

Math Team Session 1: Facilitator Guide¹

AGENDA

1. **MATH VISION**
 - What does it mean to be good at math?
 - Burning questions
2. **EARLY MATH LEARNING**
 - Counting and Quantity
3. **JUNIOR and INTERMEDIATE MATH**
 - Arrays and Areas Models
4. **PEDAGOGICAL SYSTEMS**
 - Planning a Task
5. **LEADING MATHEMATICS LEARNING IN YOUR SCHOOL**
 - What is our next best move?

Our GOALS are to:

- Extend our understanding of the GECDSE: Mathematics Vision and Mathematical Proficiencies
- Build an understanding of number sense concepts from K-10
- Develop an understanding of Pedagogical Systems
- Plan a math task
- Learn to lead mathematics in our schools.

¹ This Guide was prepared by the GECDSE team for the Mathematics Leadership Community of Practice. This guide was used by the GECDSE Principals to support sessions on Number Sense, organized in their schools.

1. MATH VISION: THE WORK—AMBITIOUS AND NECESSARY

Table Talk...

- Why is this work both ambitious and necessary?

SCHOOL MATH TEAMS

Table Talk...

- What is the (possible) role of the school math team at your school?
- Where are some professional learning spaces in your school?
- Brainstorm some of these ideas on chart paper or on paper.

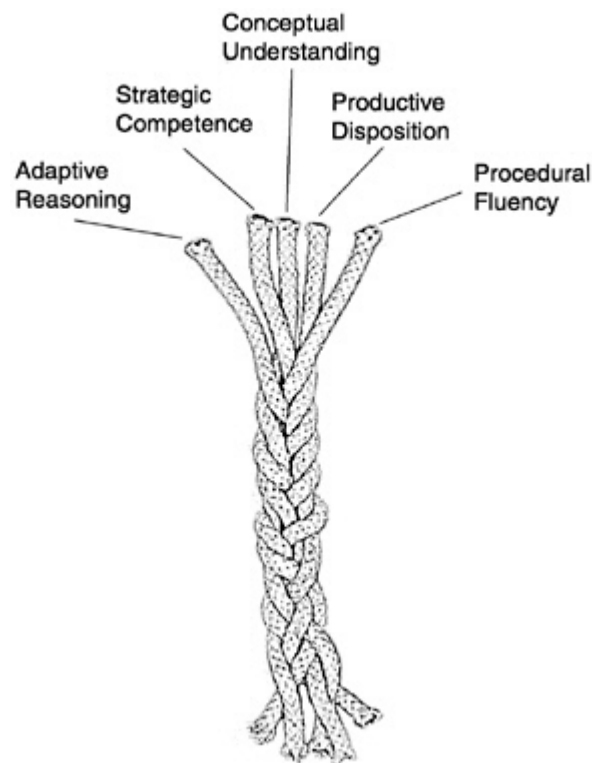
Group Question: What does it mean to be good at mathematics?

- Brainstorm and jot down ideas on chart paper.
- Compare the thinking of the group to the GECD SB Vision and the 5 Math Proficiencies.

UNDERSTANDING MATHEMATICAL PROFICIENCY

Jigsaw protocol: Each person at your table will read about one of the proficiencies and share the details back with the group.

TASK: During the task highlight how each mathematical proficiency can be strengthened and developed.



THE WORK: GUIDED BY OUR QUESTIONS

Brainstorm on chart paper all the things you wonder about mathematics and mathematical education. Record any questions, inquiries and curiosities.

2. EARLY MATH LEARNING: COUNTING AND QUANTITY EXPLORATION PROTOCOL

Following each prompt, facilitator reads the key learning following each step of the protocol and facilitates any discussion in the team:

Facilitator – Prompt 1: Each person please gather any number of manipulatives from those provided at your table (wait for all participants to make their choice).

Facilitator – Prompt 2: Look at other groups of manipulatives around the table. Do you have more or less?

Key Learning from Prompt 2:

Comparing quantities – Children recognize quantity as ‘howmuchness’ there is of something and can do this at a very young age (3–6 months). Students need to visually recognize ‘more’ or ‘less’ when comparing 2 quantities. To help children with the concept of more and less, frequently ask ‘Which is more?’ and ‘Which is less?’ questions at all grade levels. This supports students visualizing quantity.

Facilitator–Prompt 3: How could you determine how many manipulatives you have in front of you? (Counting). What would you need to know and understand in order to do this? (Possible answers include names of number, order of numbers, and a strategy to count, such as touching each object or moving each object as you count.)

Key Learning from Prompt 3:

Stable order – the idea that the counting sequence stays consistent; it is always 1, 2, 3, 4, 5, 6, 7, 8... not 1, 2, 3, 5, 6, 8.

One-to-one correspondence – the idea that each object being counted must be given one count and only one count. In the early stages, it is useful for students to tag each item as they count it and to move the item out of the way as it is counted.

Facilitator–Prompt 4: How many manipulatives do you have? Count them again starting from a different spot in your group. (Observe how people count. Some people may count their manipulatives in groups or skip count. If you notice this happening, this is an opportunity to also point out as part of the key learning that they subitized to do this.)

Key Learning from Prompt 4:

Cardinality – the idea that the last count or the last number reached when counting a group of objects represents the total number of objects in the group. If a child recounts groups when asked how many candies are in the set that he or she has just counted, this suggests that they do not understand cardinality yet.

Order irrelevance – the idea that the counting of objects can begin with any object in a set and the total will still be the same.

Subitizing – the ability to identify quantity without counting – to “just see it.”

Facilitator-Prompt 5: Does the type of manipulative you have chosen, change the quantity or count?

Key Learning from Prompt 5:

Abstraction – the idea that a quantity can be represented by different things (e.g., 5 can be represented by 5 like objects, by 5 different objects, by 5 invisible things [5 ideas], or by 5 points on a line). Abstraction is a complex concept but one that most students come to understand quite easily. Some students, however, struggle with such complexity, and teachers may need to provide additional support to help them grasp the concept. For example, if a problem is asking, “How many fish would be in a bowl?” some students would need to use manipulative shaped like fish, others would understand that any object could be used to represent the fish.

Facilitator-Prompt 6: Take your manipulatives and move them into a different configuration. Does this change the quantity or count?

Key Learning from Prompt 6

Conservation – the idea that the count for a set group of objects stays the same no matter whether the objects are spread out or are close together.

3. JUNIOR and INTERMEDIATE MATH

Facilitator-Prompt 7: How did you move the objects into this new configuration? (Notice if manipulatives are moved in groups)

Key Learning from Prompt 7:

Subitizing – the ability to identify quantity without counting – to “just see it”. This is a foundational skill necessary for developing fluency in all operations and many mathematical processes.

Unitizing – given a quantity, finding different ways to chunk the quantity into parts in order to name it. This conceptual understanding is key to understanding multiplication and division (groups of, or to create and understand arrays) and most importantly for the idea that, in the base ten system, objects are grouped into tens once the count exceeds 9 (and into tens of tens when it exceeds 99) and that this grouping of objects is indicated by a 1 in the tens place of a number once the count exceeds 9 (and by a 1 in the hundreds place once the count exceeds 99).

Facilitator-Prompt 8: Please gather some more manipulatives to your group. What happens to the quantity and count now? What happens to the quantity and count if you remove some of the manipulatives from your group?

Key Learning from Prompt 8:

Movement is magnitude – the idea that, as one moves up the counting sequence, the quantity increases by 1 (or by whatever number is being counted by), and as one moves down or backwards in the sequence, the quantity decreases by 1 (or by whatever number is being counting by) (e.g., in skip counting by 10's, the amount goes up by 10 each time). This is a foundational understanding that supports the development of a mental number line for students to visualize and access as they engage in a variety of operations with increasingly complex numbers.

IN MATH CLASS

Table Talk...

- What would you see, hear and feel in an exemplary math class?
- Brainstorm ideas on sticky notes.
- Sort your sticky notes into categories.
- Give your categories a name.

4. PEDAGOGICAL SYSTEMS

- Instructional Task
- No-Threatening Learning Environment
- Discourse
- Tool and Representations

Re-sort your earlier ideas. Do they fit? What could be added?

UNDERSTANDING TASK: What is a Math Task?

Any problem or set of problems that focuses students' attention on a particular **mathematical** idea and/or provides an opportunity to develop or use a particular **mathematical** habit of mind.

High or Low Cognitive Demand

The cognitive demand of a task is the level of cognitive engagement needed to complete the task (Stein et al., 2009).

BUMP IT UP

Use the task sheets on the table. Identify the specific expectations to help you rewrite the task. Justify your modifications to others at your table.

- What was your task?

- What did you notice about the curriculum?
- What/How can the task be modified, refined, extended to support ALL students?

LEARNING CONVERSATIONS

A learning conversation is a form of discourse in which the participants discuss the facets of a topic. It is important to remember it is not a debate. The goal of the learning conversation is to acknowledge perspectives so as to support learning.

At your table...

- Brainstorm some of the 'things' we hear about math.
- Discuss at your table how you could engage in a learning conversation about these topics.
- Develop a one sentence takeaway (share back).

5. LEADING MATHEMATICS LEARNING IN YOUR SCHOOL

Refer back to the brainstorm at the beginning of the day.

Building Confidence in our Next Best Move...

- What is your next best move?
- What is the role (possible role) of the school math team at your school?
- Where are some professional learning spaces in your school?
- Use the ideas you brainstormed at the beginning of the day.

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