Zach Powers
PACT Task 5
1/22/05

Task 5 – Reflecting on Teaching and Learning

- ***Daily Reflective Journals***

10/25

Today was a pretty good day. We got through all the material I had planned on and the students seemed to understand the concepts fairly well. I think some students were a little confused as to why I started talking about 2-D motion with the example of blowing on a hockey puck with a leaf blower. My intention was to create a situation that was similar to what we had seen before (a hockey puck moving in a straight line) but acted in a manner that would be clearly analogous to a projectile launched horizontally. Some of the students seemed to understand how the situations were similar right off the bat, while others didn't readily see the correlation between the leaf blower and gravity. I think once I drew the force vectors on both drawings, side by side, most everyone saw how the forces were really doing the same thing (pushing the object perpendicular to the initial velocity). The students seemed most engaged when I demonstrated how a real ball launched horizontally would fly in a parabolic arc. They also seemed very interested in the outcome of the mini-experiment we did to test a student's theory of "giving it a whack to the side".

I think the hardest part of the lesson today, especially for those students already struggling with vectors, was breaking velocity vector down into horizontal and vertical components. Students who were already confident with breaking down force vectors seemed to make the transition to velocity vectors alright, but those still struggling with force vectors seemed overwhelmed when asked to think of velocity as a vector as well. However, I am hopeful that the hands-on experience in the lab, as well as the worksheet we will be doing on kicking a soccer ball to get maximum distance will clarify much of the confusion around vectors.

10/26
Although the kids seemed a little sluggish at the start of the period today, we were able to review all the things we needed to in order to be prepared to go into the lab. Everyone agreed about what they expected to see the ball do in the lab (make a parabolic arc) and agreed on the forces acting on the ball. They were a little more unclear on exactly which graphs to make in order to check if their hypothesis was right. I hadn't really

planned on asking them to tell me what the graphs looked like (didn't want to give away what we expected to find), but after a student suggested what she expected to see I kind of just went with it. I think that if I were in that situation again I would have specified beforehand that I only wanted to know what types of graphs might be useful in understanding the motion, rather than what we would expect to see in those graphs look like.

I forgot to discuss one of the possible sources of error before going into the lab, but my master teacher reminded me about 5 minutes into the lab, so I was able to draw everyone's attention to that before any groups had collected much data. I tried to get them to think about the possible effects of tilting the board, and why that would screw up their data, rather than just telling them "don't tilt the board". A few students seemed already aware of the effects of tilting the board and were eager to answer my questions about how it might skew their data.

All the students seemed very engaged in the lab and did a good job collecting data. Some were confused about how exactly to measure the distance the ball had fallen (whether to measure from the top of the paper or from the first dot). I used Socratic questioning to lead them to the answer, and all students were able to understand why they should measure from the first dot, rather than the top of the paper.

10/27

The worksheet today was a big success. The students really liked that I incorporated one of their peers into the problem. For some, I think it actually got them more engaged than they may have been otherwise. I was unsure if the level of scaffolding was too much or not enough, but it seemed to work well. I assigned random groups using playing cards and nearly every group seemed to work well together (although I have never really had problems trying to get any group to work together well). Each question seemed to ask just enough of the student to stretch their mind past what they were previously comfortable with. However, I am not sure that the students would have been able to get through it all without me circulating around and providing guidance. The one piece that almost everyone had big problems with was the question that asked them to represent a relationship in the form of an equation. I have noticed throughout the course that my students have had a very hard time taking physical situations and representing them in the form of an equation. They also have trouble representing things graphically, but have improved drastically over the last few months in that respect. I think the equations give them so many problems because they have never really been asked to perform a task like that before. It's sort of like translating something into a foreign language. Unless you understand both the root and the target domains, it will be a very hard task to go between them.

Students seemed fairly comfortable presenting solutions at the board. I think going up as a group takes a lot of the pressure off of any one student, so they all feel more comfortable talking. I have also been stressing all year that it doesn't matter weather or not they get the right answer, their responsibility is to present how they went about solving the problem, and then field questions that other student have about their solution.

➢ ***Reflective commentary (3 pages)***

1. When you consider the content learning of your students and the development of their academic language, what do you think explains the learning or differences in learning that you observed during the learning segment? Cite relevant research or theory that explains what you observed.

I think there are a number of things that may have effected what each individual student learned.

- Motivation – students motivation plays a huge role in how engaged they are willing to become with the material (Haydel and Roeser, 2002).
- View of self as a "science person" or "not a science person" – perceived ability will effect engagement, effort, and performance (Haydel and Roeser, 2002).
- Math background – comfort with vectors and trig, graphing, mathematical representation of physical relationships
- Science Background – experience with testing variables, identifying relationships, graphing relationships
- Academic English proficiency – ability to write coherent lab report and describe functional relationships
- Socio-economic background – parents ability to negotiate within the school system, procure necessary resources (supplies, tutors, good teachers, nutrition) for students to have positive school experience
- Past school interactions – related to motivation, negative views of school make them less likely to get engaged with material, more likely to goof off

References:
Haydel, A. M., & Roeser, R. W. (2002). *On the links between students' motivational patterns and their perceptions of, beliefs about, and performance on different types of science assessments: A multidimensional approach to achievement validation. CSE technical report* No. CSETR573). U.S.; California: UCLA/Center for the Study of Evaluation.

2. Based on your experience teaching this learning segment, what did you learn about your students as science learners (e.g., easy/difficult concepts and skills, easy/difficult learning tasks, common misconceptions)? Please cite specific evidence from

previous Teaching Event tasks as well as specific research and theories that inform your analysis. (TPE 13)

- Many have a hard time with inquiry in general. Students are often uncomfortable doing a lab in which they are not given a set of instructions. In this lab, as in all the labs I did this semester, I stressed understanding of why they were doing something a particular way, and how changing their methods would effect the result. At this point in the semester I think most students had become more comfortable with the inquiry process, however, some still constantly asked for me to tell them exactly what to do. Lillian McDermott and the Physics Education Group at the University of Washington have found that many students are initially hesitant to engage in inquiry science. However, they have also found that once students become engaged in the process they learn things more deeply. They have also found that physics through inquiry is accessible to a larger range of students than traditional lecture methods. In particular, inquiry is especially good for those students who traditionally do poorly in lecture-based classrooms (McDermot, 1996).
- Equations are seen as hard but important to understand, rather than being seen as a method of describing relationships. Students often ask me "what equation should I use?". I usually respond with something like "which equation describes the relationship you are trying to understand?". I try to get emphasize that understanding the relationship is the important part, and that knowing equations is secondary. One of the big things about the lab, as well as the projectile goalie worksheet was to help students understand that the equations of projectile motion (which came after lesson 3) were really just a means to describe the relationship they already understood. I think some students made progress in understanding this idea, while other remained stuck in the 'what equation should I use?' rut.

References:

McDermott, Lillian C. (1996). *Physics by Inquiry*. New York, John Wiley and Sons, Inc.

3. If you could go back and teach this learning segment again to the same group of students, what would you do differently in relation to planning, instruction, and assessment? How would the changes improve the learning of students with different needs and characteristics? (TPE 13)

- Bradford and I redesigned this lab to be computer-based, utilizing video analysis tools that allow students to put data points on a video of a projectile and generate graphs from those data points.
    - Keeps aspects of 'experimentation' because students are collecting data on an even they saw in real life
    - Downside is that there is less kinesthetic interaction with the experimentation process

- However, allows more interaction with data and ability to 'slow down' the process (by video analysis)
- Would be helpful to students who are not seeing the connection between data and graphs
- Allows for a significant prediction phases, in which students individually predict what each graph will look like, rather than
- Asessment could be done more in real time. As I circulate among groups I could see and comment on their individual predictions and they would be able to evaluate themselves as they collected data and compared graphs to their predicted graphs
- Focuses students more on concepts and analysis, rather than experimental lab methods (this is good and bad)
  - To make up for the loss of kinesthetic lab experience, students are asked at the end of the lab to make their own video which involves them creating some sort of projectile motion. Then analyzing this motion.
  - Replaces the act of doing many repetitive trials, with one trial, which is then examined in depth. This works for a lab such as this, because most of the error is introduced by the process of measuring, which is replaced with video analysis, so multiple trials are not really necessary
  - Would be important to talk with the students about WHY multiple trials are not really necessary in this particular case. Perhaps a better approach would be to have them find where the sources of error associated with the video analysis are, and decide whether doing multiple trials would help eliminate those errors.