Nathan Belcher: Lesson 1

Topic: Let's Get Moving (Movement of Objects)
Date: 5 February 2010
Subject: Physical Science
Grade level: 8
NSES Standards:

Teaching Standard B: Teachers of science guide and facilitate learning. In doing this, teachers:
- Focus and support inquiries while interacting with students;
- Challenge students to accept and share responsibility for their own learning;
- Encourage and model the skills of scientific inquiry, as well as the curiosity, openness to new ideas and data, and skepticism that characterize science.

Teaching Standard D: Teachers of science design and manage learning environments that provide students with the time, space, and resources needed for learning science. In doing this, teachers:
- Structure the time available so that students are able to engage in extended investigations;
- Create a setting for student work that is flexible and supportive of science inquiry;
- Ensure a safe working environment.

Assessment Standard A: Assessments must be consistent with the decisions they are designed to inform:
- Assessments are deliberately designed;
- Assessments have explicitly stated purposes;

Assessment Standard D: Assessment practices must be fair:
- Assessment tasks must be appropriately modified to accommodate the needs of students with physical disabilities, learning disabilities, or limited English proficiency;
- Assessment tasks must be set in a variety of contexts, be engaging to students with different interests and experiences, and must not assume the perspective or experience of a particular gender, racial, or ethnic group.

Grades 5-8 Content Standard A: As a result of activities in grades 5-8, all students should develop:
- Abilities necessary to do scientific inquiry;
- Understandings about scientific inquiry.

Grades 5-8 Content Standard B: As a result of their activities in grades 5-8, all students should develop an understanding of:
- Motions and forces;
- Transfer of energy.

SOL: PS.1

The student will plan and conduct investigations in which:

b) length, mass, volume, density, temperature, weight, and force are accurately measured and reported using metric units;
g) independent and dependent variables, constants, controls, and repeated trials are identified;
h) data tables showing independent and dependent variables, derived quantities, and the number of trials are constructed and interpreted.

PS.10

The student will investigate and understand scientific principles and technological applications of work, force, and motion. Key concepts include:

a) speed, velocity, and acceleration.

Intended Learning Outcomes:

- Student will (SW) measure time it takes a car to travel between two points as it is rolling down an incline.
- SW calculate speed of the car from the distance and time.
- SW define and contrast speed and velocity.

Daily Question: What is speed and how is it measured?

Procedures for Learning Experience	Guiding Questions	Materials Needed	**E**valuation (Assessment)	Approximate Time
Engagement/**E**xploration: Activity with car and ramp. Directions: Everything will be set up so that students may get right into the activity. Give the sheets to the students, and have them follow the directions. Walk around between groups and ensure progress.	How long does it take for the car to pass under both timers?	Stands Cars Timing Box Sensors Power Cords Worksheets	Student participation Lab worksheet	25 minutes
Explanation: Presentation about speed. Directions: Follow the presentation about speed, discussing the difference between speed and velocity, constant speed and velocity, characterization of speed and velocity, and the formula for average speed and velocity.	What is speed? What is velocity? How are they different? How are they the same? What are their formulas?	PowerPoint presentation Guided notes	Questions Notes	15 minutes

Extension: Graphing the data found from the car and ramp activity. Directions: The students took much data in the activity, and we will use this data to show that the slope of a distance v. time graph is the velocity. The students will construct three different distance v. time graphs from the three different heights of the ramp and compare the graphs.	What kind of shape is made when we connect the data points? What is the average speed/ velocity for the car?	Graph paper Paper/pencil	Student graphs	10 minutes

Notes:

Vocabulary: speed, distance, time, velocity, average speed, average velocity

Safety:
- Reminder to students not to touch anything as they enter the room and sit at their seat.
- Reminder to be gentle with equipment.

Differentiation:
- Guided notes will range from open to closed (for those with IEPs).
- For those with IEPs, I will give the equation in its final form and show the steps of solving.

Technology
- Presentation using computer and projector.
- Timing box and timers during Engage/Explore activity.

Reflection from watching the video:
- I need to do a better job of engaging the students when they come into the classroom. Yes, it was a strange day with all the snow, but having an actual WYW activity could alleviate their commotion when coming into the classroom.
- I did a decent job of fully explaining the apparatus so that they would not be so lost when starting the activity.
- The organization of groups was a bit tough, and I will get better at this when I know the students better. I will try to employ some of the grouping strategies that we have learned and see how they go.
- The students did not have too many issues with the equipment even though it was their first time using it. They seemed to enjoy using it and appreciated the chance to get to do some hands-on work.

- The biggest issue with this lesson was that groups in the 6th period class finished about 15 minutes apart from the first to the last. In all the other classes, they were only about five minutes apart, so I did not know what to do with the groups who had already finished. I was a bit of a pushover and let them "figure out" the equation for speed on their own and start their homework, when I should have been stronger and not given it to them.
- Ms. Lewis did have a good idea to have the students who were finished move the equipment to the room beside ours so that their classes could use it on the next day. This took some students who would otherwise be just hanging out in the downtime to doing something of importance, and was an idea I probably would not have thought of.
- The actual time for all the students to finish the activity was approximately 39 minutes (yikes!).
- I took some time to discuss data plotting, which worked out well because they are starting scatter plots in their math class also. I wanted them to find the independent and dependent variables, and lead a very roundabout discussion to get them to that point. During the discussion, I felt like it was going okay, it was just a matter of getting them to answer how I wanted them to answer. I also brought up the reasons for multiple trials, as a part of the overarching theme of nature of science.
- During the presentation, I brought up the differences between speed and velocity without explicitly mentioning vector quantities. I feel that they are tough for 12th graders and freshmen in college to understand, so I did not want to introduce math unnecessarily into the lesson.
- Finally, as a part of the problem-solving, I explicitly mentioned that the students must include their units in their answer. I used the three answers of 5 m/s, 4 km/s, and 4 mm/s (in hindsight I should have made them the same number) to discuss the differences in a unit, and went from there. I also may have rushed just a touch at the end because of the lost time during the activity.
- Overall, I thought it went well with the 6th period class (and the others because I taught it all day) and that it was a good introduction to speed and velocity.