Physics Lesson - Distance v. Time Graphs

**Rationale:** Physics is not currently part of the seventh grade curriculum. However, students can benefit by learning some of the concepts and math involved to strengthen their graphing skills. Students encounter graphs in all sciences and often in other subjects and real-world situations. By focusing on distance v. time graphs, students will increase their ability to interpret graphs and refresh their math skills.

**Day One: Distance v. Time Graphs – Constant Velocity**

**Objectives:**
1. Students will be able to create graphs.
2. Students will interpret a variety of distance v. time graphs.
3. Students will analyze how changing variables will affect a resulting graph.

**Materials:**
- Toy car with remote
- Overhead projector (with transparencies) OR laptop with Power Point slides and LCD projector
- Masking tape
- Meter stick
- Stop watches

**Lesson:**
Have toy car on display.
Warm-up (Students complete warm-up within first five minutes of entering class): Show concept question #1.
We decide to drive this car down the hallway at a constant speed. Which graph best represents the distance the ball travels v. the time it takes to make the trip?
- a)
- b)
- c)
- d)
Give students time to discuss question with group. Take answers, then ask, “How could we test this?”
Build on students’ prior knowledge of creating a line graph by connecting coordinate points.
Set up chart at front of the room and label x (time) and y (distance).
DQ: Will it be easier for us to measure where the ball is at a specific time or what time it takes to get to a specific distance?
Have students line up in the hallway. Have two volunteers measure out 10 m on hallway floor (making a mark every meter).
Start car and drive down the hall, having 10 students take time measurements at designated distances.
Fill in class chart as a whole class.
   DQ: Can you see any patterns between the variables?
      We said the toy car was driving at a constant speed. If you consider these numbers, were we successful?
Take suggestions about how to set up axes. Students should work in lab groups to create graph using the data compiled.

Wrap-up: Refer back to the concept question. Ask students if they changed their answer or, if not, how the graphs they created prove this. Model how to put a story to the graph.

HW: Give students a distance v. time graph showing distance decreasing as time increases. Students should create a story to go along with the graph.
Day Two: Distance v. Time Graphs with Acceleration

Objectives:
1. Students will be able to create graphs.
2. Students will interpret a variety of distance v. time graphs.
3. Students will analyze how changing variables will affect a resulting graph.

Lesson:
Review concepts from Day One. Have students share stories from homework graph.
Concept Question #2
(see attachment)
Ask for volunteers to explain their reasoning.

Concept Question #3
Charles walks down the hallway to his next class and realizes he’s going to be late, so he starts to run. Which graph illustrates the distance he travels v. the time it takes him to get to class?

a.  
b.  
c.  
d.  

Give students time to discuss question in groups.
Marks from Day One will still be in the hallway. Choose a volunteer to act as the late student and have designated students act as timekeepers.
Create a class chart of the data.
DQ: Can you see any patterns between the variables?
How does this data differ from yesterday’s data?
Physics Lesson

Creating, Interpreting and Analyzing Graphs

Day Three: Independent Exploration and Assessment

Objectives:
1. Students will be able to create graphs.
2. Students will interpret a variety of distance v. time graphs.
3. Students will analyze how changing variables affects a resulting graph.

Materials:
- Masking tape
- Meter stick
- Stopwatches
- Handout of various distance v. time graphs for each group

Lesson:
- Review concepts from Day Two. Invite students to share stories from homework graphs/answer questions.
- Pass out distance v. time graphs for each lab group.
- Assessment:
  - Students will work in groups to create stories for each graph, using the knowledge acquired during the past two days.
  - Each group will choose one graph from those given to recreate using the meter sticks and stopwatches in the hallway. Groups will rotate so one group is working in the hall while the other groups are working on their stories in the classroom.
  - Group members will complete a lab write-up to explain their interpretation of the graph, how they attempted to recreate it and the graph they drew based on their calculations.

Extensions:
- This series of lessons could continue with a discussion of the relationship between distance v. time and velocity and incorporate slope calculations and linear functions. It would connect to the mathematics curriculum and provide a real-life examples.
- I would also extend this lesson with sonic rangers if they were available, letting the students experiment with changing speed and direction.