Stephanie Miller’s Lesson Plan

Lesson: Introduction to Relations and Functions
Length: 35 minutes
Grade: Algebra I

Academic Standard: A1.3.3 | Understand the concept of a function, decide if a given relation is a function, and link equations to functions.

Performance Objectives:
1) Given graphs of relations, the students will be able to identify if the relation is a function with 80% accuracy.
2) Given simple polynomial equations, the students will be able to sketch the graph of the equation with 80% accuracy.

Assessment:
The students will complete a take-home worksheet containing five graphs of relations and five simple polynomial expressions (plus an extra credit problem) with 80% accuracy.

Advance Preparation by Teacher:
1) Print out worksheets
2) Make key
3) Bring in a pack of gum, 1 large Hershey’s bar, and 30+ mini Hershey’s bars

Procedure:
Introduction: “Today we will be learning about relations and functions. You can think of relations as a vending machine. I put in $.75 and out came a pack of gum. If I put in $1.00, out comes a Hershey’s bar. What I get depends on how much I put into the vending machine. Please make sure to throw the wrapper away.”

Step by Step Plan:
1) Have students get out their notebook.
2) Explain that while a relation can be thought of as a vending machine, it is more formally thought of as a set of ordered pairs.
3) Write a set of ordered pairs on the board. “The first number is called the domain, which is your input, or your money in the vending machine example. The second number is called the range, which is your output, or your candy in the vending machine example.”
4) “If we use numbers for both our input and output, we can sometimes find a pattern to how the numbers are related, in which case we can write an equation to show the relationship.”
5) Write $y = 2x + 1$ on board. This is a relation because what we get for $y$ depends on what we plug in for $x$.
6) Ask a student, “Can you make the distinction between which variable is the input and which is the output?” Answer should be $x$ is the input or domain and $y$ is the output or range. (Bloom: Analysis)
7) “Since we can write it as an equation, we can now graph it.” (Graph the equation)
8) “Now let me clarify. This is the graph of the relation. Whatever we put in for x, the line represents what we would get for y.”

9) “When we have the graph of a relation, it is easy to tell whether it is a function or not. We simply put it to the vertical line test.”

10) “To use the vertical line test, take a straight edge, and place it vertically on the graph.” Take yardstick and demonstrate.

11) “Then we move the straight edge along the graph to see if at any point, the relation touches the straight edge at more than one point.” Demonstrate.

12) “Since this only touches the straight edge once everywhere, this relation is a function.”

13) “What would happen if we had a relation like this?” Draw $y = \pm \sqrt{x}$. (Bloom: Synthesis)

14) “I want you guys to tell me to stop when if the line touches the yardstick twice.” Slide yardstick slowly across graph.

15) “You can see that the line touches up here and down here while I hold this straight edge vertically. Thus this relation is not a function.”

16) “I am going to draw three graphs, and with your neighbor, I want you to decide which of them are functions. Draw:

17) “If you have trouble visualizing a straight edge going across, draw it on a piece of paper and use a pencil as your straight edge.” Give students a few minutes to decide. (Gardner: Interpersonal, Visual-Spatial (if they can visualize it), Bodily-Kinesthetic (if they used a straight edge))

18) Ask students what they decided. Second graph is the only one that is a function.

19) “So we have discussed linear equations, and quadratic equations previously, and we have also talked about translations, where you move the graph up or down”

20) “The graph of x is a diagonal line. Recall that x+3 is the same line, only moved up or down. 2x+3 is slightly steeper than x+3, but crosses the y-axis at the same spot.” Draw these lines.

21) “All of these lines have the same general shape. The same holds true for an equation like this: $y = x^2$.” Draw it. “The only difference is the shape is a U. Adding a number moves the entire graph up. Putting a negative in front of the x flips it across the x-axis.”

22) “$y = x^3$ has a shape like this.” Graph it. “Who can tell me what happens if we add 3?”

23) “Right, we will move it up 3 units.” Graph this new line, so the students see the shift.

24) “Any questions?”

25) “Okay, so now it is time for you to try. I have a 10 point worksheet that is due tomorrow.” Pass it out.

26) Explain directions. Tell them for part two, it is okay to draw the original lightly, then add the shift.
Closure: With 2 minutes left, ask three students to share what they learned today.

Adaptations/Enrichments:

Student with a Learning Disability in Basic Reading Skills: I would make no changes to this lesson because the only reading that needs to be done is reading the instructions, which I verbally explained in my lesson.

Student with ADHD and Emotional Disabilities: To keep the student on task, I will be sure to stay near the student when not helping other students to re-direct him or her when I can tell they are not paying attention. If the student becomes emotionally stressed, I will ask the students nearby to stay clear, and I would give the student some time to calm down.

Students with Gifts/Talents in Math and Reading: If the student gets done with the worksheet in class, I would challenge the student to write an explanation of why the vertical line test works. This would challenge them mathematically and would require them to analyze the book and their notes. This would apply to all students who got done early as well. (Bloom: Synthesis)

Self-Reflection:

1) This lesson engages students first by using vending machines and snacks as my “hook.” Then I give the students to work cooperatively when they work with partners.

2) Information processing because I gained their attention by related the topic they would recognize (vending machines), and gave them a chance to rehearse what they have learned by giving them a worksheet. In future lessons, I would give the students review questions for maintenance rehearsal, in the hopes that the information would be stored long term.

3) I would like to know what math classes they have taken because this lesson really only works for an Algebra I or Pre-Algebra student. If I were in Geometry, this lesson would be a little out of place.