EXPANDED LESSON PLANNING FRAMEWORK

PLANNING FOR THE ENACTMENT OF SCIENCE LESSON THAT PROMOTE CONCEPTUAL UNDERSTANDING

Regular use of this framework – alone and with colleagues – fosters productive professional habits-of-mind and –practice.

<table>
<tr><td>SET CLEAR
SCIENCE GOALS</td><td colspan="2">

Using the Lesson Goals sheet, identify the core science idea and relevant standards on which this lesson needs to focus. What is the focus question?
What do all students need to know and understand about science as a result of their engagement in this lesson?
What prior knowledge/preconceptions will you need to access? How will you do this?
What scientific habits-of-practice, scientific habits-of-interaction, and discourse skills will students develop within this science investigation?

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<tr><td>DO THE
SCIENCE</td><td colspan="2">The purpose of "doing" the science is to examine your own scientific thinking about the investigation as well as to anticipate how students will engage in the investigation and what science ideas they will learn.

What is the scientific investigation or engineering problem on which students will be working? (Note: in this context, "investigation" refers to the lesson and/or set of lessons that center on the big idea on which this investigation focuses. It is assumed that the investigation, as designed, contributes to the conceptual development and understanding of a core science/engineering concept or practice.)
What are the ways the investigation can be approached?
What strategies/ideas can/cannot provide evidence for the scientific explanation that students will generate from this investigation?
How does this investigation relate to the science goals for this investigation? How does this investigation contribute to and advance students' scientific understanding and practices?

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<tr><td>ANTICIPATE
STUDENT
STRATEGIES AND
CONCEPTIONS</td><td colspan="2">

What are the typical misconceptions that students have about the core science ideas of the investigation? What correct and incorrect student conceptions do you anticipate of your students? What is your reasoning?
How will you surface student prior experiences and preconceptions about the core science ideas of this investigation?
What scientific concepts, practices, and ideas will students understand and struggle with? What is your reasoning?
How might you respond to students' correct and incorrect science ideas?
What will students say and do that provides evidence that the lesson goals are being met?

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<tr><td rowspan="3">PLENARY (Whole Group)</td><td rowspan="3">SET UP FOR
SCIENCE
INQUIRY</td><td colspan="2">GENERAL QUESTIONS ABOUT THE SET-UP

What resources and materials will students have available to use in their work on this investigation?
How will the students work during the investigation – independently, in small groups, in pairs, and/or in plenary (whole group)? When will the groupings change? Why?
What other group and discourse structures and strategies are planned for the investigation? What is your rationale?
What will students record in their science notebooks? What support will they need?
Will there be public records of students' thinking? If so, how will these be displayed and used to support learning?

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<tr><td>STUDENTS

What will students say/do that will indicate they understand the requirements of the investigation?
What will students say/do that suggests they may misunderstand the intent/requirements of the investigation?
How and for how long will students engage privately with the focus question before making their thinking public in pairs, small groups, and/or the large group?

</td><td>TEACHER

How do you intend to introduce the investigation to the students?
How will you present the focus question to the students (orally, in writing, on the Smart Board, or hand-out)?
What will you do to foster thoughtful private think time for reflection about the investigation?
What will you do or ask to help students access their prior knowledge and preconceptions?
What will you do if a student or student group does not know how to begin? How will you intervene without reducing the cognitive level of the investigation?

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EXPANDED INVESTIGATION PLANNING FRAMEWORK

		STUDENTS	TEACHER
INDIVIDUAL AND SMALL GROUP	**MONITOR AND SUPPORT STUDENT THINKING**	**While students are working individually and/or in small groups:** • *How will students interact with each other about their scientific thinking? What will you see and hear that tells you they are listening/inquiring to understand and build on each other's thinking?* • *Specifically, what will students say/do that lets you know they are/are not making sense of the investigation? What correct and incorrect scientific reasoning and explanations will students provide for their ideas?* • *What do you expect will be the boundaries of students' understanding? What misunderstandings and misconceptions do you anticipate?* • *What will students say/do as indicators the investigation has not engaged their thinking? What might be the reasons for such disengagement?* • *What will students say/do that will suggest they view that the authority for the correctness or sensibility of science ideas resides in scientific evidence and reasoning (not student status)? What will students say/do that shows they do/do not trust their won capacity to think and reason scientifically?* • *How will they demonstrate they are accountable to the group and the content?* • *What student responses might prompt you to call for a plenary (whole group) discussion?* • *Specifically, what will students say/do that will indicate they are extending their thinking to new contexts, concepts, and/or methods and to the core science concept or explanation?*	**While you monitor students working individually and/or in small groups:** • *What specific questions, statements, and actions will you use to encourage students to share their thinking with each other, to build on each others' ideas, and/or to assess their understanding of each other's ideas?* • *What questions, statements, and actions will you use to focus students' thinking and foster sensemaking – without diminishing the cognitive demand of the investigation?* • *What questions, statements, and actions will you use to elicit and assess students' understanding of key scientific ideas, practices, and/or scientific models and other representations (without reducing the cognitive demand of the investigation)? That is, how will you press for the depth and the boundaries of students' thinking – how will you uncover their understandings as well as the nature and roots of any misconceptions and errors in reasoning?* • *What will you do if a student finishes the investigation almost immediately, becomes bored or disruptive, and/or focuses on non-scientific aspects of the activity (e.g. coloring graphs)?* • *How will you respond to correct/incorrect strategies, conceptions, evidence, and explanations – while maintaining cognitive demands and reinforcing the notion that authority for the correctness and sensibility of an idea resides in scientific argument and reasoning?* • *How will you assure that each student is individually accountable for contributing to and understanding his/her group's scientific discourse, strategies, explanations and public work?* • *How will you keep track of student strategies, understandings, explanations, and struggles (for formative assessment purposes as well as inclusion in whole class discussion)?* • *What specific questions, statements, and actions will you use to advance students' understanding of the science ideas and to promote scientific claims, explanation and argument justified with evidence and reasoning?*

EXPANDED LESSON PLANNING FRAMEWORK

ABOUT PLENARIES: Besides a plenary to set up the science inquiry and at the end of the class period for surfacing, connecting, summarizing, and extending the day's learning, are you planning for other plenaries during the lesson (e.g. to address confusions or provide scaffolds during the main investigation)? What student thinking might lead you to call for an impromptu plenary?

PLENARY SESSION(S) (WHOLE GROUP)

PREPARE FOR SCIENCE DISCUSSION

*For **each plenary** consider these questions:*

- *What is the purpose and focus of the plenary discussion? How does this purpose relate to the purpose and focus of the Stages of Inquiry? How does this purpose relate to the Focus Question? What question will you use to start the plenary discussion?*
- *What physical objects and materials are important to focus the discussion? What student data, notebook entries, and other artifacts will students need to have at hand?*
- *Which anticipated student ideas of science practices, claims, explanations, and evidence will be shared and how will they be shared?*
- *What will you do if key ideas you want to come up don't come up? How will you raise these ideas for consideration at a high cognitive level?*
- *How will you sequence the order in which students' claims, evidence, and explanations are presented during each plenary?*
- *How will this sequencing support/advance students' understanding of scientific ideas on which the lesson focuses?*

SURFACE, CONNECT, SUMMARIZE, AND EXTEND SCIENCE IDEAS

STUDENTS	TEACHER
*For **each plenary** you consider:*	*For **each plenary** consider:*
• *What will students say/do to show they are listening to understand, expanding on, debating, and questioning the ideas, evidence and explanations shared by their classmates?*	• *What structures/strategies will you use to encourage students to listen to understand, expand on, debate and question the ideas and explanations share by their classmates?*
• *How will students show they respect each other's right and capacity to develop scientific claims, explanations, and arguments?*	
• *What similarities and differences will students identify among their science ideas? What connections will they make?*	• *What questions will you ask to encourage students to analyze and compare the ideas and explanations that are presented?*
• *What connections will students make between their science ideas and answering the focus question?*	• *How will you elicit scientific practices, claims, evidence, and explanations related to the lesson goals? How will you help students make connections to the focus question?*
• *What science language will students use to communicate their science ideas?*	• *How will you introduce and encourage precise science language?*
	• *How/where will you document, create and/or display a public record of intended science language and students' science ideas, claims, evidence and explanations?*
• *During the **closing plenary**, what student-based evidence will suggest that the investigation has/has not leveraged understanding of the core scientific ideas – i.e. lesson goals?*	• *During the **closing plenary**, what will you do to determine whether the investigation has leveraged understanding of the core scientific ideas you have identified as goals for the lesson?*

EXPANDED LESSON PLANNING FRAMEWORK		
	STUDENTS	**TEACHER**
COLLECT ARTIFACTS AND LOOK AHEAD	• *What are likely/intended responses to the reflection prompts and student self-assessments you pose during and/or at the end of the investigation?* • *What student thinking do you anticipate will be revealed by the other artifacts you collect during and/or at the end of the investigation?*	• *During/after the investigation, what will you do to engage students in reflection and self-assessment about the development of their thinking and/or their growth as engaged scientific thinkers? Specifically, how will you word, present, and collect these student reflections and self-assessments?* • *How will you use the student reflections and self-assessments to inform your instruction?* • *What other artifacts of student thinking will you collect at the end of the investigation to inform your planning?* • *If you assign and entry or exit task or a closing reflection about the scientific ideas in the investigation, specifically how will it be worded? Presented? Collected?* • *What will you do during your next lesson(s) and investigations that will build on this investigation?*

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