**LESSON PLAN OUTLINE- Secondary Mathematics Version**

1. TITLE OF LESSON: *Relating Graphs to Events*
2. CONTEXT OF LESSON: This lesson would introduce time vs. distance graphs and how they can help describe real life events. Some students will conceptually understand this with little effort or explanation, where others will struggle visualizing it. This topic is essentially introducing slope in its simplest form, which will be covered heavily in the following tow lessons.
3. LEARNING OBJECTIVES and ASSESSMENT: Complete the table below to show your objectives, the level(s) of thinking required for each objective, and how you plan to assess each objective during the lesson.

Please make sure that your objectives state observable or measureable behaviors. Rather than state that “Students will understand” a particular concept, it is better to state what they will

If you choose to use observation as one form of assessment, you must include exactly what you will be looking for the students to do in order to make sure your objectives have been met. You must state how you will record your observations (e.g., observation checklist).

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| Learning Objective | Bloom | Assessment (Formative/Summative) |
| Students will relate the properties of a graph to actual events | Understand | Correct labels and descriptions on graph.  Students will match the graph correctly by walking. Those not walking will give accurate prompts. |
| Students will analyze characteristics of graphs | Analyze | Accurate responses to questions involving how the graph is different. |
| Students will define the linear behavior of graphs | Remember | During class discussion, descriptions of the graphs (inc, dec, steady) are accurate |
| Students will create a scenario and make a corresponding graph | Create | Completion of mini-project |

1. RELATED 2009 VIRGINIA STANDARDS OF LEARNING: A.7 The student will investigate and analyze function (linear and quadratic) families and their characteristics both algebraically and graphically, including
   1. determining whether a relation is a function;
   2. domain and range;
   3. zeros of a function;
   4. x- and y- intercepts;
   5. finding the values of a function for elements in its domain; and
   6. making connections between and among multiple representations of functions including concrete, verbal, numeric, graphic, and algebraic.
2. MATERIALS NEEDED: CBR, note cards with walking instructions, lab worksheets, HandiMart copies, Notetaking Guide copies, calculator, overhead, batteries, Smart Board, three different shaped bowls, pitcher of water, cart or table

PROCEDURE:

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| Time | Mathematical Tasks to be Used,  Teacher Thoughts/Actions/Questions | Anticipated Student Comments, Questions, Actions, and Strategies |
| 5-10 min | BEFORE: CBR should be set up, making sure there are fresh batteries in both the CBR and calculator. Pass out six walking cards to six different volunteers. They should not show anyone their card.  Warm up: Students will be given the Handi-Mart scenario with a blank graph. They must work individually and try to create some sort of graph that would match the verbal description.  Students should be given little guidance, but these questions could be asked to those having a hard time. This is more of a pre-assessment. Students will see after a few class periods, that given this same assignment, they can do it.  “What does the x-axis/y-axis represent?  Where did she begin?  Which direction is she going?  Is she walking towards the store or away?  How fast is she going?  Does she walk at the same speed the whole time?”  Ask student to share work and draw their graph on the Smart Board/overhead.  Discuss pieces of the graph.  x-axis = time  y-axis = distance from home  increasing lines since the distance from home is increasing  “half-way there”- line should be half the length of the final line. | Offer additional hints or questions to those who are confused.  Students will be working individually.  One student will share graph with class. |
| 15 min  25-30 min  10 min | DURING:   * Graph Match Game   Using Graph match application in TI-calculator, the calculator will display a graph. (It will have sections of increasing, decreasing and/or flat lines.) For this first graph, discuss with the class what the axis mean, the units, the tick marks, starting point, should you move forward or backward for a segment that slopes up/down?, what happens if line is flat? etc.  Use a volunteer who wants to try to match the graph by walking. Allow first person to try it again using coaching from the class.  Match another three graphs, or so, with different volunteers. Prior to the walking, class should discuss starting point, how fast they should walk and in which direction.   * Graph to Events Lab   Pass our Lab Sheet. Six students were given a walking card. Call up one student at a time to walk according to the directions they were given. After each walk, class will discuss its components and answer the questions.  Starting with walker #2, every question f is asking how the graph is different from the previous one. Ask students to talk to their neighbor first about the noticeable differences. Then discuss it as a class.  Walk and discuss all six walks. Collect lab sheet.   * Structured Notes   Use Lesson 5-1 Notetaking Guide. Do pg. 76 quickly together, then ask students to complete three questions on back.  Use three bowls and pitcher of water to *show* the rate of the bowls filling up as conclusion or as help as needed. | One student at a time will be walking, other classmates may try to coach him/her.  Students will sketch graph each walker creates as accurate as possible and answers questions about “the walk” as discussed with a class.  Students will work individually. |
| 15-20 min | AFTER:   * Small Group Project   Students will be assigned in groups of 2-3. Each group must create/invent/make up a creative time vs. distance situation that has at least four components, but no more than seven. Each group will then create a graph that corresponds to the story, clearly labeling each axis and each piece of the graph and how it relates to the story. They will display the graph neatly on a poster board/big paper for the class to see.  Depending on time, this project will probably be turned in next class. Then allow students to do a Gallery Walk to read and look at their classmates projects.  Projects will be graded according to given criteria. | Students will work in groups. |

1. MEETING THE NEEDS OF ALL STUDENTS:
2. WHAT COULD GO WRONG WITH THIS LESSON AND WHAT WILL YOU DO ABOUT IT? Time! This lesson might be too much! I wanted to do it all, but it may need to be split into two days to cover all the information. Technical difficulties. I could always just draw a few graphs on the board similar to what the CBR would have done and discuss the pieces if CBR isn’t working.
3. CONNECTION TO CTA: I have loved working with the CBR in the past and also wanted to do some form of a mini-project like Brian Nussbaum showed us. I thought this topic would allow for some creativity for the students and let me practice with a rubric! John Strebe also taught us about kinetic learners and I thought this lab was perfect for that.



