PLANNING AND COACHING PROTOCOL

Mathematical Goal

Learner

Community

Plan

Launch

Facilitate Productive Struggle

Discuss Learner Thinking

Return to Mathematical Goal

Reflect

Teacher Preparation

Whole Group

Individual/Small Groups

Whole Group
• What is your mathematical goal?

• Do you need to make adjustments based on evidence from prior lessons?

• What task will you use? Does it need revisions?
  • Is it low-floor, high-ceiling? Does it allow for multiple approaches? If not, how can you open the problem up?
  • Will it help get to your mathematical goal?
  • Is it accessible to your students? Possible revisions include:
    • changing the numbers
    • changing the context
    • changing the conditions

• What do you anticipate students will think?
  • What strategies/ideas will students use/have?
  • What stumbling blocks are they likely to encounter?
  • What representations could you use to help make
• How will you help learners begin to make sense of the task individually?

• How will you establish collective understanding of the task and context (without telling them how to do it)? Think about:
  • eliciting prior knowledge, clarifying context and vocabulary, and representing important information

• How will you build a bridge to solving? Think about:
  • communicating expectations for work, products, and tools
  • assessing individual and class readiness to engage in productive struggle
### LAUNCH

**How will you help learners begin to make sense of the task individually?**

| Give multiple ways to **process the task** (e.g. hearing it read out loud, reading silently, choral reading, different voices) | - Listen carefully. I’m going to read it twice.  
- Your only job right now is to read the problem and try to make sense of it yourself.  
- Feel free to write on the problem to help you make sense of it.  
- Lizzy, will you read the problem out loud? |
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<td>When developmentally appropriate, encourage learners to <strong>write notes</strong> about their thinking</td>
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| Have learners describe task or problem in their own words | - Who wants to try summarizing the problem in their own words?  
- What are we being asked to figure out? |
| Ask learners to **visualize the problem** and describe what is happening in the situation | - What is happening in this situation? What’s going on here? |

**How will you establish collective understanding of the task and context (without telling them how to do it)?**

| Elicit and/or make connections to **prior knowledge and experience** and fill gaps as needed | - Who here has cooked with a family member before? Did you use measuring cups? Can you share a personal story about your experience?  
- This problem uses the term regular polygon. We learned about them last month when we did the ____ activity. Talk to your partner about what it means to be a regular polygon. |
| Provide opportunity for **clarification** of task and vocabulary (scaffolded or open-ended questions) | - What do you think it means when it says a ‘fair share’?  
- Is this the kind of problem that could have more than one solution, or are we looking for a single correct solution? |
| **Record** group sense-making of problem | - List important information/constraints the group agrees to on the board. |
| If needed, ask **explicit questions** without specifying an equation, strategy, or operation for solving | - It asks us to find the largest rectangle. Could the answer be a square? Why or why not? |

**How will you build a bridge to solving?**

| **Set expectations** for working (individuals, partners, groups, timing), products (solution AND justification), and available tools | - Take a few minutes to start solving the problem yourself. In a few minutes I’ll ask you to start talking with someone else about your ideas.  
- Think about using the counters or the base ten blocks up here if they might help you.  
- So you have two jobs. First—to find out how much money he started with. Second—to have some kind of work that shows your thinking and proves your solution.  
- In fifteen minutes, I’m going to ask each group to share what they are finding. |
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<td><strong>Assess</strong> individual and class readiness to engage in productive struggle on the problem</td>
<td>- Consider: Is there anyone who seems like they may need extra support understanding the problem or getting started?</td>
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• What opportunities will learners have for collaboration?
  • Be specific—what will this look like?

• How will you support learner thinking without lowering the cognitive demand?
  • Consider getting learners started
  • Consider getting learners “unstuck”
  • Consider pushing learners’ ideas further
  • Consider tools/supplies/resources
  • Consider alternate versions of the task

• How will you make decisions about what to do in the next parts of the lesson?
  • Keep track of student strategies and misconceptions
  • Remind yourself to look for opportunities to assign competence
# FACILITATE PRODUCTIVE STRUGGLE

**What opportunities will students have for collaboration?**

| Provide opportunities for students to work collaboratively, in pairs or small groups | • Talk with your partner about your ideas and their ideas. Are they thinking about the problem in a similar or different way?  
• You two have similar strategies. Why don’t you see if you can help each other to find a solution? |
| --- | --- |
| **Scaffold collaboration** between students | • What do you think about what Keira just said?  
• That’s a great question. Why don’t you ask your partner that question and see what she thinks. |

**How will you support student thinking without lowering the cognitive demand?**

| Help students understand the problem by rereading the problem, focusing on understanding the situation and/or clarifying terms or contexts | • Read the problem out loud to me.  
• What do we know?  
• Try explaining what’s going on in your own words. |
| --- | --- |
| Help students get started or unstuck by:  
• using models, diagrams or acting out the problem  
• thinking about a similar, simpler scenario  
• building on their informal and/or incomplete strategies  
• asking questions and/or providing just enough information (scaffolding)  
• pointing out an approach that has helped another group get started | • Let’s act it out  
• Can you draw a picture of what is happening?  
• What are you thinking about?  
• What are you trying to find out?  
• What’s hard or standing in your way?  
• Does this remind you of anything we’ve done before?  
• Let’s all come back together for a moment. Jamal has noticed an important pattern. |
| Provide appropriate tools, resources, and supplies for students to engage with task | • Remember there are counters if you would like to use them.  
• What are some materials you could use to help you solve this? |
| For students that need it, provide alternate versions of the task (simpler/more complex) or follow-up tasks | • Vary the numbers, the problem structure, or the context  
• Provide graphic organizers or sentence frames  
• Provide supports “just in time”—when a student demonstrates the need because the struggle is no longer productive |
| **Coach mathematical participation** | • What would happen if you used a different number? Let’s try!  
• See if you can convince your groupmates that it works |

**How will you make decisions about what to do in the next parts of the lesson?**

| Circulate to visit, listen in on, and monitor | • Try to check in with each group, asking questions to gauge understanding  
• Monitor time, progress, and group dynamics |
| --- | --- |
| Determine what strategies students are using to solve the task and keep a mental or written record | • Look for a range of student strategies you could share with the class (perhaps take a picture)  
• Look for common misconceptions that need addressing |
| Look for opportunities to assign competence, particularly to low-status students, by giving praise that is public, specific, and meaningful to the task. | • I noticed Eric was doing something really important—he was looking for patterns.  
• I love how Jada is trying out different combinations!
DISCUSS LEARNER THINKING

- How will you decide **what will be shared, by whom and in what order?**

- How will you **facilitate and support the sharing and discussion of work and strategies?**
### DISCUSS LEARNER THINKING

#### How will you decide **what will be shared, by whom and in what order?**

| Consider the **type of mathematical goal** you have identified | • Build or reinforce a new conceptual understanding  
| | • Connect a conceptual understanding to a procedure  
| | • Develop procedural fluency (with understanding)  
| Using this knowledge, strategically **select** solution approaches to make visible to the class | • Related and/or contrasting strategies  
| | • Common misconceptions  
| | • Useful notation or organization  
| Intentionally **sequence or organize** solutions to lead to the mathematical goal. | • Accessible/concrete to efficient/abstract  
| | • Common to unconventional  
| | • Exhibition protocols  
| Attend to **equitable participation, identities, and status.** Consider who will represent work: the facilitator, a student or multiple students. | • Whose work will be represented and why?  
| | • Whose work and/or voices are not represented?  
| | • Allow everyone’s work to be shown? (e.g., gallery walks)  

#### How will you **facilitate and support the sharing and discussion of work and strategies?**

| Coach students on **how** to present their ideas and solutions to peers | • Turn and face the class so that we can hear and see you.  
| | • Could you stand to the side so we can see your drawing?  
| | • Could you say that again so everyone can hear your ideas?  
| **Represent** learner strategies visually by projecting or recording learner solutions using pictures, equations, and/or words and orienting learners to parts of solutions | • Use visual models (number lines and area models) to make strategies accessible.  
| | • Use colors, circling, arrows, etc. to highlight parts of solutions.  
| Cultivate **rich learner explanations** by providing wait time, probing, and pressing learner thinking | • Can you say more about that?  
| | • Why do you think Tiffany’s method works?  
| | • Tell us how your strategy works.  
| | • I’m wondering if this method will always work?  
| | • I want to hear from someone else who hasn’t spoken yet  
| Engage learners in **making sense of each other’s thinking** by: | • I think what you’re saying is ______. Did I get your idea right?  
| | • revoicing for clarity  
| | • prompting and scaffolding participation from learners  
| | • asking learners to rephrase, agree or disagree, or add on to another learner’s response  
| Intentionally make space for and **assign competence** to marginalized and/or low-status learner contributions by: | • That mistake helped us all to better understand this!  
| | • acknowledging mathematical practices  
| | • attributing an idea to a specific learner  
| | • treating errors as an opportunity for learning  
| Introduce standard **language, notation, and/or models** in response to learner ideas and questions | • Here is one way to visualize what Anna is doing. [Teacher draws a model.] How do you see Anna’s strategy in this picture?  
| | • How could we write that with equations?  
| | • Did you notice how in John’s pattern we keep multiplying numbers by themselves? We call these square numbers. Mathematicians have a special notation for this.
RETURN TO MATHEMATICAL GOAL

- What are the connections you need learners to make to explicitly bridge their thinking and strategies to the important mathematical ideas? What is your plan for helping learners to make these connections?

- How will you help learners to solidify connections and consolidate their understanding? How will you formatively assess learners’ understanding?
## What are the connections you need learners to make to explicitly bridge their thinking and strategies to the important mathematical ideas? What is your plan for helping learners to make these connections?

### Facilitate a whole class debrief
- Try to surface and highlight:
  - an understanding of the main mathematical ideas of the lesson
  - any remaining questions or uncertainties
  - connections to other concepts
  - real-world applications

### Help learners to formalize their ideas by generalizing patterns and relationships, articulating theories and/or proving or disproving conjectures
- Do you see any patterns?
- Will that strategy always work? How do you know?
- Can you think of an example where that wouldn’t be true?
- Why do you think that makes sense?
- Let’s look at the table we made. What did we discover about the relationship between the value of a digit when it is in the tens place, and the value of that same digit when it is in the hundreds place?

### Connect procedures to concepts
- Let’s take a look at Chris’ drawing and at Jamir’s equation. How are they connected to each other?
- Is there a more efficient way to record those steps?
- Now I’m going to show you how we can write that a different way.

### How will you help learners to solidify connections and consolidate their understanding? How will you formatively assess learners’ understanding? Choose one or more of the options below.

#### Give learners the opportunity to revise their thinking on the task
- Revisions to rough draft thinking might include:
  - Making the work clear and understandable
  - Making a convincing argument
  - Changing the answer, or adding additional solutions
  - Trying a different strategy to get to the solution
  - Looking for patterns or generalizing a rule

#### Engage learners in written reflection
- **General Feedback:** What is something you learned today? What do you still have questions about?
- **Focused on the mathematical goal:** In your own words, what makes a relationship proportional?
- **Focused on identity:** How do you feel about being called on to share your thinking? What’s it like to listen to other people’s strategies?
- **Focused on group process:** How well did your group work together?

#### Collaboratively create a chart to anchor problem solving
- Clearly record things like:
  - steps to a procedure discovered through learner’s strategy (e.g. Martha’s Method of Factoring)
  - definitions, theorems or mathematical truths discovered and clarified through the course of the lesson
  - a list of different kinds of strategies that could be used to solve a certain kind of problem based on the class's work for the day

#### Select and administer an exit slip
- Characteristics of a good exit slip:
  - can be solved quickly, in about 5 minutes
  - provides an opportunity for learners to use different strategies
  - requires mathematical justification or explanation
  - is not exactly the same kind of problem they just solved
REFLECT

• How will you use the evidence you collected to make decisions about instructional next steps?

• What options do you have for follow-up work to build from and expand learners’ current understanding?
  • A mini lesson to the whole class
  • A small group lesson on an identified area of need
  • Practice problems or activity
  • Adding in a new math routine
  • A new task
  • Something else?
### Reflect

**How will you use the evidence you collected to make decisions about instructional next steps?**

| Look for evidence of developing understanding or underlying issues in your students’ work | • What is the good news that I can build upon?  
• What issues or concepts do I want to make sure to address before moving forward? |
| Analyze evidence of learner participation, identity, and/or group processes | • Is there evidence that my students are engaging in problem solving and discussion?  
• Are all students developing positive mathematical identities?  
• How could I help Amira develop more confidence in her own thinking? |
| Review video and/or observation notes in relation to professional learning goals | • Identify a moment that went well – what facilitation moves did you use and how did they support your learners?  
• Identify a moment that didn’t go as well as you hoped – what could you have done differently and what can you learn from this?  
• Set goals for your next lesson to build upon |

### What options do you have for follow-up work to build from and expand learners’ current understanding?

| Does the whole group need more instruction?  
Teach or plan to teach a **mini-lesson** on an identified need to the whole class | • If you notice that learners are not labeling their answers, you might do a mini-lesson on identifying the meanings of the quantities in word problems  
• A mini-lesson on equipartitioning area models might follow a task where learners had difficulty visually representing a whole with equally sized fractional units (i.e. sixths) |
| Does a small group have a specific need?  
Provide **differentiated support or instruction to a small group** | • Work with a small group on an identified area of need, using a different approach, model, or activity  
• Intentionally pair learners based on identified strengths/needs |
| Would students benefit from more practice?  
Choose **additional problems or an activity** to give students more opportunities to utilize a new math skill or concept | • Introduce a mathematical routine (e.g. number talks, Which One Doesn’t Belong, Quick Images)  
• Have students play a math game to reinforce and practice a specific skill  
• Give students a small number of problems to work on with a partner/small group |