No Tears Tiered Support:
Structures for Collaboration
& Assessment Review

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The Premier Math Education Event

NCTM

2024 ANNUAL MEETING & EXPOSITION

Sept. 25-28, Chicago

Introduction

- Jamie Goering

- High School Math Teacher: 8 years

- Currently Teaching: Algebra 1 and Honors Geometry

BMTN & Improvement Science

- American Institute of Research (AIR)

- Goal: Impact Algebra students nationwide with effective teacher practices

- Areas of focus: Solve ➔ Connect ➔ Justify

- Implementation of PDSA Cycle

  - Plan

  - Do

  - Study

  - Act

- Question: What's a problem you'd like to fix in your classroom?

Structured Student Talk (SST):

2 minutes

Partner A to Partner B:

15 seconds

Partner A to Partner B:

15 seconds

The Structure

- ==Personal Reasoning Time==: 2-5 minutes (prompt dependent)

  - Encourage different representations (Who ==GETS== it?)

- Structured Math Talk: 2 minutes

  - Partner A: 30 second summary

  - Partner B: 15 second revoice

  - Partner A: 15 second recap/revision

  - Partner B: 30 second summary

  - Partner A: 15 second revoice

  - Partner B: 15 second recap/revision

  - GIVE THEM LESS TIME THAN THEY NEED

Example Prompt

2^4 2^3 2^2 2^1

16 8 4 2

2^0? 2^{-1}? 2^{-2}? 2^{-3}?
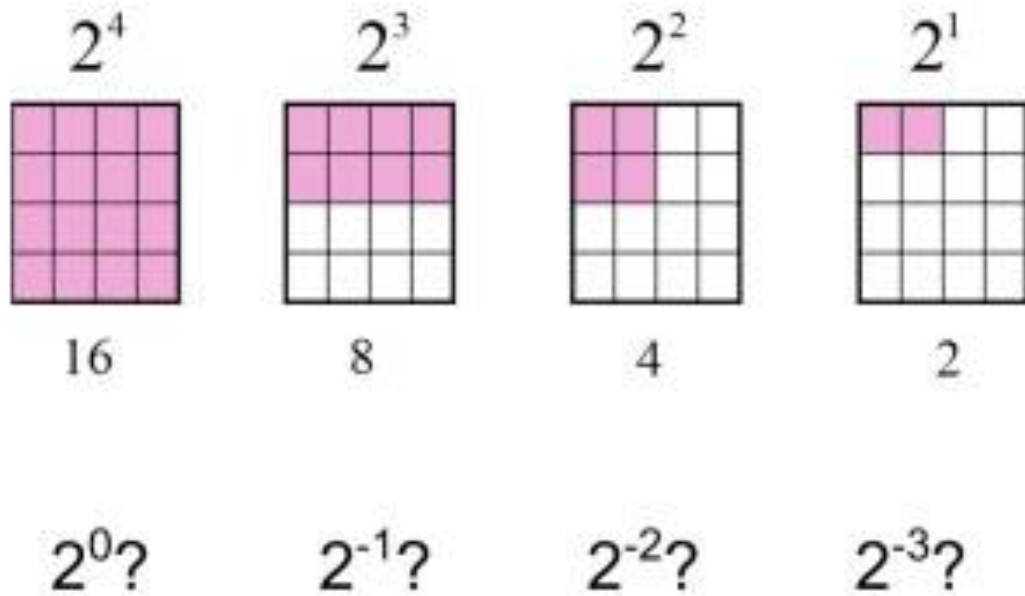
PRT: 3 minutes

If you continued the pattern, what would happen with zero and negative exponents?

Feedback Slips & Audio Recordings

Student Feedback Slip #2 (cutting time in SMT)

1. During PRT/SMT, I was

Fully engaged   Almost fully engaged   Somewhat engaged   Not engaged at all

2. I think PRT/SMT is a positive experience

Agree   Disagree

3. I saw a new approach or strategy during today's PRT/SMT

Agree   Disagree

4. I like the new Structured Math Talk time frame (no going up to the board)

Agree   Disagree

Any questions/comments?

The Research/Feedback

3. STUDY

Questions: Questions you have about what will happen. What do you want to learn? (From Plan – Step 1)	Predictions: Make a prediction for each question. Not optional. (From Plan – Step 1)		What were the results? Comment on your predictions in the rows below. Were the correct? Record any data summaries as well.
Does PRT/SMT engage the students with the material?	50% of students will be fully engaged in PRT/SMT	→	**84%** of students reported being engaged with PRT/SMT with 49% of students fully engaged
Is PRT/SMT a positive/meaningful experience for students?	50% of students will report PRT/SMT as a positive experience	→	**95%** of students reported PRT/SMT as a positive/meaningful experience
Will having open ended/conceptual PRT prompts allow students to see new approaches/strategies?	50% of students will see a new approach/strategy through PRT/SMT	→	**69%** of students reported seeing a new approach/strategy with PRT/SMT
Will students produce quality discussions/communications during SMT?	75% of students will use the SMT time appropriately and with quality results	→	This percentage was hard to determine, but from the audio recordings it was clear that students were staying on topic of the material and communicating/revoicing effectively
Does the faster structure of SMT make the experience better/worse for students?	50% of students will find the quicker SMT structure better	→	**75%** of students reported that they liked the quicker SMT (not going to the board) experience

The Change Idea:
Structure & Tiers of Support

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You are given the following resources:
- 3-gallon jug
- 5-gallon jug
- Unlimited supply of water

- Your task: fill one of the jugs with EXACTLY 4 gallons of water

Small Group Time: 1 minute

You are given the following resources:
- 3-gallon jug
- 5-gallon jug
- Unlimited supply of water

- Your task: fill one of the jugs with EXACTLY 4 gallons of water

You are given the following resources:
- 3-gallon jug
- 5-gallon jug
- Unlimited supply of water

- Your task: fill one of the jugs with EXACTLY 4 gallons of water

Answer Provided: 1 minute

1. Fill the 5-gallon jug completely.

2. Pour 3 gallons into the 3-gallon jug, leaving 2 gallons in the 5-gallon jug.

3. Empty the 3-gallon jug.

4. Pour the 2 gallons from the 5-gallon jug into the 3-gallon jug.

5. Fill the 5-gallon jug completely.

6. Empty 1 gallon from the 5-gallon jug into the 3-gallon jug.

7. Your 5-gallon jug now has exactly 4 gallons of water.

8. Confirm your suspicion that this problem is, in fact, from *Die Hard With a Vengeance.*

Teacher Time/Debrief

- What did you notice?

- Any willing participants that can share their experience?

- What did this time look, feel, and sound like as a participant?

- Burning questions?

The Structure/Outline

Tiered Checkpoints

- Prompt (PRT)
  - Can be review problems or a "practice quiz" (checkpoint)
- Partner Pairs
- Small Group
- Whole Group
- Answers Provided
- Teacher Time

Example Checkpoint

Resources

Resource #1: Example Checkpoint

This is an example checkpoint for a Systems Unit. The document was created by the Freshmen Algebra 1 PLC.
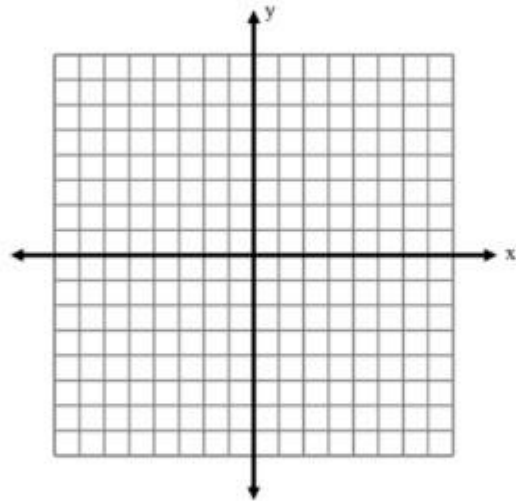
Algebra 1B   Name_____

Checkpoint: Solving systems by Graphing and Substitution

Solve by graphing:

$3x + y = -1$

$y = \dfrac{1}{2}x + 6$

Solve by substitution:

$y = 3x - 4$ $x - y = 14$

$6x - 3y = 12$ $y = -2x - 2$

Data Collection

Measure #1: Student Reflection Form

This form is given to students at the conclusion of the checkpoint, self-assessed.

Student Reflection Form

Please complete the following questions:

1. I was on task for
   a. The whole Checkpoint
   b. Most of the Checkpoint
   c. About half of the Checkpoint
   d. Very little of the Checkpoint

2. When working with someone else, I
   ❏ Referenced the original question
   ❏ Explained my work using things we've learned in class
   ❏ Used math vocabulary to explain myself
   ❏ Compared my work to my partner's work

3. I looked at and listened to someone else's work during the Checkpoint
   (didn't just talk about the answers)
   a. Agree
   b. Disagree

4. I explained my <u>work</u> to someone else during the Checkpoint
   (didn't just ask about answers)
   a. Agree
   b. Disagree

Comments/Questions: Please let me know what you thought of this activity and any feedback you want to give to make it better. This is anonymous, so feel free to be brutally honest. Thanks!

The Research/Findings

Evidence of Promise:

- Student Reflection Forms were given to students to report engagement, depth of comparisons, and suggestions for future applications of the checkpoint
  - 90% of students reported consistent engagement with 69% reporting full engagement
  - 79% of students justified with quality
- Assessment Scores were compared between a control group and the tiered checkpoint class
  - 4.9% higher quiz and test grades in the tiered group vs the control over the course of the testing year
- Audio Recordings were taken to use and assess what types of justification/communication students were making on the material; these were used for the Teacher Quality Rubric
- The Teacher Quality Rubric measured the engagement and quality of the randomly assigned, partner pair student dialogue based on BMTN guidelines for depth

Context:

- Urban public academy with 3300 students
- Students range from 6 sending towns in the nearby area; large range of academic achievement and backgrounds
- Tiered checkpoints were used over the course of the entire 8 month testing window with 16 different trials

The Outcomes:

- Higher scores
- More collaboration
- Better class culture

I've Tried This…

- During a warm-up review problem
- With an inquiry-based lesson opener
- During direct instruction
- To formalize the lesson after direct instruction
- With a lesson checkpoint

Your Student Talk Routines

Personal Reasoning Time (PRT): 2 minutes

What other student talk routines do you use in your classroom?

Thank You!

BMTN website:
 https://www.air.org/project/better-math-teaching-network

"Nothing great was ever achieved without enthusiasm."
~Ralph Waldo Emerson