematic equations at all.



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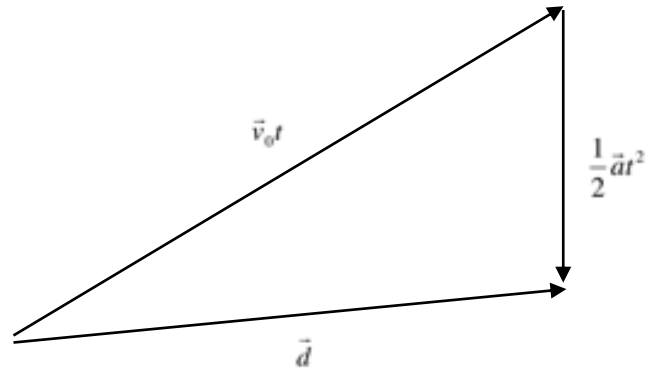
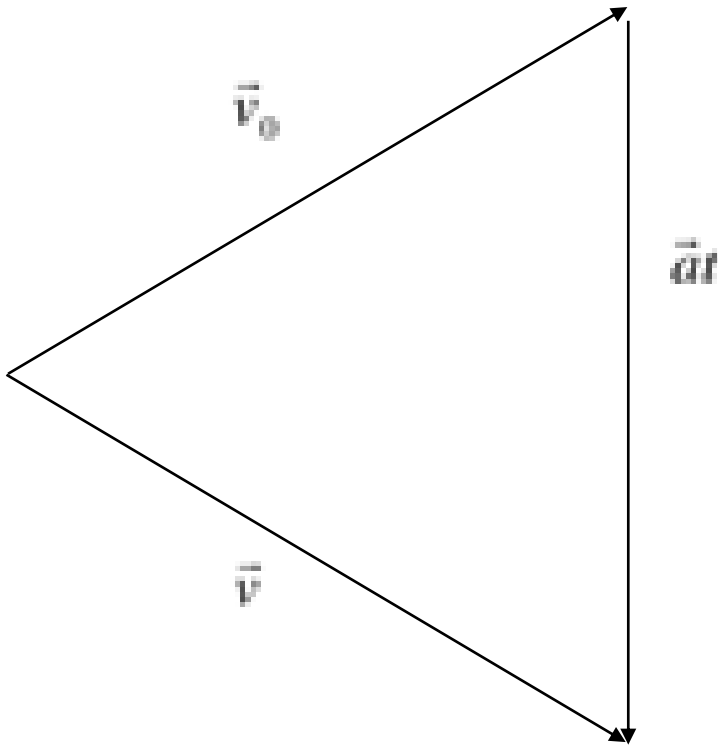
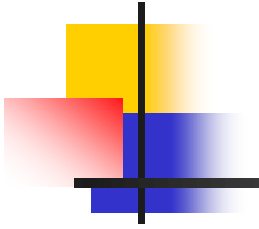
Another problem for you

An antelope moving with constant acceleration covers the distance between two points that are 80m apart in 7s. Its speed as it passes the second point is 15m/s.



Back to tools! Vectors!

- No vector avoidance!
- Both as a tool to do problems and for qualitative reasoning.
- Practice with both.





Journals: A student written “textbook”

- First I don't use a textbook
- Students must write in Journal AFTER each class period
- Must be pen! No changes
- Journals show growth in real world and in physics
- Length of entry and what do tell students about entries.