

CHAPTER 6

CHOOSING TASKS

The Heart of a Lesson

Third-grade teachers Marvin and James were planning out their next three lessons on fractions. They were both unenthused about what they had written so far. James finally said, “Marvin, our students are really not that engaged in this fraction unit we are doing. In fact, I’m a little bored by the tasks we have been giving them.”

Marvin responded, “I feel the same way. Yet the tasks are really getting to the math we want to hit, but the situations are not engaging the students. You know, I was at the movies this weekend and while I was there I saw our students, Jessie, Mayda, and Ruby, leaving that new *Wonder Woman* movie and they were all excited, chatting away. Maybe we could do something with superheroes. They are all the rage with third graders these days.”

James exclaimed, “I think you are on to something! You know, we won’t even need to write new tasks. The fractions tasks in our text are mathematically rich even though they are boring.

Let’s try rewriting those with a superhero theme. Do you think we can do it?”

Marvin replied, “Why not? We can at least give it a try. I am getting more enthused about these lessons already!”

A worthwhile task is the heart of a lesson. In fact, selecting the task is the most important decision teachers make that affects instruction (Lappan & Briars, 1995; Smith & Stein, 2011).

This chapter will address the following questions:

- Why are tasks important?
- What is a worthwhile task?
- How do you adapt a task?
- What are some sources for worthwhile tasks?

WHY ARE TASKS IMPORTANT?

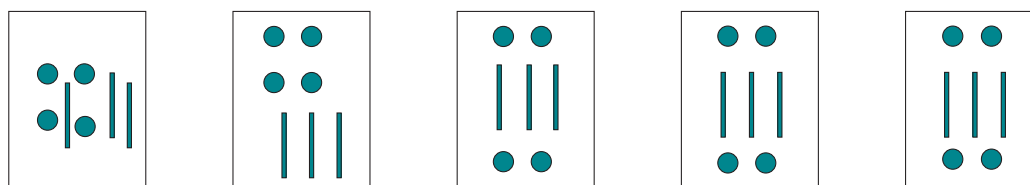
Effective teachers understand that the **tasks** they choose influence how their students make sense of mathematics. Tasks should challenge students to explore mathematical concepts; they should not be designed simply to have children work to get the right answer. Getting students to use **higher-order thinking skills**, such as those from Bloom's Taxonomy (create, evaluate, apply, etc.), is a hallmark of a worthwhile task. As you plan your lessons, be sure to select tasks to reach this goal. Consider the following two examples.

Example 1: Jennifer

Jennifer gives her fifth-grade students this challenge:

There are 5 prize bags on the table. Each bag has 4 pieces of candy and 3 pencils. Explain why the expression $5 \times 4 + 5 \times 3$ describes the total number of prizes in the bags? See Figure 6.1.

Figure 6.1



Example 2: Carlos

Carlos asks his fifth graders the following:

Solve the following equation: $5 \times 4 + 5 \times 3 = ?$

These two examples illustrate the types of questions that teachers ask about the distributive property. Only one is an example of a worthwhile task. The following section will identify the characteristics of a worthwhile task.

WHAT IS A WORTHWHILE TASK?

There are seven characteristics of worthwhile tasks:

1. Uses significant mathematics for the grade level
2. Rich
3. Problem solving in nature
4. Authentic/interesting
5. Equitable
6. Active
7. Connects to the Process Standards and Standards for Mathematical Practice

Let's take a look at each feature in more detail.

Uses Significant Mathematics for the Grade Level

The big ideas, essential questions, and standards from your lesson should be your guiding light for finding a worthwhile task; these three elements keep your lesson plan coherent. Tasks based on significant mathematics focus on students' understandings and skills, and they stimulate students to make sense of the mathematics

they are learning. A task should take into account students' prior knowledge and the understandings and skills already taught at this grade level or previous grades.

Rich

Each task should be challenging, requiring students to use higher-order thinking skills. Smith and Stein (2011) refer to this kind of task as a **high cognitive demand** task. According to Van de Walle et al. (2016), "A high cognitive demand task is a task that requires students to engage in **productive struggle**, that challenges them to make connections to concepts and to other relevant knowledge" (p. 37). A high cognitive demand task encourages students to represent their thinking in multiple ways, explore various solution pathways, and connect procedures to mathematics. These tasks always call for some degree of higher-level thinking, and students cannot routinely solve them. Students often use multiple representations such as manipulatives or diagrams to help develop the meaning of mathematical ideas and to work through the task to develop the understanding (Smith & Stein, 2011). If students immediately know the answer, then the task was not challenging.

Problem Solving in Nature

When a task is problem solving in nature, students will not know how to immediately and routinely solve it. They will need to reason and develop a new strategy or try previously learned strategies to seek a solution. Simply applying an algorithm to arrive at the answer is not problem solving. Productive struggle is a hallmark of problem solving. This means that students wrestle with a solution strategy and must apply effort to make sense of the mathematics—to figure something out that is not obvious. The challenge may not come easy to them, but they persevere. Good problems have multiple entry points so that all students have an opportunity to learn. It is important to point out that all worthwhile tasks are problems, but not all problems are worthwhile tasks.

Authentic/Interesting

An authentic and interesting task is one that represents mathematics as a useful tool for navigating the real world. It captures students' curiosity and invites them to wonder and make conjectures. Authentic/interesting tasks prompt classroom discourse and pique student interest either through the topic or the method of engagement. This does not mean that the task must be real world. In fact, many young children are just as interested in fanciful stories that stimulate their curiosity. Think about the superheroes theme Marvin and James want to pursue from the beginning of this chapter.

Equitable

When a task is equitable, it has multiple entry points and representations so that students of all levels, abilities, and skills can access the task. NRICH (2017) from the University of Cambridge describes these kinds of tasks as having low threshold and high ceilings (LTHC), and Jo Boaler (2015) describes them as having low floors and high ceilings. Essentially, this means that when a task is equitable, "everyone in the group can begin and then work at their own level, yet the task also offers lots of possibilities for learners to do much more challenging mathematics, too" (NRICH, 2017, paragraph 6). The content can be fairly simple, but the processes and the thinking that students do are much more complex. Some students may solve a task using manipulatives or drawing pictures while others apply symbols at a more abstract level. The task is also nonbiased, meaning it does not contain information that stereotypes individuals or groups of people, and it is culturally sensitive. The teacher honors and respects all students' ideas and solutions pathways. Everyone has an opportunity to learn.

Active

With an active task, students are engaged in doing the mathematics. They are decision makers. An active task requires more than simply applying an algorithm. Students must develop reasons, offer explanations, and actively figure things out to make sense of the task and its solution.

Connects to the Process Standards and Standards for Mathematical Practice

The tasks you select should be designed to encourage students to exhibit process standards. Sometimes, teachers believe the way to challenge learners is by presenting them with higher-level content. However, this act alone does not necessarily support all students to reason, communicate mathematically, use and apply representations, see and use patterns, and recognize the underlying structure of the mathematics they are learning. By ensuring that a task incorporates opportunities for students to demonstrate the process standards, you support their learning.


To determine if a task is worthwhile for you to use in a lesson, use the rubric shown in Figure 6.2. The first column identifies the characteristic, and the next three columns allow you to rate the degree to which you feel the task has met that characteristic by checking the box, with 3 being not acceptable and 1 being a good example of that characteristic. The final column is for any comments you would like to discuss with your colleagues. Note: You may deem a task worthwhile even if you do not rate all of the characteristics as a 1. Not all worthwhile tasks will have all of the characteristics.

Figure 6.2

Determining a Worthwhile Task Rubric

Characteristic	1	2	3	Notes
Uses significant mathematics for the grade level				
Rich				
Problem solving in nature				
Authentic/interesting				
Equitable				
Active				
Connects to Standards for Mathematical Practice or Process Standards				

 This Determining a Worthwhile Task Rubric can be downloaded for your use at resources.corwin.com/mathlessonplanning/3-5

 **Thinking about Jennifer and Carlos and their tasks, rate the tasks using the checklist in Figure 6.2. Discuss your results with a colleague. Whose example is a worthwhile task and why? Note your thoughts below.**

HOW DO YOU ADAPT TASKS?

In the vignette presented at the beginning of the chapter, Marvin and James wanted to develop a task that more closely aligned to their students' experiences and interests. You may also have experienced a time when you encountered a textbook or school district task that did not match the multiple needs of your learners. Like Marvin and James, many teachers choose to adapt tasks to increase the cognitive demand (Smith & Stein, 2011) and to provide more entry points for students to reason mathematically. Here are a few examples.

Example: Michaela

Michaela, a third-grade teacher, found the task in Figure 6.3 in her textbook and adapted it to incorporate the process standards.

Figure 6.3

Original Task	Adapted Task
Round 3,651 to the nearest hundred.	Leo rounded 3,651 to 3,600. Lettie rounded 3,651 to 3,700. Who rounded the number to the nearest hundred correctly? How do you know?

Example: Marty

Marty, a fourth-grade teacher, was given the task in Figure 6.4 by his school district. He wanted to design a task to provide more entry points for his students.

Figure 6.4

Original Task	Adapted Task
Margot invites three friends to her house for ice cream. She wants to give each friend $\frac{3}{4}$ cup of ice cream. How many cups of ice cream will Margot need for her friends?	Margot needs $\frac{3}{4}$ cup of ice cream for each of her three friends. She has $2\frac{1}{2}$ cups of ice cream. Will this be enough? Explain your thinking in pictures and words.

Example: Andrea

Andrea, a fifth-grade teacher, found the task in Figure 6.5 after an Internet search. She wanted a task that was more engaging than the one she found on the Internet.

Figure 6.5

Original Task

Decide if the statement is true or false.

$$\frac{2}{3} = \frac{6}{9} \quad 14 = \frac{48}{4}$$

Adapted Task

Some of these equations are true and some are false. Alex says that three are true and Mariana says that four are true. Explain who is correct.

$$\frac{6}{8} = \frac{3}{4} \quad \frac{4}{8} = \frac{8}{4}$$

$$\frac{4}{5} > \frac{2}{3} \quad \frac{9}{8} < \frac{10}{9}$$

$$3\frac{3}{4} = \frac{15}{4} \quad \frac{2}{6} > \frac{5}{8}$$



What do you notice about how each of the teachers enhanced the task? How might you adapt your tasks to make them worthwhile? Jot a few notes below.

WHAT ARE SOME SOURCES FOR WORTHWHILE TASKS?

Tasks can be problems, short- or long-term projects, or games. In Chapter 5, we listed many tasks as they relate to learning intentions in Grades 3 through 5. Some other reliable sources for worthwhile tasks in this grade range follow.

Books

- Markworth, K., McCool, J., & Kosiak, J. (2015). *Problem solving in all seasons*. Reston, VA: NCTM.
- Ray-Reik, M. (2013). *Powerful problem solving: Activities for sense making with the mathematical practices*. Portsmouth, NH: Heinemann.
- Schrock, C., Norris, K., Pugalee, D., Seitz, R., & Hollingshead, F. (2013). *Great tasks for mathematics, K–5*. Denver, CO: National Council of Supervisors of Mathematics.
- Van de Walle, J., Karp, K., & Bay-Williams, J. (2016). *Elementary and middle school mathematics: Teaching developmentally*. New York, NY: Pearson.

Online

- Graham Fletcher <https://gfletchy.com/category/3-act-tasks/>
- Robert Kaplinsky <http://robertkaplinsky.com/lessons/>
- Illuminations at NCTM <https://illuminations.nctm.org>
- Illustrative Mathematics <https://www.illustrativemathematics.org>
- Inside Mathematics, Problem of the Month <http://www.insidemathematics.org/problems-of-the-month/download-problems-of-the-month>
- Math Forum: Primary Problems of the Week <http://mathforum.org/library/problems/primary.html>
- Math Pickle Mathpickle.com
- NRICH <http://nrich.maths.org>
- Numberless Word Problems <https://bstockus.wordpress.com/numberless-word-problems/>
- Open Middle: Challenging Math Problems Worth Solving (Third, Fourth, Fifth) <http://www.openmiddle.com>



Building Unit Coherence

Tasks are another great way to build coherence and ensure rigor throughout a unit. As you look across the unit, you can connect the tasks that you construct, select, or adapt. Some teachers do this by linking the tasks across a theme. Others do this by extending tasks over two or three days so students have plenty of time to dive into the concept.

Example: Huan

Huan, a third-grade teacher, noticed how his students were obsessed with making slime from glue. They brought him several batches to experience since he was unaware of the new fad. Capitalizing on this interest his students had, Huan decided to use slime as the topic of most of his real-world problems for his unit on fractions.



Task Selection

Kimi and Julian agreed. Kimi said, "Let's try it."

Task:

Convince Us!

We are going to play a game. I will put a statement on the board. With your partner, you need to convince us that what I wrote is true. You can use any materials, drawings, or reasoning that you want. We are looking for a variety of ways to convince us that the statement is true.

See the complete lesson plan in Appendix A on page 186.



This task can be downloaded for your use at resources.corwin.com/mathlessonplanning/3-5



Why do you think this is a good third-grade task? Use the task checklist to help you decide. Write any thoughts or concerns below.

[illegible]



Adrienne and Davante want a rich problem-solving task for their transfer lesson on fractions. However, they are having difficulty finding just the right one. Davante thinks aloud, "I saw one in our text last week that was OK. It was close to what we want but not exactly. We need something more open-ended."

Adrienne suggests, "Could we adapt it?"

Davante responded, "I never thought of that. Let's try!"

Task:

Carol's Cookie Corner

You are the manager of Carol's Cookie Corner. It is your busy season and almost all of your bakers are hard at work. A new order for your special Choco-oat-raisin cookies just came in and you have one baker, Sammy, who can make them. However, you only have a $\frac{1}{4}$ cup measuring cup and $\frac{1}{4}$ teaspoon handy because your other bakers are using all of your other measuring cups and spoons. Sammy needs help with fractions so you have to change all of the measures in the recipe so he can use the $\frac{1}{4}$ teaspoon and measuring cup.

You remember using a number line in school to work with fractions.

1. Rewrite all of the measures in the recipe as equivalent fractions that Sammy can use with the measurement tools you gave him.

Your business is booming and you may run out of measuring tools again. You decide to teach all of your bakers to use equivalent fractions.

2. Create a large number line on chart paper. Put the numbers from the recipe on the number line.
3. Add as many equivalent fractions as you can to the number line for each number you placed on the number line.
4. Be prepared to teach your fellow bakers about equivalent fractions. Explain in writing what you will say to them.

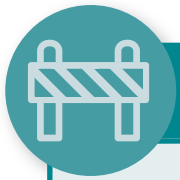
See the complete lesson plan in Appendix A on page 191.



This task can be downloaded for your use at resources.corwin.com/mathlessonplanning/3-5



Why do you think this is a good fourth-grade task? Use the checklist to help you decide. Write any thoughts or concerns below.



Under Construction

Using your lesson plan that is under construction, add a task. Be sure it follows from your previous work and matches your instructional purpose.

Task:



Download the full Lesson-Planning Template from resources.corwin.com/mathlessonplanning/3-5

Remember that you can use the online version of the lesson plan template to begin compiling each section into the full template as your lesson plan grows.