

OGAPMath LLC

ONGOING ASSESSMENT PROJECT

Multiplicative Professional Development Overview

About the Ongoing Assessment Project (OGAP)

The Ongoing Assessment Project (OGAP) is a systematic and intentional formative assessment system in mathematics based on mathematics education research on how students learn specific concepts, common errors students make, and preconceptions or misconceptions that may interfere with learning new concepts or solving related problems.

The system involves using OGAP knowledge and the OGAP Frameworks/learning progressions to:

- 1) Gather evidence about pre-existing knowledge through the use of a pre-assessment;
- 2) Analyze the pre-assessment to guide unit planning; and
- Implement a continuous and intentional system of instruction, probing with instructionally embedded questions, and analysis of evidence in student work to make timely instructional modifications.

Implementing the OGAP formative assessment system requires a commitment by teachers, teacher leaders, and administrators:

- a) To deepen professional development on related content, related math education research, and OGAP tools and strategies for gathering evidence from student work and making instructional decisions.
- b) To support and implement the ongoing nature of OGAP. For OGAP to have sustaining power districts/ schools should provide teachers and teacher leaders time (e.g., regular PLC) to meet regularly to discuss evidence in student work, instructional implications, and implementation issues as they arise.
- c) To implement OGAP school wide. For example, it is strongly recommended that *all* teachers who teach mathematics (classroom teachers, special educators and interventionists), within grades 3-6 receive the professional development and ongoing support for fractions.

Evidence from OGAP work with hundreds of OGAP teachers has shown that utilizing the knowledge from the professional development is *only* solidified as teachers use this knowledge with students and that seems to happen best when teachers are supported on an ongoing basis through a system like PLCs.

IMPORTANT: If asked to do OGAP professional development in a school or district, please secure a commitment to a system of ongoing support.

OGAP Multiplicative Professional Development consists of 14 sessions. These sessions are organized around multiplicative content, mathematics education research, evidence in student work and instructional decision-making. The sessions are shown below, followed by descriptions of each session.



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These sessions can be completed in about 4 days of professional development time, implemented in a number of ways: 1) as a 4-day workshop/course; 2) as two 2-day workshops/courses; 3) spread throughout in-service days or a course during the school year; and, 4) other variations that maintain the integrity of the materials and the ongoing use of OGAP materials and resources.

OGAP Multiplicative Workshop Sessions
Session 1: What is Multiplicative Reasoning?
Session 2: The Big Ideas
Session 3: Properties
Session 4: Problem Structures
Session 5: Meaning of the Quantities
Session 6: Algorithms and the Open Area Model
Session 7: Additive to Multiplicative
Session 8: Telling the Story
Session 9: Math Program and Unit Planning
Session 10: Navigating the Item Bank
Session 11: Math Facts
Session 12: Division
Session 13: Math Games
Session 14: OGAP Multiplicative eTool
Important Documents:
» OGAP Multiplicative Framework/Learning Progression
» OGAP Training Overview
» Evidence Collection documents 4E and 4F « CCSSM
» OGAP Item Bank
» Pre-assessments/Training Item sets of student work

If the group is using the OGAP eTool, Session 14 The OGAP eTool Part A should be completed before Sessions 10 and 8. Part B of the OGAP eTool Session is completed in Session 12. Additionally, the eTool is used in Session 10 Navigating the Item Bank.

When you are thinking about the time you have for the workshops you should consider the following important features of OGAP Professional Development remembering that the professional development supports the implementation of the OGAP Formative Assessment system.

- 1) Design of the sessions: The OGAP multiplicative sessions intertwine math content, the mathematics education research about student learning of the concepts, analysis of evidence in student work with instructional implications, and review of instructional materials. Maintaining the integrity of these parts is critical. For example, looking at student work without understanding the research and content that underpins the work has been shown to be counterproductive. Think about each session as a package that moves participants through content, research and then implications for evidence in student work and instruction.
- 2) Thinking about order and implementation: The sessions and the parts within sessions do not necessarily have to be implemented in the order of the session numbers. The facilitator notes and the information in this document makes suggestions of order in which the sessions should be implemented and ways in which the "parts" of the sessions can be completed during separate smaller workshop or during PLC time.
- 3) Estimated times: The facilitator notes provide times for each session. *These times are estimates*. The actual time to implement a session is dependent upon a number of factors: size of the group, the grades the teachers teach, math content knowledge, and knowledge of curriculum and instructional strategies. Use your judgment given the situation.
- 4) Pre-assessments: A key principle of OGAP is gathering evidence about student learning before instruction begins. To accomplish this, there are pre-assessments that participants should administer to their students prior to the OGAP training. The evidence from the pre-assessment will be analyzed as the workshop progresses. These can be analyzed during the workshop or at a PLC after the training. In either case, participants will have gathered initial information about their students learning during the professional development sessions.
- 5) Analyzing evidence in student work: The whole point of OGAP is to strengthen teachers' ability to analyze evidence in student work to help make effective instructional decisions. To that point almost every session involves analyzing sets of student work and/or work from participant class-rooms. While you can use the sets of student work in the workshop materials, the materials have greater relevance if the work comes from the participants' classrooms. Importantly, as teachers analyze student work we ask participants to be constantly thinking about three questions.
 - a. What do you know from the evidence in student work that can be built upon?
 - b. What issues or concerns are evidenced in student work?
 - c. What are instructional implications of the evidence in student work?
- 6) OGAP and the CCSSM: All OGAP materials and professional development are aligned with the CCSSM. In particular, the CCSS is highlighted in a number of sessions.
- 7) OGAP Professional Development Instructional Strategies: These professional development ma-

terials utilize a range of instructional strategies designed to engage all participants *in thinking about* the important aspects of the workshops. Strategies such as:

a. Think, Pair, Share: "The Think-Pair-Share strategy is designed to differentiate instruction by providing students time and structure for thinking on a given topic, enabling them to formulate individual ideas and share these ideas with a peer. This learning strategy promotes classroom participation by encouraging a high degree of pupil response, rather than using a basic recitation method in which a teacher poses a question and one student offers a response. Additionally, this strategy provides an opportunity for all students to share their thinking with at least one other student which, in turn, increases their sense of involvement in classroom learning. Think-Pair-Share can also be used as in information assessment tool; as students discuss their ideas, the teacher can circulate and listen to the conversations taking place and respond accordingly." The think, pair, share strategy is used throughout OGAP training.

For more information on Think, Pair, Share, please visit <u>http://www.readwritethink.org/professional-development/strategy-guides/using-think-pair-share-30626.html</u>.

- **b. Group work**: We suggest that participants be in groups of not more than 3 or 4 people for the most effective use of group work.
- c. Questioning: Questioning is used throughout all OGAP sessions as a strategy to deepen understanding of targeted concepts and ideas. In some cases probing questions are provided. However, facilitators should not limit themselves to those questions provided if opportunities arise.
- d. Sharing Solutions: The point of sharing solutions is to help deepen understanding of a concept. The point is NOT to give participants an opportunity to participate. For this strategy to be effective the facilitator must carefully select solutions to share with the mathematical goal in mind. See Session 1 Facilitator Notes, page 4 of the for an example.
- e. Poster Sessions: The point of poster sessions is to get *all* participants to think deeply about an idea or concept. We have found that the depth of discussion and thought increases when participants have to commit their ideas to a public poster. In addition, poster sessions are designed to synthesize ideas and concepts. See Session 3 Facilitator Notes, page 9 for one example of how to debrief a poster session.
- f. Problem Solving: Many sessions start with a set of problems or a single problem for the sole purpose of engaging participants in the mathematical ideas related to the session. Examples include: Sessions 1, 4, 6, 9, 10, 11, 12, 13, and 14. Providing participants ample time to engage in the problems, activity, or sets of problems in these sessions is critical.
- g. Formative assessment: Every session is designed to help the facilitator gather evidence about participant learning to guide their facilitation: a) listening and observing during individual work; b) listening and observing group discussions; c) analysis of posters as they are developed and discussed; d) Full group discussion; and, e) embedding problems into instruction as needed as entry or exit cards.

h. Using daily workshop evaluations: Appendix A contains a sample of a daily evaluation. The point of the evaluation is for you to understand what is working and what needs modification as the workshop progresses along with eliciting any questions that participants have that need clarification. We have instituted a daily protocol of opening the following day's session by reviewing the evaluation information, addressing questions and concerns, and explaining any adjustments that have been made to the workshop as a result of the feedback. We suggest that you make a three slide power point: What's working; Issues/Concerns; Questions.

It is important to be explicit as the workshop progresses about the different instructional strategies you are using; what they are and why they are important. Most importantly, be clear that these same strategies can be used when participants are working with their own students.

Some suggested readings about instructional strategies:

Chapin, S. H., O'Connor, C., & Anderson, N. C. (2009). *Classroom discussions: Using math talk to help students learn*. Sausalito, CA: Math Solutions.

Lamberg, T. (2013). Whole Class Discussions: Improving In-depth Mathematical Thinking and Learning. Pearson Publishing.

Smith M., & Stein, M.K. (2011). *5 Practices for Orchestrating Productive Mathematics Discussions*. National Council of the Teachers of Mathematics, Reston, VA.

Walsh, J., & Sattes, B. (2005). Quality Questioning: Research-based practice to engage every learner. Corwin Press, London, England.

Wiliam, D. (2011). Embedded Formative Assessment. Solution Tree Press, Bloomington, IN.

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Session 0 – Introduction to OGAP

In this session participants will be introduced to the Ongoing Assessment Project (OGAP) and engage in discussions about formative assessment and learning progressions. **NOTE:** This session is NOT designed to engage participants in everything there is to know about OGAP, formative assessment, or learning progressions. Rather, it is designed to be a relatively quick introduction to these ideas

Intro Session: OGAP Overview

Session Sequence

A) Overview (40 minutes with introductions)



Session 1: What is Multiplicative Reasoning?

Session 1 – What is Multiplicative Reasoning:

In this session participants will determine characteristics of multiplicative reasoning and begin to interact with the OGAP Multiplicative Reasoning Progression. They will also watch 2 video clips to help understand how teachers can facilitate movement from additive to multiplicative reasoning.

Session Sequence

- A) Write questions related to multiplication using the picture of the muffin tins. (10 minutes)
- B) Read the quote on multiplicative reasoning and make a list of attributes the student with multiplicative reasoning demonstrates. (20 minutes)
- C) Watch and discuss video clips. (40 minutes)
- D) Examine student work using the OGAP Multiplicative Reasoning Progression. (20-30 minutes)

Session 2 – Big Ideas:

In this session participants will work in small groups. Each group will respond to one of seven prompts related to developing multiplicative reasoning. Each group will create a poster based on a reading on the topic that will be used to communicate the big ideas to others. The session includes a gallery walk and debriefing designed to support understanding of the seven big ideas by all participants.

Seven Big Ideas

- 1. Unitizing
- 2. Linking visual models
- 3. The distributive property, visual models, and math facts



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- 4. Commutative property
- 5. Multiplying by powers of ten
- 6. Associative property
- 7. Compensation and doubling and halving

Session Sequence:

A) Poster development 2A (30 minutes)

B) Gallery Walk (30 minutes)

C) Debriefing (30 minutes)

Session 3: Properties of Operations CCSSM

Session 3 – Properties of Operations General:

In this session participants will examine the CCSSM for properties of operations across grades 3-5 including the relationships between and among standards. They will also engage in a sample activity designed to engage students in the properties of operations.

Session Sequence

- A) Examining the CCSSM for Properties of Operations (50 55 minutes)
- B) Examining a large scale assessment property item (10 15 minutes)

Session 4 – Introduction to Structures of Problems and Contexts

In this session participants will engage in an exercise to help them identify the multiplicative structures in problem situations that increase or decrease the difficulty of the task. They will also learn about the research related to problem structures and identify these structures in some sample problems. Finally they will participate in an activity designed to provide a new method for having students interpret and solve word problems. OGAP

Session 4: Multiplicative Reasoning – Intro to Structures of Problems and Context

Session Sequence:

- A) Identifying structures of problems (30 minutes)
- B) Research Part I Visual Models (1.25 hours)

Break Recommended (Optional: Complete Session 6: Open Area Model before going to parts C and D.)

C) Research Part II – Complexity of Numbers (40 minutes)D) Research Part III– Number and Language Relationships (20 minutes)

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Session 4.2 – Interpreting and Solving Word Problems:

Session 4.2: Interpreting & Solving Word Problems In this session participants will engage in a strategy to help students solve word problems. The strategy is adapted from researchedbased literacy strategies.

Session Sequence:

A) Word Problem Strategy (30 Minutes)

Session 5 – Meaning of the Quantities:

In this session participants will examine 4 pieces of student work for evidence of the students' understanding of the meaning of the quantities in the problems. Participants will generate a list of questions they might ask the student in order to help their understanding. Then participants will examine the question types. Session 5: Meaning of the Quantities

Session Sequence:

- A) Meaning of the Quantities Case Study (30 minutes)
- B) Sharing and evaluating question types (30 minutes)

Session 6 – Visual Models and Multiplication:



In Part A of this session participants will work in small groups to solve a multi-digit multiplication problem using the open area model, partial products, and the traditional algorithm. Participants will then illustrate how the three strategies are related. They will then show how the open area model and partial products is related to multiplying algebraic expressions. In Part B of this session participants will identity standards in the CCSSM focused on using visual models and acquiring algorithms for multiplication and division.

Session Sequence:

- A) Linking multiplication strategies to each other (40 minutes)
- B) Examining the CCSSM for use of visual models and algorithms (30 minutes)

Session 7 – The Bridge from Additive to Multiplicative Strategies:

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Session 7: Multiplicative Reasoning – The Bridge from Additive Strategies to Multiplicative Strategies

In this session participants will examine student work for evidence of developing understanding, errors, and misconceptions. Based on the evidence participants will identify next instructional steps. In addition, participants will explicitly look more closely at the two types of OGAP questions: a) concept/property questions; and, b) and application/context questions. They will learn the process for collecting and recording evidence for each type of

problem. Finally, participants will learn about using quick images to develop conceptual subitizing, how it grows and develops over the grade levels, and its value as a strategy for getting students to develop multiplicative understanding.

Session Sequence:

- A) Examining student work samples for additive, transitional, and multiplicative strategies (60 Minutes)
 - A.1) Intro why evidence is important
 - A.2) Additive strategies
 - A.3) Transitional strategies
 - A.4) Multiplicative strategies
 - A.5) Non-multiplicative
- B) Two Types of OGAP tasks (45 minutes)
 - B.1) Analyzing Property/Concept Items
 - **B.2)** Analyzing Application Items
- C) Subitizing (20 minutes)

Session 8 – Telling the Story

The focus of this session is on synthesizing the evidence across the OGAP Pre-assessment Training items* that have been analyzed from three perspectives listed below. This OGAP process is called 'Telling the Story'.

- 1) What are some patterns in your class of developing understanding and strategies along the Progression that can be built upon? (e.g., many students are using equal groups, build on this to transition to array models.)
- 2) What are underlying issues or concerns across your class?
- 3) What are implications for instruction? (e.g., mathematical concepts/ideas that should be emphasized or deemphasized)

Session Sequence:

A) Becoming familiar with the pre-assessment (Use before Session 4: Problem Structures). (20 minutes)

B) Analyzing the evidence in the OGAP Pre-assessments Training items to tell your class story (Use after Session 12: Division) (30 minutes)



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General Description:

In this activity participants will draw on the evidence they have collected from analyzing student preassessments (Session 8) and knowledge of math education research to review their math program/instructional materials. Based on this evidence participants identify and address gaps in their math programs/instructional materials. In addition, participants will select appropriate OGAP items that can be used to quickly check for understanding at the

Session 9: Program Review and Planning

end of lessons and inform their instruction for the first couple of lessons in their next unit on multiplication or division.

NOTE: This session must follow the sessions Session 10: Navigating the Item Bank (Session 10), and Session 8: Telling the Story (Session 8). This session is often not done during the main training days and is a good session for teacher leaders to complete.

Session Sequence:

A) Reviewing your math program (45 minutes)B) Unit planning (45 minutes)

Session 10 – Navigating the Item Bank:



In this session participants will become familiar with how the item bank is organized, how to locate items, and what the research says about different problem contexts. Participants will form small groups and examine one section of the item bank to help fellow participants understand it more thoroughly.

Session Sequence:

- A. OGAP Item Bank Overview (30 40 minutes)
- B. A Closer Look at the OGAP Item Bank (50 minutes)

Session 11 – Math Facts:

Session 11: Math Facts – Strategies to help learning and retaining math facts

In this session participants will be introduced to the research on math fact acquisition. They will then develop a list of "thinking" strategies for developing fact fluency.

This session is best completed before Session 13: Analyzing Math Games.

Session 12:

Division

Session Sequence A) Developing math fact fluency (40 minutes)

Session 12 – Division:

This session is designed to build understanding of:

- The role visual models play in solving division problems, understanding the relationship between multiplication and division, and developing understanding of division algorithms.
- Partitive and quotative division.
- Meaning of remainders.

Participants also analyze evidence of division in student work using the OGAP Division Progression, and engage in discussions about instructional next steps based on the evidence.

OGAP eTool users will record evidence using the eTool for the first time during this session.

Session Sequence:

- A. Writing and solving division word problems (40 minutes)
- B. Debriefing word problems and solutions poster session (30 minutes)
- C. Understanding an algorithm for division (30 minutes)
- D. Examining Student Work (30 minutes)

Session 13 – Math Games:



In this session participants will play a variety of multiplication games. They will analyze the intent of the game, and plan for explicit and intentional instruction related to the games. Games are one strategy for increasing automaticity with math facts and for developing understanding of multiplication concepts.

This session can be completed in one block of time, can be used as warm-ups or filler for a short block of time, or as a change of pace in a training day. In the hour session not everyone will be able to play each game but they can do enough to get the idea.

Session Sequence:

A) Playing and Analyzing the Game (60 minutes)

Session 4 – eTool:

This session is broken into two parts that are used throughout other sessions.

A) General Overview – During this part of the session participants explore the functions of the eTool with minimum directions. Part A should be completed before Sessions 8 and Session 10.



B) Entering Work – Although this happens part way through Session 10, this will be the first time participants enter work *in the eTool* instead of paper on paper.

Note: The eTool is used twice more in the training. The directions for how to use it and what you are doing with it are in the facilitator notes for **Session 8: Telling the Story**, and then **Session 10: Navigating the Item Bank**.

<u>Session Sequence:</u> This session is divided into two parts. Part A should be completed BEFORE Session 8 and 10.

- A) General eTool overview (about 30 minutes)
- B) Entering work mid-session 12 (about 30 minutes)

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Date:	Which best describes you? Classroom Teacher School or District Mathematics Teacher Leader Other
What activities and/or	r concepts in today's workshop were especially useful for you?
Do you have any issue	as ar concerns shout the workshon? If yes, describe
Do you have any issue	ss of concerns about the workshop. If yes, describe.
What questions do vo	u have for the instructors?
what questions do yo	
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