What makes a literacy rich math classroom?

Record your thinking on the post-its provided.

Share with members of your table.

Post them on the chart paper in the front of the room.
Using Literacy Skills to Measure Mathematical Proficiency

Liza Hoyer
Will Taege
MATH PRACTICE 3: Construct viable arguments and critique the reasoning of others.

MATH PRACTICE 6: Attend to precision.
Writing about Math

Benefits of Writing in Math

- Helps students to think more deeply and clearly about math
- Powerful assessment tool as it provides a window into their understandings, misconceptions and feelings about the content
- Supports learning by requiring students to organize, clarify, and reflect on their ideas

Writing about Math Learning Outcomes

- Establish strategies to effectively integrate writing into mathematics
- Using descriptive tools to check student proficiency

(Burns, 2004)
Strategies for Incorporating Writing

• Establish the purpose for writing in math class (to support their learning and to help you assess their progress)
• Establish yourself as the audience
• Encourage them to use words, numbers, and, if they like, pictures to provide as much information as possible to explain their thinking
• Have students discuss their ideas before writing
• Post useful mathematics vocabulary
• Give individual assistance as needed
• Have students share their writing in pairs or small groups for feedback
• Use student papers to create class inventories

Link to Article

(Burns, 2004)
Share out

What did you find to be the most important strategy for incorporating writing into your mathematics classroom?
Journaling in Math Class

Keeping journals or logs. When students create ongoing records about what they're doing and learning in math class, they have a chronological record of their learning experiences to refer back to.
Writing About Learning Processes

Some writing assignments don't focus on a math problem or concept but instead on some general aspect of the students' learning during math class.

For example:

- What are your favorite and least favorite activities in this unit?
- What are the qualities of a good problem-solving partner in math class?
- Write a letter to an absent student telling him/her what they missed.
- Why is math necessary to learn?
Creating a “Good” Question

Open vs. Closed

Closed: Requires an answer or a response to be given from memory

Open (Good): Requires a student to think more deeply to give a response

- Requires more than remembering a fact or reproducing a skill
- Students can learn by answering the questions
- Teacher learns about each student from the attempt
- There may be several acceptable answers
Creating a “Good” Question

Step 1: Identify a topic
Step 2: Think of a closed question and write down the answer
Step 3: Make up a question that includes (or addresses) the answer

For example:

Step 1: The topic for tomorrow is money
Step 2: What is the value of a nickel?
Step 3: I have two coins in one hand and one coin in the other hand. The coins in each hand are worth the same amount. What could the coins be?

Padlet/creating open questions

Teacher Created Journal Prompts
Journaling in Math Class

Classroom Implementation:

1. Pose the Good Question
2. Students work independently on the Good Question
3. Students work collaboratively on the Good Question
4. Whole Class Discussion/Feedback

I have two coins in one hand and one coin in the other hand. The coins in each hand are worth the same amount. What could the coins be?

I gave change of $1.00 using quarters, dimes and nickels. What might the change have looked like?

How could I spend exactly $20.00 at the supermarket?
Writing within Problem Solving

Mathematics instruction should engage students in applying a variety of strategies for solving problems and also teach them to monitor and reflect on their problem-solving processes.

Writing enhances both of these skills. Even when students work cooperatively on a problem-solving situation, it's beneficial to have each student write his or her own paper.

Although the group work gives them access to one another's ideas, writing requires students to clarify their thinking.

Sometimes problems have one right answer, even though there are different ways to get to the answer or explain why the answer makes sense. (Burns, 2004)
MATH JOURNAL RUBRIC

You clearly answered the question with details and used appropriate math language extensively. You used pictures, diagrams/charts, numbers, and/or words to clearly explain your thinking. Your math computation is accurate and complete. You gave and explained original examples of where this concept is used in the real world.

You answered the question completely and used appropriate math language. You used pictures, diagrams/charts, numbers, and/or words to explain your thinking. Your math computation is usually accurate and complete. You gave an example of where this concept is used in the real world.

You answered the question with some understanding and sometimes used appropriate math language. You used little pictures, diagrams/charts, numbers, and/or words to explain your thinking. Your math computation is incomplete and/or inaccurate. You gave a simple example of where this concept is used in the real world.

You answered the question with limited understanding and hardly used or misused appropriate math language. You used no pictures, diagrams/charts, numbers, and/or words to explain your thinking. Your math computation is inaccurate and/or not included. You gave no example of where this concept is used in the real world.
Math Projects

Demonstrate student mastery using cumulative projects

Think of the Writing Process in Math:

Prewrite → Draft → Revise → Edit → Publish

Examples:

Adjusting dessert recipes to make enough for their classroom after a multiplying fractions unit. Students use playdough to compare what one batch would require after calculating what 2 1/2 batches may require.

Create waterslides to measure and convert lengths and heights, calculate the cost, use water to do time trials and create line plots to graph their data.

Attend the local art museum and create your own art piece inspired by Wassily Kandinsky using your knowledge of shapes, symmetry, angles and coordinate grids while meeting specific criteria and requirements.
In math we are learning about geometry. Our goal was to design a painting that had parallel lines, acute angle, obtuse angle, parallelogram, perpendicular lines, line segment, isosceles triangle, trapezoid, scalene triangle, square, symmetry, and a hexagon. Also, the picture that we painted was suppose to show a story. Mine was rain helps things grow. Like learning helps humans grow. I am proud of my work because I leaned about so many new shapes. It helped me with the painting by knowing what shape to draw where. A tip for my self next time would be more precise with my raining shapes because it was very messy and not on the lines.”
Math-Writing

What writing does for me is it unlocks my brain and it lets me think. But if I didn't write I would be getting nowhere. I wouldn't learn anything. I mean I wouldn't think so hard if I didn't write. I would just play the game even if I didn't know how because I wouldn't have to write.

But when you write it just makes you think.

Math-Writing

Writing about the activities we do in math helps me because it is easier to explain what I think and what I did, and it is easier for the math teacher to understand what you think and what you do. If we just went up to the math teacher and told them what we think the math teacher rite not understand unlike writing in writing I can think and make it understandable.
Talking About Math Learning Outcomes

- Establish effective classroom strategies to incorporate math discussion to enhance student learning.

- Increase knowledge of math discussions and their purpose in the math classroom

- Create a set of strategies and questions to be incorporated into your own classroom.
Reflecting on your own practice...

Who talks during lessons?

To whom do they talk?

What do they talk about?

How do they talk?
Creating an Environment of Communication

All answers are accepted, respected, and considered. A first step toward establishing a respectful classroom learning community is acceptance of all ideas and answers—regardless of any obvious errors. Rich mathematical discussions cannot occur if this expectation is not in place.

-Shari Parrish, Number Talks pg. 19

Discussion Norms

-Aligned with school systems already in place (PBIS)

-Built into classroom management processes
Avoiding the “Ping-Pong Pattern”

Teacher: What kind of angle is this?
(some students raise their hand)
Teacher: Sammy?
Sammy: Acute
Teacher: That’s right
Teacher: What kind of angle is this one?
(some students raise their hands)
Teacher: Daniel?
Daniel: Obtuse
Teacher: Correct!

Resource: Small Steps, Big Changes
by Chris Confer & Marco Ramirez
Improved Patterns of Talk

Teacher: You have several plastic triangles labeled with an A in front of you. They’re all the same size and shape; they’re all congruent. Pick up one triangle and examine each of its three angles. (Pause for student think time)

Teacher: Think for yourself: Do you know the measure of any of those angles? (Pause for student think time)

Teacher: Now see whether you and your partner agree on the name of the familiar angle and its measure. ( Longer pause while students talk)
Teacher: Which angle do you immediately know? Hold the triangle up, and point at the angle you are sure of. (Teacher scans the class.) Look at your classmates: you all seem to agree about the easy angle. Everybody please name the angle.

Students: Right angle

Teacher: That’s correct. And what is its measure?

Students: Ninety degrees (some students are looking at the anchor chart on the wall as a resource)
Strategies for Improved Patterns of Talk

- Individual think time
- Use of choral response
- Teacher encourages use of reference charts
- Partners talk: Often after think time
- Students are asked to solve problems
- Students are asked to make convincing arguments
- Teacher orchestrates initial discussion
- Teacher keeps the focus on student thinking
- Teacher encouraged multiple ways to solve the problem
- Errors were opportunities to examine ideas
- Teacher highlights important thinking by having students restate other people’s ideas.
- Students talk to class and not to teacher
- Students are a source of the right answer

Resource: Small Steps, Big Changes by Chris Confer & Marco Ramirez
Discussion Prompts - Notes

During the next part of the session, please feel free to use the post its to create a set of questioning prompts to use in a guided group type setting, or for students to use with talking with each other.
The Teacher as a Facilitator of Discussions

- How did you solve it?
- What do you notice?
- Why did you choose that strategy?
- Why do you suppose you each got different answers?
- How do you determine which strategy is most efficient?

By using these questions, students participate in critical thinking.
The Teacher as a Facilitator of Discussions

Regardless of age and readiness level discussion skills need to be scaffolded

- Agree/ Disagree with thumbs
- Post it written feedback
- 2 compliments and a question
- Turn & Talk
- Providing prompts
- “Moves”
Students Talking Math!

Teaching students “what” they should be talking about in math class is important.

Scaffolding, scaffolding, scaffolding

Topics of Discussion
- Math concepts
- Misconceptions
- Problem Solving strategies
- Mental math strategies
- Mathematical reasoning
“A student interview is, perhaps, the most effective way for educators to understand a student’s thinking”.

- Structured dialogue
- Flexible questioning approach
- Conversation with a purpose

Student Interviews: Math Solutions
Math Inventory: Including Videos
Decimals

Natasha
Resources


The green anaconda is by far the biggest snake in the world. It's the heaviest, the thickest, and also the second longest, outdone only by the python. Many snakes swallow whole animals like rabbits and raccoons for dinner, but the anaconda is so huge that it can swallow a whole deer in one gulp. It's a good thing they don't like to eat people!

No one really knows how long the longest anaconda is, because they live in the jungles of South America far away from humans and are hard to find. Males easily grow to 16 feet - probably longer than your bedroom - and have reached 22 feet officially; people have said they've seen anacondas as long as 35 or even 40 feet, but no one has managed to bring a snake that long to a zoo or museum as proof. According to Wikipedia there's even a cash prize of $50,000 for anyone who finds an anaconda 30 feet or longer, but no one has claimed it yet, and in a way that leaves us feeling better.

**Wee ones:** Female (girl) anacondas average around 15 feet long, while the males (boys) are 16 feet long. Who's longer, the girl snakes or the boys?

**Little kids:** If a 21-foot anaconda meets up with a python just 1 foot longer, how long is the python?
**Bonus:** If you're 4 feet tall and you lay down next to that 21-foot anaconda, how much longer would the snake be?

**Big kids:** Anacondas can weigh up to 150 pounds! If that's the weight of a 16-foot snake, how much would a 32-foot snake weigh if the weight doubles with length?
**Bonus:** If 3 people actually found anacondas over 30 feet, how much prize money would be paid out at $50,000 per snake?