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APPENDIX D: Goal and Task Identification Guide

Identify the Challenge	Address the Challenge	Guiding Rationale
<p>a. Selected a low-level task and a performance goal.</p>	<p>i. Invite the teacher to explain what she wants students to learn from engaging in the selected task.</p> <ul style="list-style-type: none"> - <i>You indicated that you wanted students to solve a division problem involving a mixed numeral and a fraction set in a context and you selected the pizza party task (given below). Using the features of the task analysis guide, how would you classify this task? [This would be a low-level task because no representational suggestions are provided; given the numbers in the task, students must have a procedure for solving it; there is no requirement to do anything but find the answer.]</i> - <i>You ordered pizza for your birthday party. When the party was over, you still had $4\frac{4}{5}$ pizzas left over. Your mother decided to freeze the remaining pizza. She put $\frac{2}{3}$ of a pizza (one serving) in each freezer bag. How many servings would your mother be able to freeze?</i> <p>ii. If the teacher does not see that the task is low level, make a suggestion about features of the task that would make it high level.</p> <ul style="list-style-type: none"> - <i>Tell the teacher that tasks that are high level require more than application of a known rule and getting the correct answer. High-level tasks include features such as the following:</i> <ul style="list-style-type: none"> - <i>The task requires students to think and reason</i> - <i>There are multiple ways to enter the task and to show competence</i> - <i>The task requires students to provide a justification or explanation</i> - <i>Suggest that $4\frac{4}{5}$ be changed to $4\frac{2}{6}$ and the following instruction be added to the task: Draw a picture, construct a number line, or make a table to help explain your solution. Ask the teacher: How does this change the task? What features from the list above are now addressed? What opportunities does this task afford that the initial task did not?</i> 	<p>Learning goals for students set the stage for everything else. When a teacher knows what they want their students to learn, they are better equipped to make downstream decisions (e.g., deciding how to advance a student's thinking during small-group work; selecting which student responses to publicly share during the final phase of the lesson).</p> <p>Learning goals that are about what a teacher wants their students to understand are critical for the design of lessons in which students engage in high cognitive demand tasks. Performance goals, on the other hand, focus on procedures that lead to correct answers without providing insight into the underlying concepts or meaning.</p> <p>Student engagement with high-level tasks is a necessary condition for students' opportunity to develop thinking, reasoning, and problem-solving skills; to experience mathematics as something that is meaningful and that they can make sense of; and to build understanding of important mathematics ideas and concepts, including the learning goal of the lesson.</p> <p>Alignment matters! A high-level task without a learning goal often leads to lessons that fail to live up to their potential; a low-level task that is paired with a learning goal will not set into motion the kinds of thinking and reasoning that students must engage in to achieve the goal of the lesson.</p>

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APPENDIX D (Continued)

Identify the Challenge	Address the Challenge	Guiding Rationale
	<ul style="list-style-type: none"> • Invite the teacher to consider how changing the task might change the opportunities for learning. Here are some things that students could learn from engaging in a task such as the Pizza Party. For each goal, consider how students' work on the task could help you accomplish the goal. <ul style="list-style-type: none"> – When you find "how many _____ are in _____?" you are doing division. That is, in $a + b$ you are trying to find how many times b is contained in a. – When dividing by a fraction, the remainder is expressed as a fraction of the divisor. – Division situations can be represented in different ways and connections can be made between symbolic, physical, pictorial, and contextual representations. iii. Push for generalization. Ask the teacher to describe the characteristics of the revised task and to consider how these features of high level tasks can be helpful in selecting tasks for future lessons. 	
<p>b. Selected a low-level task and a learning goal.</p>	<ul style="list-style-type: none"> i. Invite the teacher to explain how the selected task will help address the goals they established for the lesson. <ul style="list-style-type: none"> • How will the pizza task you have selected (shown below) help you accomplish the goals you have identified for the lesson (shown below)? Which goals could it help illuminate and which goals would be difficult to achieve? You ordered pizza for your birthday party. When the party was over you still had $4\frac{1}{2}$ pizzas left over. Your mother decided to freeze the remaining pizza. She put $\frac{2}{3}$ of a pizza (one serving) in each freezer bag. How many servings would your mother be able to freeze? <ul style="list-style-type: none"> – When you find "how many _____ are in _____?" you are doing division. That is, in $a + b$ you are trying to find how many times b is contained in a. – When dividing by a fraction, the remainder is expressed as a fraction of the divisor. – Division situations can be represented in different ways and connections can be made between symbolic, physical, pictorial, and contextual representations. 	

Identify the Challenge	Address the Challenge	Guiding Rationale
<p>c. Selected a high-level task and a performance goal (or no goal).</p>	<p>ii. If the teacher does not see the limitations of the task they have selected, make a suggestion about the features of the task they might take into consideration and how these features could be used to adapt the selected task or select a different task.</p> <ul style="list-style-type: none"> • Does the task align with lesson goals? • Does the task require students to think and reason? • Are there multiple ways to enter the task and to show competence? • Does the task require students to provide a justification or explanation? Suggest that $4\frac{4}{5}$ be changed to $4\frac{1}{5}$ and the following instruction be added to the task: Draw a picture, construct a number line, or make a table to help explain your solution. Ask the teacher: How does this change the task? What features from the list above are now addressed? What opportunities does this task afford that the initial task did not? <p>iii. Push for generalization. Ask the teacher to explain how high-level tasks, and the alignment of goals and tasks, can, in general, support student learning during a lesson.</p>	
<p>i. Invite the teacher to explain what she wants students to learn about mathematics as a result of engaging in the lesson based on the task she has identified.</p>	<ul style="list-style-type: none"> • You indicated that you wanted students to solve a division problem involving a mixed numeral and a fraction set in a context and you selected Max's Dog Food as the task in which students would engage. What do you want students to understand about the fraction division through their work on the Max's Dog Food task? [e.g., a mixed numeral can be rewritten as an improper fraction; equivalent fractions can be created by multiplying the numerator and denominator of a fraction by the same number; in doing division $a \div b$ you are trying to determine how many copies of b are contained in the a; when there is a remainder, it must be expressed as a fraction of the divisor; division situations can be represented in different ways—with diagrams, number lines, tables, and symbols.] 	

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APPENDIX D (Continued)

Identify the Challenge	Address the Challenge	Guiding Rationale
	<div data-bbox="446 1081 592 1507" style="border: 1px solid black; padding: 5px; margin-bottom: 10px;"> <p>Dog food is sold in a $12\frac{1}{2}$ pound bag. My dog, Max, eats $\frac{3}{4}$ of a pound of dog food every day. How many servings of dog food are in the bag?</p> </div> <ul style="list-style-type: none"> • Which of the identified understandings do students need to have prior to engaging with the task? (A mixed numeral can be rewritten as an improper fraction; equivalent fractions can be created by multiplying the numerator and denominator of a fraction by the same number.) <p>ii. If the teacher is unsure about what students would learn from engaging in the task, make a suggestion regarding possible learning goals.</p> <ul style="list-style-type: none"> • Here are some things that students could learn from engaging in the <i>Max's Dog Food</i> task. For each goal, consider how students work on the task could help you accomplish the goal. <ul style="list-style-type: none"> - When you find "how many _____ are in _____?" you are doing division. That is, in $a \div b$ you are trying to find how many times b is contained in a. - When dividing by a fraction, the remainder is expressed as a fraction of the divisor. - Division situations can be represented in different ways and connections can be made between symbolic, physical, pictorial, and contextual representations. <p>iii. Push for generalization. Ask the teacher to consider the characteristics of the revised goals and how these characteristics can support student learning in a lesson.</p>	

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<p>d. Identified a topic, unit, or standard but has not selected a task or established a learning goal.</p>	<p>i. Invite the teacher to consider a high-level task (or tasks) that would fit with the identified topic, unit, or standard and what students could learn from engaging in such a task.</p> <ul style="list-style-type: none"> <i>You indicated that you wanted to use a task that involves the division of fractions, specifically a mixed number divided by a proper fraction. Here are two examples that you might consider:</i> <div style="display: flex; justify-content: space-around;"> <div style="border: 1px solid black; padding: 5px; width: 45%;"> <p><i>Max's Dog Food</i></p> <p>Dog food is sold in a $12\frac{1}{2}$ pound bag. My dog, Max, eats $\frac{3}{4}$ of a pound of dog food every day. How many servings of dog food are in the bag? Draw a picture, construct a number line, or make a table to help explain your solution.</p> </div> <div style="border: 1px solid black; padding: 5px; width: 45%;"> <p><i>The Pizza Party</i></p> <p>You ordered pizza for your birthday party. When the party was over, you still had $4\frac{5}{6}$ pizzas left over. Your mother decided to freeze the remaining pizza. She put $\frac{2}{3}$ of a pizza (one serving) in each freezer bag. How many servings would your mother be able to freeze? Draw a picture, construct a number line, or make a table to help explain your solution.</p> </div> </div> <p><i>You could change the numbers and the context to what you think would work best for your students but think about the general structure of the problems.</i></p> <ul style="list-style-type: none"> <i>How could students solve a problem of this type?</i> <i>What prior knowledge would students need to solve a task like this?</i> <i>What might students learn about fraction division from engaging in this task?</i> 	

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APPENDIX D (Continued)

Identify the Challenge	Address the Challenge	Guiding Rationale
	<p>ii. If the teacher is unsure about what students would learn from engaging in such a task, make a suggestion regarding possible learning goals:</p> <ul style="list-style-type: none"> • <i>Here are some things that students could learn from engaging in a task such as Max's Dog Food or the Pizza Party. For each goal, consider how students' work on the task could help you accomplish each goal.</i> <ul style="list-style-type: none"> - <i>When you find "how many _____ are in _____?" you are doing division. That is, in $a \div b$ you are trying to find how many times b is contained in a.</i> - <i>When dividing by a fraction, the remainder is expressed as a fraction of the divisor.</i> - <i>Division situations can be represented in different ways and connections can be made between symbolic, physical, pictorial, and contextual representations.</i> <p>iii. Push for generalization. Ask the teacher to explain how high-level tasks that are aligned with specific learning goals can support student learning during a lesson.</p>	