

NCTM – April 2014

USING STUDENTS' MISCONCEPTIONS TO CREATE INSTRUCTIONAL TASKS

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1

Goals

- Examine the developing mathematical thinking framework
- Identify common misconceptions in student thinking
- Utilize student work containing common misconceptions to write 'critique the reasoning of others' problems
 - Warm-ups
 - Tasks
 - Assessment items

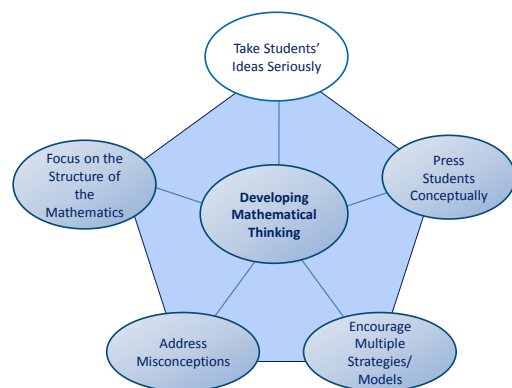
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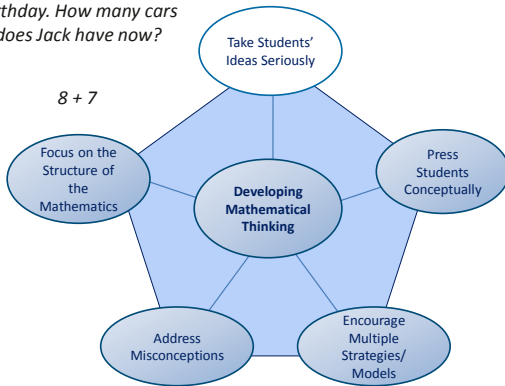
DEVELOPING MATHEMATICAL THINKING FRAMEWORK

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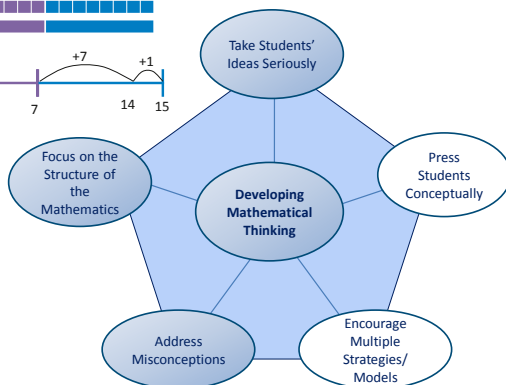
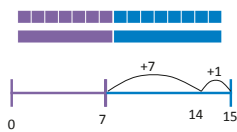
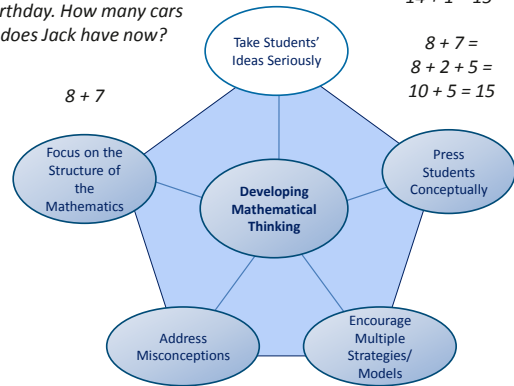
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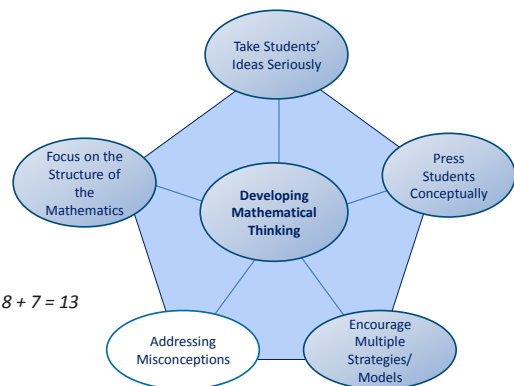
Jack had 8 cars, he received 7 cars for his birthday. How many cars does Jack have now?

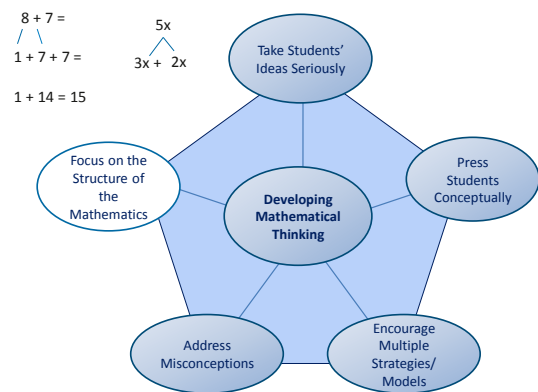
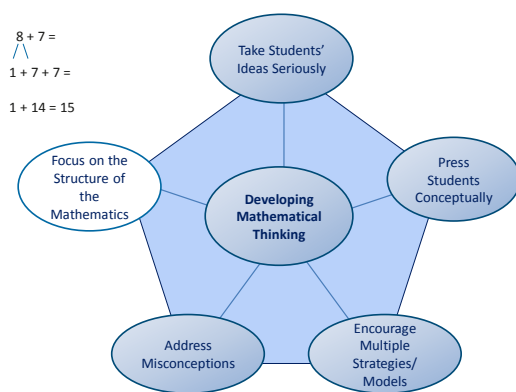
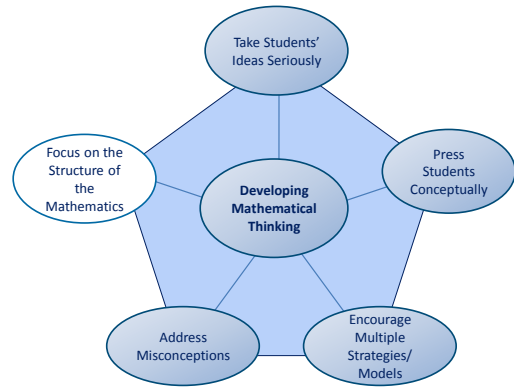
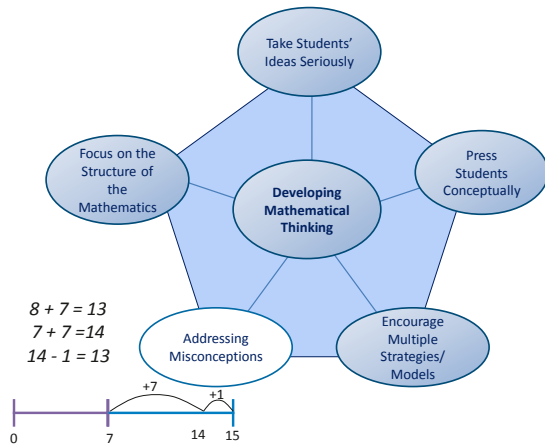


Jack had 8 cars, he received 7 cars for his birthday. How many cars does Jack have now?



$8 + 7 = 13$





How I addressed misconceptions?

Place 250, 300 and 600 on the number line.



Susan drove 256 miles on the first day of her trip. She drove some more on the second day of her trip. At the end of the second day she had driven 612 miles. How many miles did she drive on the second day?

Use a number line to model and solve the problem.



Write the equation that represents the problem.

EXAMINING STUDENT THINKING

Examining student work

- In looking through the student work, what do you notice?
 - Any patterns in students mistakes?

Framework for examining student work

- Step 1: Sort student work into two piles
 - Correct
 - Incorrect

Identifying Student Misconceptions

Problem or Task:

Step 1: Number Correct & Incorrect

Number Correct

Number Incorrect

Framework for examining student work

- Step 1: Sort student work into two piles
 - Correct
 - Incorrect
- Step 2: Sort incorrect student work into piles based on similar misconceptions
 - Describe the misconceptions or mistake
 - Indicate the number of students with that misconception or mistake

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Steps 2:

Incorrect Solutions:
Describe the misconceptions and/or mistakes you find below.

Number of students with that mistake/misconception.

- 1.
- 2.
- 3.
- 4.
- 5.

Share out categories of misconceptions

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Favorite No – Video (Middle School)

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Writing Items

- Using your student work, write items where students will have to...

"... clearly and precisely construct viable arguments to support their own reasoning and to critique the reasoning of others" (SBAC – Claim 3)

Ideas

- Favorite 'No' (watch video)
- Compare and contrast two models
- Compare two solution strategies (same model)
- Identifying the mistake
- Drawing a visual model to represent symbolic notation

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Susan drove 256 miles on the first day of her trip. She drove some more on the second day of her trip. At the end of the second day she had driven 612 miles. How many miles did she drive on the second day?

Use a number line or a bar model (part/part/whole) to model and solve the problem?

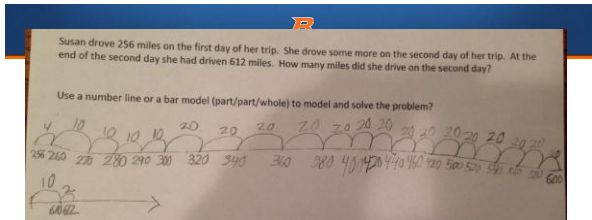
356 miles

256 556 612

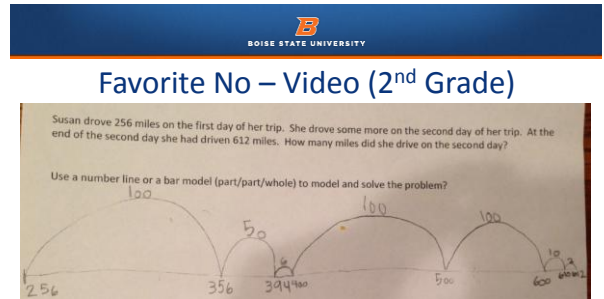
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Comparing solution strategies

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Focusing on efficiency



Identify the mistake

Implementation with new topics

- Collaboration process:
 - Give a common task
 - What types of tasks are good at highlighting student misconceptions (visual models, some element of correctness)
 - Analyze as a group
 - Generic student work analysis template
 - Come up with common problems to implement back in the classroom based on student work
- Individual teacher
 - Pre-assessment or formative assessment tool
 - Regular use in the class (similar to 'favorite no' example)

NCTM Article

- Bray, W. S. (2013). How to Leverage the Potential of Mathematical Errors. *Teaching Children Mathematics*, 19(7), 424-431.

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Student work following the 4 'favorite yes/no' tasks.

Student 6
 Ms. Quinter has some green apples. Together they have 704 apples. How many apples does Quinter have?
 Use a number line or bar model to model and solve the problem.
 $372 + 29 = 352$
 Write the equation that represents the problem.
 $308 + 29 = 332$

Student 12
 Ellie has 372 red apples. Quinter has some green apples. Together they have 704 apples. How many apples does Quinter have?
 Use a number line or bar model to model and solve the problem.
 $372 + 332 = 704$

What changes in student thinking do you notice from before to following the intervention?

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Student work following the 4 'favorite yes/no' tasks.

Student 10
 Ellie has 372 red apples. Quinter has some green apples. Together they have 704 apples. How many apples does Quinter have?
 Use a number line or bar model to model and solve the problem.
 $372 + 332 = 704$
 Write the equation that represents the problem.

Student 2
 Ellie has 372 red apples. Quinter has some green apples. Together they have 704 apples. How many apples does Quinter have?
 Use a number line or bar model to model and solve the problem.
 $372 + 332 = 704$
 Write the equation that represents the problem.

Using Students' Misconceptions to Create Instructional Tasks

Please email with questions or comments!

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