*** Disclaimer: The following lesson was a math lesson for Problem Solving Friday.*

Problem Solving Friday is a program I started in my 4th grade student teaching placement. It is a day dedicated to developing students' flexible and critical thinking skills in the context of mathematics. The whole lesson focuses on one problem that the students must solve while tracking and defending their thinking and understanding the thinking of others.

Smile vs. Frown Lesson Plan

Essential Questions:
How are each of the rows/column similar? How are they different?
Do you notice any patterns?

Key Vocabulary

- Compare/Contrast
- Difference
- Pattern
- "_____ has one* more than _____"
- "First*, I…"

Learning Objective:
Students will formulate a strategy to solve the problem.

Students will identify patterns that appear in the problem.

Common Core Standard:
CCSS.MATH.CONTENT.4.OA.C.5 Generate a number or shape pattern that follows a given rule. Identify apparent features of the pattern that were not explicit in the rule itself.

Key Common Core Mathematical Practices:

-Make sense of problems and persevere in solving them.

-Construct viable arguments and critique the reasoning of others.

Plan For Assessment:
I will ask questions to evaluate students' understanding of the problem. I will also have a rubric in which I will put check marks in each box when I see a student at that level. This will allow me to see a trend and be able to use that to further instructional decisions. If a student seems to be struggling on several parts, I will create a separate rubric for that student in order to give him/her more specialized help.

Possible Misunderstanding:
-There are more smiles in a line then frowns and it is worth the most money, therefore smiles must cost more than frowns.
-I cannot solve this because I don't know the value of any of the faces.

Lesson Plan Sequence	Time	Anticipated Student Thinking	Responses to Student Thinking
Launch/Beginning/Connect to Prior Knowledge/Clarify Expectations			
I will begin by talking about what a pattern is and we will create a classroom definition on the board. I will then give the students a warm up problem: "I went to the bakery and bought 2 donuts and 1 piece of cake for $10. If I know the cake was $4, how much is 1 donut?" ---$3 I will allow the students to first work individually, then consult with their group. As they are doing that, I will draw a picture on the board of 2 donuts and 1 cake. Then we will come together as a group and talk about the answer and talk about just because there are more donuts that doesn't necessarily mean that donuts are more because there are more of them. Then I will talk about if I changed my total to $14, the donuts would cost more than the cake, so we cannot tell what cost more by how many we have.	15 min	10-4= 6 6/2= 3 $3 per donut 10-4 = 6 $6 per donut 10-8= 2 $2 per donut	Why did you start by using subtraction? Why isn't 6 your answer? If we have two donuts and 1 piece of cake, what would be the total when you add 4, 6, and 6? What does the eight represent? How many pieces of cake do we have?

Explore/Middle/Support Student Thinking			
I will hand out a problem for each student. Explain that they will begin this problem individually and try to develop their own thinking. When they think they have a good idea of what their thinking is, then they can turn to a partner and combine their thinking and then finally consult with their group.	30 min		Do you notice any patterns? Are any of the rows or columns similar? How are they different? Can that help us solve this problem?
Summarize/Connect/Unpack/Extend/Bring Closure/Facilitate Discussion			
• Have students share their strategies (either up on the whiteboard or not, whatever is comfortable) • Ask specific kids with good ideas if they are willing to share (during explore walk around and find good strategies) • Other students will restate what other students did for some of the strategies that were shared. • Collect student work to assess understanding	15 min		Can someone repeat what they said? Does anyone disagree? Does anyone need more clarification from the expert? Did anyone do it a similar way? A different way?

WHICH IS WORTH MORE, A SMILE OR A FROWN?