Teaching Mathematical Behaviors: Successful Classroom Management for Math Teachers

Rob Wieman & Jill Perry

Welcome!

- Find a table with notecards and markers on it.
- Make a name tent.
- Today you will need something to write with and something to write on.
- Decide which one doesn't belong and be ready to explain why.
- See if you can come up with a different answer!

Which One Doesn't Belong?

Rules	Racquetballs
Expectations	Relationship

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Redefine what it means to be a successful math student

From
- Able to get right answer invisibly and quickly

- Absence of negative, disruptive behaviors

To
- Willing to work for a long time and explain/show thinking

- Presence of positive, intellectual behaviors

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Big Idea

Effective Management = Creating a Culture Focused on Learning and Growing as Mathematicians

Effective management requires

- creating norms and fleshing out expectations that support students' mathematical learning
- providing students with multiple opportunities to learn and enact these expectations and behaviors that support their mathematical learning.

- Effective management is NOT simply reacting well to negative behaviors (although this is important)
- Effective management is NOT about rewards and punishments

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3

Throughout this Workshop
We will examine Creating Culture

- Experience as a learner (Rob and Jill Teach)

- Analyze as a teacher

- Move back and forth between the two

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Coming Together as Group

We need your help with this.

When we are trying to get the whole group together . . .

- Rob or Jill will stand at the front and give the signal
- Finish your current thought and shift your focus to the front of the room.
- If you notice others next to you still talking, calmly, kindly, and quietly let them know it's time to talk as a group.
  - Just say, "It's time to talk as a group." and then shift your focus back to the front of the room.

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Let's practice "*Coming Together as a Group*"!

Introductions: With a Neighbor (2 minutes)

- What's your name?
- Where do you work?
- What is your job? (What do you teach?)
- How long have you been teaching?
- What are you hoping to gain from this session?
- Which one do you think didn't belong?

Rules	Racquetballs
Expectations	Relationship

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Coming Together as Group - How Did We Do?

Did you have the opportunity to:

❏ Finish your current thought and shift your focus to the front of the room?

❏ Notice others next to you still talking, calmly, kindly, and quietly let them know it's time to talk as a group?

How we share as a group

Presenter:

- Speak clearly and loudly enough for all to hear
- Explain your thinking so that your classmates can understand the connections you have made and strategies you have used.

Audience:

- Watch and listen to the presenter.
- Think about whether you understand their thinking
- If you understand and think the same, give the hand signal. Be ready to explain.
- If you do not understand, ask a question.

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8

Share: Which One Doesn't Belong?

Rules	Racquetballs
Expectations	Relationship

How did we do?

Presenter:

- Speak clearly and loudly enough for all to hear
- Explain your thinking so that your classmates can understand the connections you have made and strategies you have used.

Audience:

- Watch and listen to the presenter.
- Think about whether you understand their thinking
- If you understand and think the same, give the hand signal. Be ready to explain.
- If you do not understand, ask a question.

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Teacher Hats

What did we do to create a culture
focused on learning and growing
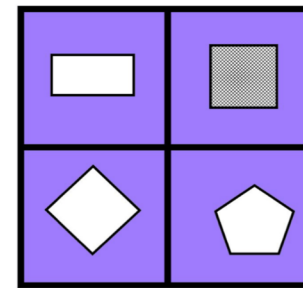as mathematicians?

Our thinking

- We focused on important mathematics
  - Definitions and criteria
  - Precision (precise language)
- We created and taught classroom procedures
  - For coming together as a group
  - For sharing
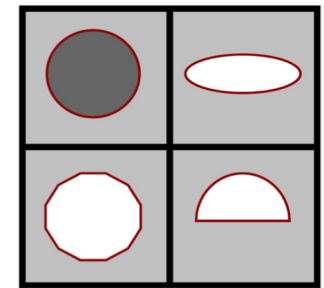- These routines supported important behaviors

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Which One Doesn't Belong
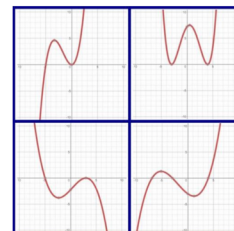# wodb.ca
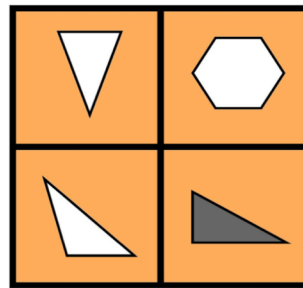
SHAPE 1

SHAPE 2

SHAPE 3

9	16
25	43

NUMBER 1

3	27
123	31

NUMBER 2

17	26
44	65

NUMBER 3

GRAPH 19

$y = 4x + 3$	$y = -4x + 5$
$y = \frac{1}{4}x + 5$	$y = 4x - 5$

GRAPH 21

GRAPH 21

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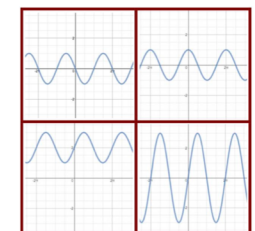
As we continue . . . think about

What specific behaviors/habits do "good" mathematics students exhibit?

How are the activities/structures/routines supporting those behaviors/habits?

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Introducing a Routine

You will need your mathematical mind and a partner.

Think-Pair-Share

We are going to do some more math together through a Think-Pair-Share routine/structure.

- I'm going to give you a task.
- You are going to think about it on your own for 30 seconds.
- When I'm ready, I am going to ask you to talk with your shoulder partner and take turns sharing your thinking.
- Then we will come together as a group to share our thinking. (Will someone remind us how we help each other come together as a group?)

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Think On Your Own (30 seconds)

Look at the numbers below. What are some of the things you notice?

24, 36, 48, 60, 72, 96

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<u>Pair</u> up with a Partner (2 minutes)

You should only talk with your partner right now.

1. **<u>Take turns</u>** sharing the things you noticed. Be sure to write down your partner's ideas
2. Then try to find something new together. Write down your new ideas.

24, 36, 48, 60, 72, 96

Think-Pair-Share -- How Did We Do?

- ❏ We gave you a task.
- ❏ You thought about it on your own for 30 seconds.
- ❏ You talked with your shoulder partner and took turns sharing your thinking.
- ❏ We came together as a group to share our thinking.

  - ❏ You finished your current thought and shifted your focus to the front of the room.
  - ❏ When you noticed others next to you still talking, you calmly, kindly, and quietly let them know it was time to talk as a group.

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Time out: Put on teacher hat

What did we do to make it more likely than not that you worked on the mathematical task?

What did the teacher do to support you in talking to a partner about the task?

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Now Put Your Student Hat Back On

How we share as a group

Presenter:

- Speak clearly and loudly enough for all to hear
- Explain your thinking so that your classmates can understand the connections you have made and strategies you have used.

Audience:

- Watch and listen to the presenter.
- Think about whether you understand their thinking
- If you understand and think the same, give the hand signal. Be ready to explain.
- If you do not understand, ask a question.

I agree

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<u>Share</u> as a Class

What is something you noticed that you bet a lot of your classmates noticed?

24, 36, 48, 60, 72, 96

What are some other things you noticed?

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Sharing as a group - How Did We Do?

Presenter:

- Speak clearly and loudly enough for all to hear
- Explain your thinking so that your classmates can understand the connections you have made and strategies you have used.

Audience:

- Watch and listen to the presenter.
- Think about whether you understand their thinking
- If you understand and think the same, give the hand signal. Be ready to explain.
- If you do not understand, ask a question.

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Expanding and Practicing a Routine

You will need something to write with and a copy of this sheet:

Patterns Galore

2	4	6	8	10
3	6	9	12	15
4	8	12	16	20
5	10	15	20	25
6	12	18	24	30

These are some of the things I notice about the figure I see above:

Things I Notice Via Think/Write-Pair-Share

We are going to do another Things I Notice task together through a Think/Write-Pair-Share routine/structure.

- I'm going to give you a task.
- You are going to think about it on your own and write down what you notice for 2 minutes.
- When I'm ready, I am going to ask you to talk with your shoulder partner and take turns sharing your thinking.
- Then we will come together as a group to share our thinking. (Will someone remind us how we help each other come together as a group?)

Think and Write On Your Own (2 minutes)

For 2 minutes:

- **Examine** the information given on your Thinking Sheet and

- **Jot down** (record) the things you notice.

Patterns Galore

2	4	6	8	10
3	6	9	12	15
4	8	12	16	20
5	10	15	20	25
6	12	18	24	30

These are some of the things I notice about the figure I see above:

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Pair up with a Partner (2 minutes)

You should only talk with your partner right now.

1. **Take turns** sharing the things you noticed.

2. Then try to find something new together.

Patterns Galore

2	4	6	8	10
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5	10	15	20	25
6	12	18	24	30

These are some of the things I notice about the figure I see above:

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Share as a Class

What is something you noticed that you bet a lot of your classmates noticed?

What are some other things you noticed?

Patterns Galore

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How we share as a group

Presenter:

- Speak clearly and loudly enough for all to hear
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Audience:

- Watch and listen to the presenter.
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Share as a Class

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What are some other things you noticed?

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Things I Notice Via Think/Write-Pair-Share -- How Did We Do?

❏ We gave you a task.
❏ You thought about it on your own and wrote down what you noticed for 2 minutes.
❏ You talked with your shoulder partner and took turns sharing your thinking.
❏ We came together as a group to share our thinking.

   ❏ You finished your current thought and shifted your focus to the front of the room.
   ❏ When you noticed others next to you still talking, you calmly, kindly, and quietly let them know it was time to talk as a group.

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Redefine what it means to be a successful math student

From
- Able to get right answer invisibly and quickly

- Absence of negative, disruptive behaviors

To
- Willing to work for a long time and explain/show thinking

- Presence of positive, intellectual behaviors

With a neighbor

What are some positive, intellectual behaviors you would like to see in your students, in class?

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Positive behaviors/habits

- Makes many mistakes and learns from examining and reflecting on those mistakes
- Ask good questions
- Identify and clarify problem
- Explain clearly
  - Speaking
  - Writing
- Draw good pictures and diagrams
- Organize information clearly
- Monitor understanding (self/others)
- Persist in the face of difficulty
- Reason logically

Practicing Behaviors and a New Routine

You will need something to write with and a copy of this sheet:

Converting between Fractions and Decimals

Directions: Record any reasoning that you do on this thinking sheet. You will more than likely have to try a few times before you know you have a correct solution. If you find a solution, see if you can find another.

The task: Using the numbers 0 through 9, at most one time each, fill in each of the boxes so that the fraction equals the decimal.

$$\frac{\square\square}{\square\square} = \square.\square\square$$

On Your Own: First Attempt (Complete or Partial):

$$\frac{\square\square}{\square\square} = \square.\square\square$$

What was your first attempt? OR What did you notice or think about before making your first attempt?

What did you learn from your first attempt that changes your strategy for your next attempt?

On Your Own or with a Partner: Second Attempt (Complete or Partial):
What was your second attempt?

What did you learn from your second attempt that changes your strategy for your next attempt?

Open Middle Problems

❏ We will be giving you a task.
❏ First you will work on your own for 2 minutes to think about the problem and attempt (at least once) to solve it on your own.
  ❏ Keep track of your attempts on your thinking sheet.
  ❏ Each time, write down your attempt and what you learned from it.
❏ Then you will share your work with a partner and work together to find a solution.
❏ If you find a solution, see if you can find another…

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On Your Own -- First Guess (2 minutes)
Once you have your first guess, share with your partner

CONVERTING BETWEEN FRACTIONS AND DECIMALS

Directions: Using the numbers 0 through 9, at most one time each, fill in each of the boxes so that the fraction equals the decimal.

$$\frac{\square\ \square}{\square\ \square} = \square.\square\square$$

On Your Own -- First Attempt (2 minutes)

CONVERTING BETWEEN FRACTIONS AND DECIMALS

Directions: Using the numbers 0 through 9, at most one time each, fill in each of the boxes so that the fraction equals the decimal.

$$\frac{\square\square}{\square\square} = \square.\square\square$$

With a Partner -- Share and Work Together (4 minutes)

CONVERTING BETWEEN FRACTIONS AND DECIMALS

Directions: Using the numbers 0 through 9, at most one time each, fill in each of the boxes so that the fraction equals the decimal.

$$\frac{\square\ \square}{\square\ \square} = \square.\square\ \square$$

How we share as a group

Presenter:

- Speak clearly and loudly enough for all to hear
- Explain your thinking so that your classmates can understand the connections you have made and strategies you have used.

Audience:

- Watch and listen to the presenter.
- Think about whether you understand their thinking
- If you understand and think the same, give the hand signal. Be ready to explain.
- If you do not understand, ask a question.

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I agree

Share as a Class

Share your first guess and what you learned from it.

How did you eventually get to an answer?

Time out: Put on teacher hat

What did the teacher do to make it more likely for you to work on the mathematical task?

What did the teacher do to support you in talking to a partner about the task?

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Extended Time Out: Keep Teacher Hat On

What behaviors/norms/culture do Open Middle Problems support?

How did our enactment of that support those behaviors?

openmiddle.com

Browse by grade level

Browse by standard

Get worksheet

COMPOUND INEQUALITIES 1

Directions: Using the digits 1 to 9, at most one time each, make a compound inequality that has the largest interval.

$$\square \leq \square x + \square < \square$$

openmiddle.com

Browse by grade level

Browse by standard

Get worksheet

COMPLEX NUMBER PRODUCTS

Directions: Use the integers -9 to 9, at most one time each, to fill in the boxes twice: once to make a positive real number product and once to make a negative real number product.

$$\left(\boxed{} + \boxed{}\,i\right)\left(\boxed{} + \boxed{}\,i\right)$$

Ending:

Being really explicit about what you want, aligning structures/routines/accountability with that.

Thank You

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Rules	Racquetballs
Expectations	Relationship

Patterns Galore

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$$\frac{\square\square}{\square\square} = \square.\square\square$$

On Your Own: First Attempt (Complete or Partial):

$$\frac{\square\square}{\square\square} = \square.\square\square$$

What was your first attempt? OR What did you notice or think about before making your first attempt?

What did you learn from your first attempt that changes your strategy for your next attempt?

On Your Own or with a Partner: Second Attempt (Complete or Partial):
What was your second attempt?

What did you learn from your second attempt that changes your strategy for your next attempt?

On Your Own or with a Partner: Third Attempt (Complete or Partial):
What was your third attempt?

What did you learn from your third attempt that changes your strategy for your next attempt?

On Your Own or with a Partner: Fourth Attempt (Complete or Partial):
What was your fourth attempt?

What did you learn from your fourth attempt that changes your strategy for your next attempt?

EXPONENTS AND ORDER OF OPERATIONS

Directions: Find 3 positive integers that add up to 10. Place each number into one of the blanks to find the largest possible result.

$$\left(\Box\right)\cdot\left(\Box\right)^{\Box}$$

ORDER OF OPERATIONS

Directions: Make the largest (or smallest) expression by using the whole numbers 0-9 in the boxes below. Note: for 5th grade, remove the exponent to make it grade level appropriate.

$$\Box \div \Box\left(\Box + \Box\right)^{\Box} \cdot \Box - \Box$$