7th Grade Mathematics Lesson Plan

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Van Buren Middle School, Albuquerque, NM

Instructor: Akihiko Takahashi

1. Title of the lesson: Playing Math Fever
2. Goal of the lesson:
   i. Explore the use of and appropriate notation for positive and negative numbers in applied settings
   ii. Deepen students' understanding of the number system by using number lines and number sentences to extend their understanding of positive numbers to negative numbers
   iii. Help students become good problem solvers by
      i. encouraging them to use their prior knowledge to examine a problem situation in order to develop their ability to use logical reasoning to make conjectures, and
      ii. encouraging them to examine and justify the conjectures presented by their peers in order to find a solution to the problem.
   iv. Provide opportunities for students to recognize the importance of working with their peers in order to deepen their understanding of mathematics
3. About the unit
   i. Name of the unit: Extending the number system (Investigation 1 in the Accentuate the Negative)
   ii. Goals of the unit:
      - Explore the use of and appropriate notation for positive and negative numbers in applied settings
      - Interpret and write number sentences
      - Locate positive and negative numbers on a number line and compare and order them
      - Understand the relationship between a positive or negative number and its opposite (additive inverse)
      - Write number sentences to reflect the actions and results of changes in situations and to find missing values
      - Develop and use both a number line and a chip model for representing addition and subtraction
   iii. Plan of the unit (Total 5 periods + 1 periods for Mathematical Reflection)
      1.1 Playing Math Fever (1 period) *This lesson*
      1.2 From Sauna to Snowbank (1 period)
         - Locate positive and negative numbers on a number line
         - Compare and order positive and negative numbers
         - Understand the relationship between a positive or negative numbers and its opposite (additive inverse)
      1.3 What's the Change? (1 period)
         - Write number sentences to reflect the actions and results of changes in situations and to find missing values
         - Develop and use a number line model for representing addition and subtraction
      1.4 In the Chips (1 period)
         - Develop and use a chip model for representing addition and subtraction
         - Interpret and write number sentences
      1.5 Mathematical Reflection (1 period)

   (Teacher's Guide for CM2 Accentuate the Negative, pp.12-35)
4. Content connections to other units in Connected Mathematics 2

Contents goals of the lesson	Prior work
Explore the use of and appropriate notation for positive and negative numbers in applied settings	Understanding of whole numbers and rational numbers (Prime Time, Bits and Pieces I, II, & III)
Deepen students' understanding of the number system by using number lines and number sentences to extend their understanding of positive numbers to negative numbers	Understanding and applying arithmetic operations with rational numbers (Bits and Pieces II & III) Using a number line to develop equivalence and operations of fractions and decimals (Bits and Pieces I, II, & III)

5. Instruction of the Lessons

According to the *Principles and Standards for School Mathematics* (National Council of Teachers of Mathematics, 2000), one of the major goals of number and operations in the 6-8 grade band is to develop meaning for numbers, which includes negative numbers, and represent and compare quantities with them. Then, students are expected to be able to extend their understanding of the meaning and effects of arithmetic operations to negative numbers.

Prior to the middle-grades, students had the experience of connecting negative integers to informal knowledge derived from everyday life. Based on such experiences, middle-grades students should be able to extend this initial understanding of numbers and refine their understanding of the number system. It is also important for students to refine their understanding of addition, subtraction, multiplication, and division as they use these operations with fractions, decimals, percents, and integers. Throughout this process, it is crucial for students to extend and refine their initial understanding of numbers and operations in order to recognize that negative integers are just like positive integers, fractions, and decimals. In other words, students should be able to recognize negative numbers as a part of the number system that they have learned.

One of the challenges for students is that negative numbers and positive numbers seem to be different. For example, some students might say that calculations with negative numbers are different and follow different rules than calculations with positive numbers. However, when students carefully study basic operations, they should be able to recognize that the commutative, associative, and distributive properties of addition and multiplication still hold not only for positive integers but also for negative integers.

When students are able to extend their initial understanding of number and operations to negative numbers, their understanding of numbers and operations becomes deeper and more comprehensive. For example, students' understanding of subtraction from elementary grades is limited to only situations in which the minuend is larger than or equal to a subtrahend. But by extending the range of numbers, students can see that subtraction can always be done. Moreover, students are expected to understand that subtraction is a form of addition. By considering that negative numbers, addition and subtraction can be unified and expressions which contain both addition and subtraction can be seen and manipulated as sums of positive and negative terms.

Considering the above expectations, this lesson should provide students with an opportunity to recognize that when the range of numbers needs to be extended, negative integers are necessary. In order to incorporate negative integers into the number system that students have already learned, students must extend this initial understanding of numbers and refine their understanding of the number system.

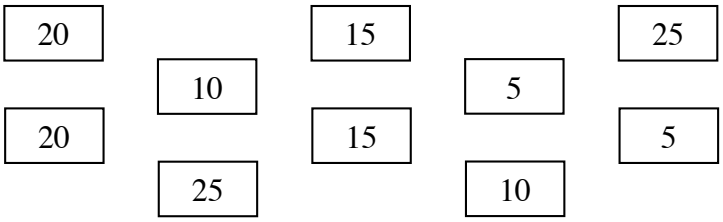
The first investigation in the *Accentuate the Negative, Connected Mathematics Series, Connected Mathematics 2 (CM2), Extending the Number System*, begins with an activity called *'Playing Math Fever'*. The activity is designed for students to recognize that negative integers are necessary and begin to understand that negative integers hold the same properties as positive numbers such as, they can be placed on a number line, they can be used to compare the size of numbers, and they can be added or subtracted. The activity uses a game that is similar to a popular TV game show as an applied setting in order for students to make a connection to everyday life.

Based on the activity in CM2, this lesson is designed as an introduction of negative integers for students. In order for students to see that negative integers are necessary when the range of numbers needs to be extended, the original problem from CM2 will be modified for this lesson in the following ways:

i. In order for students to be able to understand the situation, the lesson will begin with playing the game.
ii. In order to engage students with different levels of previous mathematical experiences, the lesson will focus on helping students to recognize the relationship between positive and negative integers.
iii. To help students visualize the relationships between positive and negative integers, a large number line will be displayed on the chalkboard throughout the lesson so that students can use it as a communication tool to understand each other.

6. Flow of the Lesson

Learning Activities, Teacher's Questions and Expected Students' Reactions	Teacher's Support	Points of Evaluation
1. Introduction to the Problem By answering questions that the teacher will ask, students will become familiar with the game, which is similar to a popular TV game show. · The front of each card shows a point value. · The back of each card has a question. · The game is played in teams. · The teacher asks the question on the back of the card. · If the team answers the question correctly, the point value on the card is added to their score. · If the team answers the question incorrectly, the point value on the card is subtracted from their score. **Posing the problem (1)** After each team has answered four questions as described below, what is the score of each team? Team A · The first question: Correct (Point value 5) · The second question: Correct (Point value 10) · The third question: Incorrect (Point value 20) · The fourth question: Correct (point value 20) Team B · The first question: Correct (Point value 5) · The second question: Incorrect (Point value 10) · The third question: Correct (Point value 15) · The fourth question: Correct (point value 15) Team C · The first question: Incorrect (Point value 5) · The second question: Incorrect (Point value 10) · The third question: Correct (Point value 15) · The fourth question: Correct (point value 20)	Use easy questions to help students familiarize the game. Special attention should be paid to students who never heard of the TV game show. The first two questions should be easily answered by the students in order for them to see that addition can be used for calculating the score.	Do students understand the situation?
2. Problem Solving Working with a partner, students try to find the answer to the problem. Anticipated students' responses: a) Team A: 5+10=15, 15-20=-5, -5+20=15 Team B: 5-10=-5, -5+15=10, 10+15=25 Team C: -5-10=-15, -15+15=0, 0+20=20 b) Team A: 5+10=15, 15-20=0, 0+20=20 Team B: 5-10=0, 0+15=15, 15+15=30 Team C: 0-10=0, 0+15=15, 15+20=35 c) Team A: Correct 5+10+20=35 Incorrect 20 Total 35-20=15 Team B: Correct 5+15+15=35 Incorrect 10 Total 35-10=25 Team C: Correct 15+20=35 Incorrect 10+5=15 Total 35-15=20	Encourage students to use the knowledge that they learned previously. Provide students with worksheets to keep their work for the whole class discussion.	Can each pair of students find a way to determine the score by using their previous learning?

d) The scores for all three teams cannot be determined because it cannot be calculated.		
3. Discussing Students' Solutions (1) Ask students to explain their solutions to the other students in the class. (2) Facilitate students' discussion about their solutions, then lead them to realize the meaning of negative integers. (3) Help students to deepen their understanding of addition and subtraction.	Write students' solutions and ideas on the blackboard in order to help students understand the discussion. Encourage students to use the large number line on the board to explain each team's performance.	Can students explain their solutions to their peers? Can students examine and justify the solutions presented by their peers?
4. Summarizing the discussion (1) By finding the final score of each team if all the teams cannot answer the final question with the point value 35. (2) By using a number sentence to summarize each team's performance and overall score. (3) By using the number sentence and a number line to explain each team's performance.	Help students to see that a number sentence can be used to describe the process of each team's performance.	
5. Deepening understanding of negative integers A team reached -5 points after they answered the following three questions from the following point values. Write a number sentence to describe how the team reached the score.  Some of the anticipated students' responses · 10-10-5=-5 · 25-20-10=-5 · 15-10-10=-5 · 10+20-25=-5 ·	Use an open-ended problem to encourage students to use their previous learning to find multiple ways to determine the score. Encourage students to use the large number line on the board along with number sentences to explain each team's performance.	
4. Summing up (1) Using the writing on the blackboard, review what students learned through the lesson. (2) Ask students to write a journal entry about what they learned through this lesson.	Encourage students to use the writing on the board as a reference when they write the journal entry.	

Board writing plan

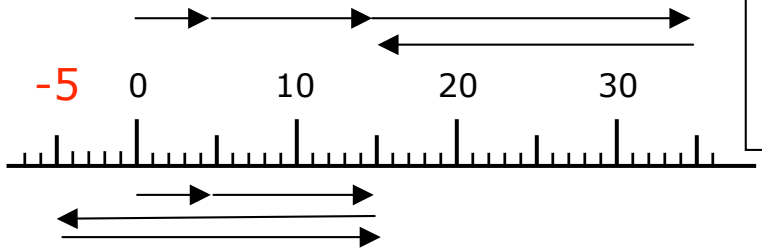
5	5
10	10
15	15
20	20
25	25

5 + 10 + 15 = 30

5 + 10 - 15 = 0

Team A

Correct 5+10+20=35
Incorrect 20
Total 35-20=15



5+10=15,
15-20=-5,
-5+20=15

Team B

5-10=-5, -5+15=10, 10+15=25

Team C

-5-10=-15, -15+15=0, 0+20=20

A team reached -5 points after they answered the three questions. How the team reached the score.

- 10-10-5=-5
- 25-20-10=-5
- 15-10-10=-5
- 10+20-25=-5