Welcome!

Capturing Quantities: Inviting ALL Students to Think Like Mathematicians

Share with your table:

- Your name
- Role
- Location

Ponder: What does it mean to think like a mathematician?
Capturing Quantities: Inviting ALL Students to Think Like Mathematicians

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Outcomes for Today

• Consider what it means to think like a mathematician
• Learn about Capturing Quantities (CQ) routine
• Think about how CQ might be used to support each student's learning
• Engage student in mathematics that gets at their thinking, reasoning and provides challenge
• Make connections and see relationships across mathematics
• Inspire curiosity
• Position students as capable
• Orient students to one another’s thinking
Mathematicians--What does it mean to think like a mathematician?
What bubbled up in your conversations?

“What a teacher says in the classroom is not unimportant, but what the student thinks is a thousand times more important.”

--George Polya
Figure 1.1 Diagram that shows the relationship of the practices to each other

Standards for Mathematical Practice

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.
Routines for Reasoning | Four Essential Instructional Strategies in the Routines

- Ask-Yourself Questions
- Annotations
- Sentence Frames and Sentence Starters
- Four R’s
  - Repeat
  - Rephrase
  - Reword
  - Record

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Routines for Reasoning | Four Routines

- Capturing Quantities
- Connecting Representations
- Recognizing Repetition
- Three Reads

Standards for Mathematical Practice

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Capturing Quantities

**WHAT:** Look for and represent quantities and relationships

**WHY:** To “think like mathematicians”, find quantities and relationships in word problems and diagrams.
Capturing Quantities

- Identify Quantities & Relationships
- Create Diagrams
- Discuss Diagrams
- Reflect on learning
Identify Quantities & Relationships

Ask yourself...

– What can I count or measure in this situation?

Each year Quinn plants 24 flowers in his garden. This year he planted only red and purple flowers. Quinn prefers purple, so he planted twice as many purple flowers as red flowers.
Each year Quinn plants 24 flowers in his garden. This year he planted only red and purple flowers. Quinn prefers purple, so he planted twice as many purple flowers as red flowers.
### Identify the quantities and values

<table>
<thead>
<tr>
<th>Quantities Listed in the Problem</th>
<th>The Value of the Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>The total number of flowers planted</td>
<td>24</td>
</tr>
<tr>
<td>The number of red flowers</td>
<td>Not yet known</td>
</tr>
<tr>
<td>The number of purple flowers</td>
<td>Not yet known</td>
</tr>
<tr>
<td>The number of colors of flowers planted.</td>
<td>2</td>
</tr>
</tbody>
</table>
Each year Quinn plants 24 flowers in his garden. This year he planted only red and purple flowers. Quinn prefers purple, so he planted twice as many purple flowers as red flowers.
<table>
<thead>
<tr>
<th>Relationships</th>
</tr>
</thead>
<tbody>
<tr>
<td>There are twice as many as purple flowers as red flowers</td>
</tr>
<tr>
<td>The number of red flowers combined with the number of purple flowers is the same as the total number of flowers</td>
</tr>
<tr>
<td>The number of red flowers is one-half the number of purple flowers.</td>
</tr>
<tr>
<td>The number of purple flowers is two times the number of red flowers.</td>
</tr>
<tr>
<td>The number of red flowers is one-third the total number of flowers.</td>
</tr>
<tr>
<td>The number of purple flowers is two-thirds the total number of flowers.</td>
</tr>
</tbody>
</table>
Ask yourself...

– How can I represent the important quantities and relationships?

Each year Quinn plants 24 flowers in his garden. This year he planted only red and purple flowers. Quinn prefers purple, so he planted twice as many purple flowers as red flowers.
Each year Quinn plants 24 flowers in his garden. This year he planted only red and purple flowers. Quinn prefers purple, so he planted twice as many purple flowers as red flowers.
Discuss Diagrams

Ask yourself…

What quantities or relationships do you see in this diagram?

Where do you see a quantity or relationship in this diagram?

They represented … by…
Meta-Reflection

A. When looking for quantities in a word problem, I learned to...

B. When analyzing a diagram, I learned to pay attention to... because...

C. When identifying relationships, I learned to ask myself...
What **teacher moves** did you see?

- During
- Facilitating discussion

What planning considerations went into this task?

What were the results?
Four Essential Instructional Strategies

- Ask Yourself Questions
- Annotations
- Sentence Frames and Sentence Starters
- Four Rs—repeat, rephrase, reword and record

*How did these support student learning?*
Start with your goals—content and practices

Capturing Quantities Routine PRE-PLANNER

<table>
<thead>
<tr>
<th>Task: Quinn’s Garden</th>
<th>Goal:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Each year Quinn plants 24 flowers in his garden. This year he planted only red and purple flowers. Quinn prefers purple, so he planted twice as many purple flowers as red flowers.</td>
<td>Identify quantities and relationships</td>
</tr>
<tr>
<td></td>
<td>Create diagrams that show quantities and relationships</td>
</tr>
</tbody>
</table>

**Identify Quantities and Relationships**

<table>
<thead>
<tr>
<th>Anticipate which quantities and relationships students might be challenged to identify.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quantities</td>
</tr>
</tbody>
</table>
Choose a task
Anticipate, anticipate, anticipate
Monitor
Select
Sequence
Connect
• Go slow to go fast
• Don’t over teach
• Give yourself grace
• Know that it will take multiple times, but students will grow and learn each time.
"It is impossible to get better and look good at the same time."

~Julia Cameron
On-going Reflection

How might the practice of Capturing Quantities, interrupt narratives about who is capable mathematically?

What’s one thing you are going to keep thinking about or try in your own context?

https://padlet.com/jsanchez6/m12rqc4o6ol6
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Questions?
Thank You!