**Supporting Intellectual Lift in Planning & Execution - Math**

**Suggested Process for Rollout**

*The coach should bring people through this process in three phases:*

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| **Phase #**  | **Description**  | **Participant Pre-Work**  | **Facilitator Pre-Work**  |
| 0 Picking the Math | This phase gets people to a proficient level of understanding the math by making key preparation moves (content and practice standards identification, key points creation, problem selection and validation). Through supporting these strong skills of problem selection and alignment, the facilitator also sets the standard for what a strong problem looks like. | Participants select aim, content and practice standards, articulate the key points that should come to light for those standards, and choose a rich exercise, problem or task that is conducive to highlighting the desired math learning. \*Note: In the beginning, the facilitator may opt to provide the participant with the standards and exercise/problem/task until the participant is able to do so on his/her own.  | Facilitator reviews the participant’s pre-work prior to the protocol to check for and provide feedback on alignment between content/practices and the exercise/problem/task as well as alignment of the exercise/problem/task to the criteria outlined in the FOI. Facilitator checks for alignment of the math content and practices within the learning progression of the unit and year. |
| 1Depth & Proficiency in Content (Identifying the why, what and how key points) | This phase focuses on crafting the representations and strategies for the exercise or task, ordering them by level of sophistication, and articulating the links between each representation from both an adult and student lens. The phase moves from crafting multiple representations and strategies to synthesizing key points based on the underlying math concepts applied.  | Once participants have reached proficiency with pre-work for phase 0, participants complete phase 1 in its entirety as pre-work, ready to present their initial attempt at creating representations and strategies as well as making connections between strategies and the key points to their coach. This allows for more time to be allocated during the protocol for phases 2 and 3. | Facilitator should do the participant’s pre-work, paying particular attention to the connections between the representations, strategies, and key points. Facilitator should be prepared to bring resources to share with participant to facilitate learning ‘the math,’ as needed. |
| 2 Questioning and Misconceptions | This phase focuses on questioning and misconceptions. What are the big meaty questions that will guide the discussions? What are the likely misconceptions (both gap and content) and how, with questioning and other means, will those misconceptions be handled? The phase closes with a revision of the questions and a series of funneled questions for responding to misconceptions | Once participants have reached proficiency with pre-work for phases 0 and 1, participants complete phase 2 in its entirety as pre-work, ready to present their initial planning. This allows for more time to be allocated during the protocol for phase 3. | Facilitator should do the participant’s pre-work, paying particular attention to crafting conceptual misconceptions that a large number of students will experience in order to focus the conversation during the protocol. |
| 3Practice | This phase focuses on practicing the execution of the lesson. It focuses on least invasive facilitator moves that support scholars in struggling to precision and ensuring that all minds are on.  | TBD  | TBD  |

**Math Intellectual Preparation Protocol: Overview**

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| --- | --- |
| **Phase #**  | **Description**  |
| *Phase 0 will begin with the coach and quickly become pre-work for the teacher*  |
| 0 – Picking the Math | Define the purpose of the unit |
| Name the focus for the lesson |
| Select the problem |
| **Phase #** | **Description**  |
| *Phases 1 and 2 should happen either in the meeting or as pre-work depending on the phase of facilitation/level of teacher proficiency.* |
| 1 – Depth & Proficiency in Content | Craft 2-3 possible solution pathways using multiple representations and strategies  |
| Final check for alignment and revise as needed |
| Select solution pathway that best illustrates the focal math concepts; and, order alternate pathways to develop depth of understanding and connection making in order to make sense of the most efficient pathway |
| Articulate the relationship between representations and strategies, and how they validate and/or shed light on the underlying focal math concepts |
| Synthesize the key why, what and how points linking the focal math concepts to the representations and strategies, and the relationships between them |
| 2 – Questioning and Misconceptions | Draft focal questions to bring out key points |
| Identify misconceptions  |
| Revise focal questions to draw out and address misconceptions |
| 3 – Practice  | Practice delivery |

**Math Intellectual Preparation Protocol: Prompts & Resources**

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| **Phase #**  | **Description**  | **Prompts/Questions** | **Resources**  |
| *Phase 0 will begin with the coach and quickly become pre-work for the teacher*  |
| 0Picking the Math | Define the purpose of the unit | Prior to IPP, relevant Unit should be unpacked. | Unit Plan |
| Name the focus for the lesson | Which aim(s) are you teaching?Which content standards support or apply the aim?Which focal SMP from the unit supports the aim?Which key points am I prioritizing developing during this lesson?  | Unit Plan |
| Select the problem | Select a problem that aligns to the prioritized math from steps 1 and 2 and meets criteria for an Exercise or Task Do the problem as an initial check for alignmentHow does the selection align to the prioritized math at this time in the unit? (Aim(s) and key points named?)How are the selected content standards being addressed in this problem?Does the selection address the content standards at the right level?What are the opportunities for students to engage in the prioritized SMP? | FOIUnit PlanCCSS |
| **Phase #** | **Description**  | **Prompts/Questions**  | **Resources**  |
| *Phases 1 and 2 should happen either in the meeting or as pre-work depending on the phase of facilitation/level of teacher proficiency.* |
| 1Depth & Proficiency in Content | Craft 2-3 possible solution pathways using multiple representations and strategies  | What are all the ways to approach the exercise/problem/task? How would you approach this concretely? Pictorially? Abstractly?  | Unit Plan and Assessment, Engage NY Materials, Progression Documents, Source of exercise or task, colleagues/coach |
| Final check for alignment and revise as needed | Is the math selected the most natural way to approach the selected problem or a natural build upon student understanding to culminate in new learning? |  |
| Select solution pathway that best illustrates the focal math concepts; and, order alternate pathways to develop depth of understanding and connection making in order to make sense of the most efficient pathway | Which solution pathway most naturally addresses the underlying math concepts? In what order should the alternate pathways be presented by students in order to lead their classmates to understand the target pathway? | See above |
| Articulate the relationship between representations and strategies, and how they validate and/or shed light on the underlying focal math concepts | How does understanding each representation and strategy support the understanding of the others and the math being applied? | See above |
| Synthesize the key why, what and how points linking the focal math concepts to the representations and strategies, and the relationships between them | How are the key points living in the problem and prioritized solution strategies? | See above |
|  |
| 2Questions and Misconceptions | Draft focal questions to bring out key points | What do students need to be considering in order to be ready to engage in the logic of the concepts? What sense making, reasoning and probing questions will support students in thinking about and developing an understanding of the focal strategies, representations, practices and concepts needed to tackle the problem?What are the questions that get kids to consider the most important ideas while preserving or pushing student thinking? | AF Mathematics Questioning Guide |
| Identify misconceptions  | *Grade level content misconceptions*What are the 1-2 misconceptions students will likely have that impede comprehension?How will you respond to each one?Will you play out the misconception or fix it?* If played out, to what end?
* If fixed, will it be for an individual, the whole group or a small group?

What do kids need to experience or see in order to change their logic/increase their mathematical intuition?  | “Transformative Assessment in Action.” James Popham.Unit plan Colleagues  |
| *Pre-requisite content knowledge gaps + misconceptions* What are the 1-2 pre-requisite knowledge and skill issues you are likely to see? How will those prevent students from accessing the content?Will you fix them beforehand or in the moment? Using:* Adjusting the entry point
* Tools/manipulatives provided
* Language
* The exercise/problem/task
* Student groupings
 |
| Revise focal questions to draw out and address misconceptions | Do your initial focal questions provide an opportunity for misconceptions to come to life and lead students through an experience that shift their thinking and solidify their understanding?What additional questions do you need incorporate to draw out and address misconceptions in order to help students see the logic required to understand the focal concepts? |  |
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| 3 Practice | In development  | NA | NA |

**Participant Note Taking Sheet**

**Phase 0: Picking the Math**

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| **The Focus of the Lesson** |
| Which aim(s) am I prioritizing? | Which content standard does this aim connect to? |
|  |  |
| Which focal SMP supports this concept? | Which key points am I prioritizing during this lesson? |
|  | * Why:
* What:
* How:
 |
| **Exercise or Task** |
|  |
| **The What of the Problem** |
| How does the problem align to the priority aims, standards, and concepts named above? |
|  |
| **The How of the Problem** |
| How are students applying the SMP(s) in this problem? |
|  |
| To what extent does the problem align to the FOI criteria? |
| Criteria for Exercise | Criteria for Problem/Task |
| * Draws thinking towards mathematics to be used and learned; is relatively narrowly focused on a strategy, concept or skill
* May be difficult or easy, complex or simple, but never puzzling
* The path(s) towards the solution is(are) often apparent
* Incorporates the following Key Cognitive Strategies (Conley):
	+ Problem Formation: requires planning and use of reasoning skills
	+ Research: lends itself to strategic selection and use of tools
	+ Interpretation: requires planning and use of reasoning skills; requires understanding, identification and/or application of one or more concepts and skills
	+ Communication: requires students to demonstrate evidence of their thinking, fluency and conceptual understanding through use of models, work shown and/or written explanations; requires evidence to be provided and may require development of logical argument for concepts or steps
	+ Precision & Accuracy: requires attention to appropriate rules of precision when tending to work in written, oral, or symbolic form
 | * Draws thinking towards mathematics to be used and learned
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	+ Precision & Accuracy: requires attention to appropriate rules of precision when tending to work in written, oral, or symbolic form
* Non-routine and complex
* Solution path is neither stated or obvious; may be multiple solution paths; may be multiple solutions
 |

**Phase 1: Depth and Proficiency in Content**

**Craft 2-3 solution pathways using multiple representations and strategies**

*Scan and paste handwritten solution pathways.*

\*\* Check for natural alignment of exercise, problem or task to math focal points, and revise as needed

**Prioritize and Order Pathways**

|  |  |  |
| --- | --- | --- |
| **Pathway 1** | **Pathway 2** | **Target Pathway** |
| Select solution pathway that best illustrates the focal math concepts; and, order alternate pathways to develop depth of understanding and connection making in order to make sense of the most efficient pathway |
|  |  |  |
| Articulate the relationship between representations and strategies, and how they validate and/or shed light on the underlying focal math concepts |
|  |
| Synthesize the key why, what and how points linking the focal math concepts to the representations and strategies, and the relationships between them  |
| How are the key points living in the problem and prioritized solution strategies? |
| **Why** | **What** | **How** |

**Phase 2: Questioning and Misconceptions**

What do students need to be considering in order to be ready to engage in the logic of the concepts?

What sense making, reasoning and probing questions will support students in thinking about and developing an understanding of the focal strategies, representations, practices and concepts needed to tackle the exercise or task?

What are the questions that get kids to consider the most important ideas while preserving or pushing student thinking?

**Questioning to Encourage Student Thinking**

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| --- |
| What questions will you ask to get students to: * Make sense of the problem?
* Reason about the mathematical concepts being applied?
* Reveal their depth of understanding?
 |
| **Question** | **Type of Question** |
|  | * Sense Making
* Reasoning
* Probing
 |
|  | * Sense Making
* Reasoning
* Probing
 |
|  | * Sense Making
* Reasoning
* Probing
 |
|  | * Sense Making
* Reasoning
* Probing
 |
|  | * Sense Making
* Reasoning
* Probing
 |
|  | * Sense Making
* Reasoning
* Probing
 |

**Identifying Misconceptions**

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| What are the key misconceptions that will obstruct student success?  |
| **Grade Level Content Misconceptions**  | **What logic led to the misconception?** | **Teacher Response** |
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| **Pre-requisite Misconceptions**  | **What logic led to the misconception?** | **Teacher Response** |
|  |  |  |
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\*\* Revise focal questions to draw out and address misconceptions

**Facilitator Prep Sheet**

**Phase 0: Picking the Math**

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| --- | --- |
| **Focus of the Lesson** | **Facilitator Guiding Questions** |
| Which aim(s) am I prioritizing? | Which content standard does this aim connect to? | * Which aims support or apply this concept (within this unit)?
* Which content standards support or apply this concept?
* Which focal SMP from the unit supports this concept?
* Which key points am I prioritizing developing during this lesson?
 |
|  |  |
| Which focal SMP supports this concept? | Which key points am I prioritizing during this lesson? |
|  | Why?What?How? |
| **Exercise or Task** | **Facilitator Guiding Questions** |
|  | * Select a problem that aligns to the prioritized math from steps 1 and 2
* Do the problem as an initial check for alignment
 |
| **The What of the Problem** | **Facilitator Guiding Questions** |
| How does the problem align to the priority aims, standards, and concepts named above? | * How does the selection align to the prioritized math at this time in the unit? (aims, and concepts named?)
* How are the selected content standards being addressed in this problem?
* Does the selection address the content standards at the right level?
 |
|  |
| **The How of the Problem** | **Facilitator Guiding Questions** |
| How are students applying the SMP(s) in this problem? | * What are the opportunities for students to engage in the prioritized SMP?
* To what extent does the problem provide opportunity for students to apply additional standards of mathematical practice?
* To what extent does the exercise or task meet the criteria defined in the FOI for this lesson type?
 |
|  |
| To what extent does the problem align to the FOI criteria? |
| Criteria for Exercise | Criteria for Problem/Task |
| * Draws thinking towards mathematics to be used and learned; is relatively narrowly focused on a strategy, concept or skill
* May be difficult or easy, complex or simple, but never puzzling
* The path(s) towards the solution is(are) often apparent
* Incorporates the following Key Cognitive Strategies (Conley):
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**Phase 1: Depth and Proficiency in Content**

**Craft 2-3 solution pathways using multiple representations and strategies**

*Scan and paste handwritten solution pathways.*

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| --- |
| **Facilitator Guiding Questions** |
| * What are all the ways to approach the exercise or task?
* How would you approach this concretely? Pictorially? Abstractly?
* Is the math selected the most natural way to approach the selected problem or a natural build upon student understanding to culminate in new learning?
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**Prioritize and Order Pathways**

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| **Pathway 1** | **Pathway 2** | **Target Pathway** | **Facilitator Guiding Questions** |
| Select solution pathway that best illustrates the focal math concepts; and, order alternate pathways to develop depth of understanding and connection making in order to make sense of the most efficient pathway | * Which solution pathway most naturally addresses the underlying math concepts?
* In what order should the alternate pathways be presented by students in order to lead their classmates to understand the target pathway?
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| Articulate the relationship between representations and strategies, and how they validate and/or shed light on the underlying focal math concepts | * How does understanding each representation and strategy support the understanding of the others and the math being applied?
 |
|  |
| Synthesize the key why, what and how points linking the focal math concepts to the representations and strategies, and the relationships between them  | **Facilitator Guiding Questions** |
| Why | What | How | * How are the key points living in the problem and prioritized solution strategies?
 |
|  |  |  |

**Phase 2: Questioning and Misconceptions**

What do students need to be considering in order to be ready to engage in the logic of the concepts?

What sense making, reasoning and probing questions will support students in thinking about and developing an understanding of the focal strategies, representations, practices and concepts needed to tackle the exercise or task?

What are the questions that get kids to consider the most important ideas while preserving or pushing student thinking?

**Questioning to Encourage Student Thinking**

|  |  |
| --- | --- |
| What questions will you ask to get students to: * Make sense of the problem?
* Reason about the mathematical concepts being applied?
* Reveal their depth of understanding?
 | **Facilitator Guiding Questions** |
| **Question** | **Type of Question** | * What do students need to be considering in order to be ready to engage in the logic of the concepts?
* What sense making, reasoning and probing questions will support students in thinking about and developing an understanding of the focal strategies, representations, practices and concepts needed to tackle the problem?
* What are the questions that get kids to consider the most important ideas while preserving or pushing student thinking?
 |
|  | * Sense Making
* Reasoning
* Probing
 |
|  | * Sense Making
* Reasoning
* Probing
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|  | * Sense Making
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* Reasoning
* Probing
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|  | * Sense Making
* Reasoning
* Probing
 |
|  | * Sense Making
* Reasoning
* Probing
 |

**Identifying Misconceptions**

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| --- | --- |
| What are the key misconceptions that will obstruct student success?  | **Facilitator Guiding Questions** |
| **Grade Level Content Misconceptions**  | **What logic led to the misconception?** | **Teacher Response** | * What are the 1-2 misconceptions students will likely have that impede comprehension?
* How will you respond to each one?
* Will you play out the misconception or fix it?
	+ If played out, to what end?
	+ If fixed, will it be for an individual, the whole group or a small group?
* What do kids need to experience or see in order to change their logic/increase their mathematical intuition?
 |
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|  |  |  |
| **Pre-requisite Misconceptions**  | **What logic led to the misconception?** | **Teacher Response** | * What are the 1-2 pre-requisite knowledge and skill issues you are likely to see?
* How will those prevent students from accessing the content?
* Will you fix them beforehand or in the moment? Using:
	+ Adjusting the entry point
	+ Tools/manipulatives provided
	+ Language
	+ The problem
	+ Student groupings
 |
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\*\* Revise focal questions to draw out and address misconceptions

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| **Facilitator Guiding Questions** |
| * Do your initial focal questions provide an opportunity for misconceptions to come to life and lead students through an experience that shift their thinking and solidify their understanding?
* What additional questions do you need incorporate to draw out and address misconceptions in order to help students see the logic required to understand the focal concepts?
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