

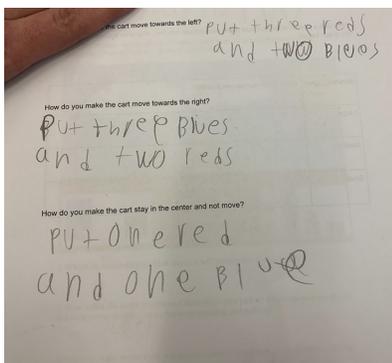
PhET Forces and Motion Basics lab
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Grade 4
10/14, 10/17, and 10/18

Introduction

I chose a PhET lab as an experience for my fourth grade class to explore the concepts of force and motion. We were between Thematic units and it fit in very well with the time we had available and the interests of my students. We are about to embark on a unit exploring erosion and the Rock cycle which will both be enriched with an understanding of how force, motion and friction work.

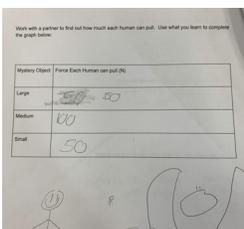
My group consisted of two fourth grade classes, twenty-four students in all. Through this experience I learned about timing and planning time for student exploration. I also found out that my students had a lot of good experiences to draw from to help explain what they were seeing happen in the applications.

Lab Experience



We started with a student inquiry activity where we introduced students to the application on the PhET website. They started with playing on the application Net Force where you have a cart full of something and a rope coming off each side. Students had some time to try many scenarios and see what would happen. After 10 minutes of exploration and conversation with peers, we had them set the tablets aside to record what they were observing using guided notes. By the time we completed the

questions it was almost the end of class so we discussed the questions to record findings.



To start our next class we started our explanation part of our lab experience with discussing balanced and unbalanced forces. We used the guided notes from the day before along with a projected version of the Net Force application to talk about what these terms mean. First the students described what they believed they meant and then we used the Net Force application to demonstrate what it looks like. Following this experience we discussed the amount of force each sized human could pull in the simulation and completed a simple graph showing our findings. We then talked about how multiple small humans would equal one medium or one large.

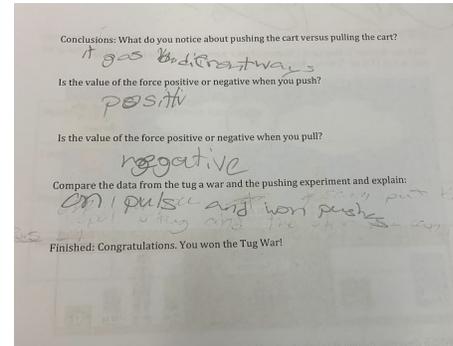
Following our definition and application of balanced and unbalanced forces we moved on to applied force. Here we followed a guided exploration portion where students were asked to complete several specific tasks using the Applied Force application. This guided students to

an understanding of positive versus negative force and the direction it is associated with. This filled the time we had set aside for the second class.

In our third class we focused on reflection and informal assessment. Students were given time to re-engage with both applications and then asked to answer some questions that directly connected with the exploration from the class before. This showed that students had a good understanding of positive versus negative forces as well as balanced and unbalanced forces. These are basic concepts but I believe that labs and/or lessons like these help lay a foundation for students to build upon when they are exploring them more deeply later on.

Conclusion:

When I first looked over this lesson to use with my students I found some parts of the original lab that were above my students skill level. I shortened the lab and re-wrote some of the questions to make it more age appropriate. The lesson overall still took more time than I was anticipating but the students were fully engaged in all three sessions. Students were also learning and exploring concepts in all three sessions. Although these concepts are not part of my curriculum plan I will continue to present these resources to my students. Students learn so much through play. We had planned to have an actual tug of war be part of the lab but unfortunately we ran out of time. We will still complete the activity as a way for students to apply what they have learned. Below I have included extra examples of work completed by students as well as pictures of them working. I was running the lab and didn't get too many pictures but I assure you the students were fully engaged the entire time.



How do you make the cart move towards the left?
By using more on the right
and a ball of mass on the left

How do you make the cart move towards the right?
Use a ball on the left side,

How do you make the cart stay in the center and not move?
Put the weak ones in

