Mathematics Lesson Plan (for grade 7)

For the lesson on Wed. May 20th
At Cambrian Middle School
FiMC
Instructors: Jake Disston/Jesse Ragent

1. Generalizing on Multiple Representations on Functions
2. Goal of the Lesson
   - Help students move from learning and doing procedures to looking for generalizations about types of graphs and their equations.
   - Making connections between graphs and equations, moving from specifics to general.
   - Opportunity to use language to communicate mathematical ideas and to reach agreement about mean of words and recognize the importance of commonly shared definitions.
3. Relationship between this lesson and:
   - State Standards 3.3 Graph linear functions, noting that the vertical change per unit of horizontal change is always the same and know that the ratio is called the slope of a graph.
   - State Standards 1.5 Represent quantitative relationships graphically and interpret the meaning of a specific part of a graph
   - The chapter in the class textbook goes from introduction of input/output tables; graphing simple equations in the form $y=mx + b$ or $y = ax^2$; graphing equations with exponents; and slope.
   - MAC Core Ideas: 7th Algebra and Functions:
     - Represent, analyze, and generalize a variety of functions including linear and simple exponential relationships.
     - Relate and compare different forms of representation for a relationship including words, tables, graphs in the coordinate plane, and symbols.
4. About this lesson:
   This lesson was developed after teaching a lesson on having students sort and make sense of equations. The idea in the first lesson was to see what ways students might sort or name different types of equations, could they start to look at attributes of equations or think about number strings as objects.

   In this lesson, designed to come at the end of a unit on equations and graphing, we want to see what attributes of graphs students might detect, what words would they use to describe those attributes. Then we wanted to push students to see relationships between equations, tables, and graphs. If you were given one of these, what might you use to predict things about the other representations.

   Because we wanted the effort or cognitive demand to be around looking at features, we decided to give students graphs, tables, and equations. We decided to use a matching activity to promote conversation about the mathematics and help students to talk about what they know. Originally we wanted to do an open investigation, but then because of time constraints narrowed the scope of the lesson. As a follow-up, we are hoping students will generate some ideas for further exploration that might be used as a problem of the week or a next lesson.

This lesson starts with giving each group a set of graphs and having them develop categories and sorting the graph. This will be followed with a class discussion about features of the graphs and ways they might be sorted. Next students will take turns in the groups matching a graph to an equation and table. Students will be given a protocol for how to discuss their ideas. The idea of a matching is to give students the opportunity to choose (so hopefully every student has an entry point); mistakes can easily go away as the student talks and realizes an error; and there is nothing but the mathematics to talk about.

Wrap up: Students will be asked to write about this experience. What in the table or the equation was most helpful for matching with the graphs? What clues did you pay attention to?

Next lesson the teacher will do a re-engagement with the activity: What are things that we can predict about the shape of the graph by looking at the equation. For example:

- I know its straight if . . . .
- I know where it crosses the y-axis by . . .
- I know its curved if . . . . .
- ….?

Students will be asked to make convincing arguments by giving a new example to back up their conjectures (e.g. a new equation, table, graph).

Protocols:
Matching –
The matcher thinks out loud giving mathematical reasons for selections.

Group mates listen closely and ask questions if they disagree.

All students should be trying to use the mathematical language that was generated from the whole class discussion.

5. Data collection points:
    a. What features of the graphs do students use in sorting?
    b. Do you notice change in the types of language and features discussed during the lesson? How does the lesson contribute to their use of academic language?
    c. What features of the table do they look at in making the predictions?
    d. What features of the equations do they use in making predictions?
    e. What conjectures do they make? Can they make justifications?