2

THE ORIGINS OF SCAFFOLDING

LEARNING INTENTION

We are learning about the research behind scaffolding so that we can better address our concerns about the use of scaffolding in our classrooms.

SUCCESS CRITERIA

We will know we are successful when

- We can describe how we know that scaffolding is beneficial to learning.
- We can explain the aspects of scaffolding discovered in the research.
- We can identify concerns, challenges, or barriers with scaffolding learning.
- We can discuss how scaffolding is related to engagement.

Where did the idea of scaffolding originate? What are the components of scaffolding that we should consider? Use the following question stems to jump-start your thinking.

- What is needed for scaffolding to work?

- How do we keep students engaged when learning? What role might scaffolding play?

Thus far, we have provided mostly non-academic examples to build our shared understanding of scaffolding. But our work involves academic content, including a wide range of skills, concepts, and understandings that students need to learn if they are to be successful in their future pursuits. Wood et al. (1976) define scaffolding as "a process that enables a child or novice to solve a task or achieve a goal that would be beyond his unassisted efforts" (p. 90). A current working definition of scaffolding in academics comes from the IRIS Center and reads:

> *Instructional scaffolding* is a process through which a teacher adds supports for students in order to enhance learning and aid in the mastery of tasks. The teacher does this by systematically building on students' experiences and knowledge as they are learning new skills. Just like [a scaffold], these supports are temporary and adjustable. As students master the assigned tasks, the supports are gradually removed. (Iris Center, n.d.)

Take a moment and circle, underline, or highlight key words or phrases from this definition. Then, describe how this definition is similar and different from the earlier definition presented in the Introduction on page 2.

Instructional scaffolding sounds easy, right? Anyone who has ever tried to scaffold the learning of another knows that it is not and will not be easy. As Wood (1998) noted, "Monitoring children's activity, remembering what one has said or done to prompt that activity, and responding quickly to their efforts at an appropriate level is a demanding intellectual feat. Effective teaching is as difficult as the learning it seeks to promote" (p. 164). And that's why we have decided to tackle this subject. As we have noted, the term *scaffolding,* or *instructional scaffolding,* was coined by Wood et al. (1976). In the first part of this module, we'll review their ground-breaking study. Later in this module, we'll explore concerns about scaffolding and newer research on scaffolding.

However, we need to first return to our earlier work and review our previous responses.

Take a moment and flip back to the beginning of Module 1, page 7. You were asked to describe what is meant by scaffolding in your school or classroom. Take some time to edit or revise your earlier responses in light of the definition provided by the IRIS Center. What additional information can you now add to your earlier response? Is there anything you need to change so that your earlier response is more precise, accurate, and robust?

THE PREREQUISITE CONDITION FOR SCAFFOLDING

In their study with young children, Wood, Bruner, and Ross noted that learners could not benefit from scaffolding unless "one paramount condition is fulfilled" (p. 90). That condition requires that students understand that there is a viable solution to the problem

or situation they have encountered. That makes it sound like surface-level learning, but we must be careful. Yes, educators can scaffold students' acquisition of concepts and skills early in the learning process. But educators can also scaffold students' deep learning experiences. In the words of Wood et al., the learner "must be able to *recognize* a solution to a particular class of problems before he is himself able to produce the steps leading to it without assistance" (p. 90, emphasis in original). Note that they say a solution to a particular *class* of problems, rather than the solution to a specific problem. In other words, scaffolding is not limited to students figuring out the answer to a specific task, but rather learning how to think about a type of challenge that they have been given.

Deliberate practice is based on a mental model of expertise. In other words, does the person engaged in the practice know what it will look like once mastered?

This is an important point as scaffolding cannot be reduced to pushing students to the right answers and avoiding incorrect ones. We have all learned from our incorrect responses, faulty thinking, and the errors we have made. Rather, scaffolding should develop students' thinking habits and result in transfer, or the application of knowledge and skills to unique situations.

What thinking habits do you want your students to develop? Make a list that you can refer back to in later modules:

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-
-
-

But it starts with students' ability to recognize that there is a solution to the cognitive challenge in front of them. That challenge may be decoding a word or writing an argument. It may involve simple arithmetic or inferential statistics. And it may involve addressing challenges for which there are no clear-cut "right" answers, such as creating art or giving a speech. Scaffolding can be used to support learner performance in any of these situations, provided that the learner knows that there is a solution, even if that means that there are multiple ways to demonstrate success.

As we will see in the next module, deliberate practice is based on a mental model of expertise. In other words, does the person engaged in the practice know what it will look like once mastered?

Your turn: Consider a learning task you have for your learners. This should be different from the learning task in Module 1. What would your students need to know to solve the problem? In other words, make a list of concepts, skills, and understandings that learners must know, understand, and be able to do to arrive at a solution.

This list will help us construct a mental model of expertise, just like Horacio. In our case, we have to ensure that we devote time and attention to unpacking the task, identifying the concepts, skills, and understandings, so that we can clearly provide a mental model for our learners. This ensures the prerequisite condition is present for scaffolding in our classroom.

In your own words, write the prerequisite condition that must be present for scaffolding to be successful in our classrooms.

Now let's look at the aspects of scaffolding.

SIX SCAFFOLDING FUNCTIONS

Based on their data, Wood et al. identified six scaffolding functions or aspects that they believed should be considered when supporting students to complete tasks. The first function likely occurs at the outset of the learning experience, but the others are more recursive in nature. We'll explore each of the six functions and analyze a classroom experience.

1. **Recruitment.** The first task in scaffolding is to solicit students' interest in the task. The teacher must ensure that students see *relevance* in the activity or assignment and *understand the requirements of the task*. It's hard to scaffold when students don't care about what they are expected to learn or if they have no idea what the task requires.

2. **Reduction in degrees of freedom.** This requires that teachers *simplify the task* by reducing the number of acts or steps to reach a solution. When teachers have engaged in task analysis, they understand the steps and process, which can then be used to reduce the options, thereby allowing a focus on the steps required to be successful.
3. **Direction maintenance.** Learning is often not a linear process, but much more like sailing in which you tack and jibe to get to the destination. Without guidance, students may head in a wrong direction, lose interest, or even give up. Thus, part of scaffolding is to "*keep them in pursuit of a particular objective*" (Wood et al., p. 98).
4. **Marking critical features.** As part of the support provided, those providing scaffolding *highlight some features of the task*. This includes *noting actions that had an impact* so that the learner is likely to try that again, as well as noting the discrepancy between what the learner did and what might be a more correct response.
5. **Frustration control.** As Wood et al. noted, "*Problem solving should be less dangerous or stressful with a tutor than without*" (p. 98). As such, the person providing the scaffolding can provide some "face-saving" comments for the student who is struggling or offer additional prompts and cues that support success. However, the risk here is creating too much dependency on the person offering scaffolds.
6. **Demonstration.** Modeling, thinking aloud, and providing other types of input *allow the student an opportunity to imitate the actions of another*, which may resolve the temporary block in the successful completion of the task.

Pause for a moment and review the six aspects of scaffolding.

Could you explain these to a colleague?

Could you provide examples to clarify the meaning of each aspect?

Find a colleague and find out. Get feedback from them and fine-tune your explanations and examples. Yes, this is deliberate practice.

Now let's look at an example in the context of a classroom. However, we are going to ask you to actively read this example. Circle, underline, or highlight information or details you think are most important from this example.

At the start of the class, Kim Chan-Patino asks students to complete a few problems that provide information about what students need to learn next. As students enter, Ms. Chan-Patino says, "Today, we will apply what we learned about the distributive property to *both* sides of the equation. It's not about speed, remember, but we are learning to think about these problems and what they really mean. Learning to solve these equations allows us to eventually make predictions and then we can use those predictions to make decisions."

Before inviting students to solve problems on their own, Ms. Chan-Patino walked to a dry-erase board with a problem written on it—$14(x + 1) = 14x$—saying, "This one only requires that I use the distributed property on one side. And I must remember to *distribute* the 14 to both the x and the 1 (drawing arrows from the 14 to the x and to the 1). Once I have distributed, I know how to solve for x. Here's a problem for you: $2(x + 12) = 4(x + 4)$."

Ms. Chan-Patino visited Sofia first, asking, “How will you start?” Sofia responded that she needed to distribute the 2 first and got started.

Ms. Chan-Patino then visited Carlos, who was staring at the problem, and said, “Maybe you should start by drawing the line down the center at the equal sign. That’s what we did last week, remember?” Carlos gets started.

Ms. Chan-Patino notices that Felix has completed the left side but did not fully distribute the 4 on the right side. In response, she says, “Let’s check again. Did you use the arrow method we talked about?”

Ms. Chan-Patino continues to walk around the room, providing support so that students continue to persevere in problem solving. She makes several comments aloud, such as “I’m seeing people add or subtract the same thing from both sides.” She also says, “This is the first time we’ve had a problem that required us to distribute on both sides of the equation.” A few minutes later, she says, “Let’s pause there. I’d like to do one more as an example and we’ll identify key steps. Then you can use those steps to check your own work.”

Ms. Chan-Patino explains how she solves a new problem, identifying the process at each step. She then asks students to use the steps to review their work. Ms. Chan-Patino ends the lesson by asking students to think about this:

> I have 5 friends and we’re going to the movies. I need to know how much it will cost for all of us to go. The admission price is $12.00, and we want popcorn which is $5.00. How will you set up the equation?

Your circling, underlining, or highlighting was purposeful. Let’s put your active reading to work. What did you see?

Did you see any of the functions that Wood et al. (1976) identified?

Use the chart to extract evidence of each aspect of scaffolding from Ms. Chan-Patino’s classroom.

Factor	Evidence From Ms. Chan-Patino
Recruitment	
Reduction in degrees of freedom	
Direction maintenance	
Marking critical features	
Frustration control	
Demonstration	

COACH A PEER

This feature is an opportunity for you to try out new learning. We'll give you a short scenario about a teacher whose instruction might benefit from scaffolding:

The students in Marco Rincon's class will use graphic organizers to prepare for an upcoming project. The students have learned a lot but need to organize their bits of information so that they can use it later. Mr. Rincon starts by saying, "We have the next 15 minutes to get ourselves organized. I'd like you to take your notes and get them synthesized down to a page so that you see the connections between all of the different ideas. You can use any of the graphic organizers that we have studied to help you. Then we will do our escape room puzzle, and remember the rules—you can only use your one-pager."

Mr. Rincon creates escape room-like puzzles for students to solve using the content of the class. He continues, "Our next puzzle has never been solved at this school. We can do it, right? [Yes!] But we need to have our information organized so that we can easily find it."

How might Mr. Rincon use the scaffolding functions to support students?

FACTOR	RECOMMENDATION FOR MR. RINCON
Recruitment	
Reduction in degrees of freedom	
Direction maintenance	
Marking critical features	
Frustration control	
Demonstration	

You might have noticed that Ms. Chan-Patino and Mr. Rincon's students were engaged in their learning. One of the benefits of instructional scaffolding is authentic engagement, engagement across multiple dimensions of learning.

INSTRUCTIONAL SCAFFOLDING AS ENGAGEMENT

Educational psychologists often describe engagement in three dimensions: *metacognitive, cognitive*, and *affective*. These form the heart of motivation for learning. But they also provide a lens for understanding the further development of instructional scaffolding as a field.

What do you think of when you hear metacognitive engagement, cognitive engagement, and affective engagement? Use the space below to summarize what you believe is meant by these terms.

Metacognition in scaffolding. Metacognitive scaffolds are intended to build students' ability to think about their thinking, which is a key skill for self-regulation and the future ability to apply the skills being taught. For example, there are times when students need *direction maintenance* because they have moved into a less productive route. Direction maintenance is more than redirection. Redirection is pointing students to a different path but without the reasoning that goes with it, for instance, when a teacher says, "You said that you wanted to use a startling statistic but I think you've asked a question of your reader instead." Direction maintenance that asks students to think metacognitively looks more like this: "I'd like for you to read aloud what you just wrote. Is it accomplishing what you intended? In other words, are you meeting the goal that you set for yourself to startle the reader?"

Cognition in scaffolding. Cognitive structuring and *reduction of degrees of freedom* form the heart of instructional scaffolding. This entails the give-and-take of learning as students and the teacher respond to one another. To do so most effectively requires *dynamic assessment*, which is to say that there is an iterative loop of test-teach-retest.

For example, a teacher working with a student on reading multisyllabic words asks a child to identify the vowels in a multisyllabic word to see if the child can locate the syllables (test). The teacher then reminds the student that all syllables contain a vowel (teach), then asks the student to segment the word (retest). The teacher then points out that the syllables can be read like small words (teach) and then has the student read each syllable in

succession (retest). When the child does so successfully, they are then prompted by the teacher to read the syllables more rapidly to pronounce them as an entire word (teach). They work through each multisyllabic word on the list.

When the student has difficulty, the teacher moves into reducing the degrees of freedom. When the child stumbles on *transportation* due to an incorrect method for identifying the syllables, she covers the letters at the beginning and end of the longer word with blank cards and asks if there is a smaller word in there that could stand alone. With the reduced view, the student could see the word "port."

"Can that be a single syllable?" the teacher asks.

"Yes, because a syllable has a vowel," says the child, now rewriting the four syllables in the longer word. By covering the rest of the word, the teacher was able to temporarily isolate a specific skill in order to rebuild student knowledge.

Affect in scaffolding. The feelings and emotions of the student are crucial in whether they will learn or not. It comes as no surprise that students who are uninterested, overwhelmed, or frustrated are going to shut down. Recruitment and frustration control are critical for preventing or restoring learning during scaffolding. Affective scaffolding has received increased attention in this decade, especially in the instruction of multilingual learners. Affective scaffolds are used with intention to foster the emotional safety needed to learn. These can include (Tajeddin & Kamali, 2020):

The feelings and emotions of the student are crucial in whether they will learn or not.

- *Encouraging:* Providing acknowledgments like "aha," "okay," and "good" to spur the learner to continue.
- *Emotional scaffolding:* Providing feedback on the content of the learner's talk to put them in a relaxed condition or using analogies, metaphors, and stories to influence students' emotional response to the content. For example, the teacher might offer support by saying, "We can do hard things; we've done it before." Or the teacher may use a story, such as "I remember a time a few weeks ago when you got frustrated and you had some ways to work through that, right?"
- *Shy tracking:* Inviting a student who has a low willingness to communicate to contribute as might be the case when a teacher says privately to a student, "This is a really good idea. Would you mind sharing with the class?"

These affective scaffolds don't have a direct causal link to academic learning, but rather are interspersed as invitations and encouragements. These are critical because effective instructional scaffolding is relational and bidirectional, and not a matter of demanding student performance of an academic skill or concept.

In 2010, van de Pol and colleagues engaged in a review of the previous decade's research on the subject, 66 studies in total. They investigated how instructional scaffolding was described, utilized, and analyzed. They developed a model of understanding how instructional scaffolding moves, or decisions by the teacher, might be analyzed, according to their intention (see Figure 2.1). *Intention* describes whether the scaffolding is meant to support metacognitive, cognitive, or affective engagement. In doing so, they built on the work of Wood et al. (1976) and others. Importantly, van de Pol and his colleagues wove the language of engagement into scaffolding.

2.1 A FRAMEWORK FOR ANALYSIS OF SCAFFOLDING STRATEGIES

	Scaffolding Intentions				
	Support of students' metacognitive activities	Support of students' cognitive activities		Support of student affect	
	A. Direction maintenance	B. Cognitive structuring	C. Reduction of degrees of freedom	D. Recruitment	E. Contingency management/ frustration control
Means 1. Feeding back 2. Hints 3. Instructing 4. Explaining 5. Modeling 6. Questioning					

Source: van de Pol et al. (2010, p. 278).

CONCERNS ABOUT SCAFFOLDING

Over the years since Wood et al. published their account of scaffolding, concerns have arisen about their model. We will discuss five of those concerns here:

1. **Limited ages are represented in their study.** First, it should be noted that they studied three-, four-, and five-year-olds building block pyramids. Interestingly, they noted significant differences in the ways in which scaffolding worked across these three years of life with reductions in the ratio between showing and telling with higher levels of showing for younger students. They also noted increased success with scaffolds as students get older. Thus, a valid question concerns the implications and application for older students in academic learning. Since 1976, there have been hundreds of studies of scaffolding and it seems safe to say that the general model applies to many, or even most, types of learning.

2. **The structure of the lessons.** The study that produced the evidence used to argue for scaffolding was based on individual interactions between an adult and a child. There were no other students waiting for something to happen and the adult did not have to manage groups of students at the same time.

This remains a challenge as many examples of scaffolding focus on individual students receiving support from a teacher. There are also examples of small-group scaffolded instruction, but it is rare to see whole-class examples. This makes sense given that the scaffolds needed by one student may not be necessary for another. More recent work on scaffolding includes front-end scaffolds that the teacher designs for the entire class in advance of the lesson. These will be discussed in Module 7.

3. **The learning they studied had only one right answer** (Wood et al.). There was only one way to build the pyramid that would work. In much of school-based learning, there are many right answers or many ways to get to the answer. This requires a sophisticated type of scaffolding and the use of heuristics, or a general cognitive framework that we rely on to reach a solution. Consider how you find a parking place. Do you want to park as close as possible to the place you are going? Are you looking for shade? Do you want to be away from other cars, if possible, to prevent your car from being scratched? Or do you take the first spot you see, congratulating yourself that you found one? There is no right way, but you likely have a heuristic for solving the parking spot problem. To ensure that students develop cognitive flexibility, creativity, and entrepreneurial spirit, teacher scaffolding needs to include heuristics, while recognizing the many right ways to do this.

4. **Is the teacher leading the student to a specific answer?** The role of the student has become important in the conversation about scaffolding. The concern is that the teacher is leading the student to a specific answer or kind of thinking. As Searle noted in "Scaffolding: Who's Building Whose Building?" (1984): "Schools . . . are rarely effective in allowing children either to initiate topics or to shape the experience for themselves. As a result, scaffolding can more often become the imposition of a structure on the student" (p. 481). Just eight years after the seminal piece on scaffolding was published, concerns about teachers using scaffolding to control students and their learning were raised. Others have raised concerns about the lack of a transactional relationship between teacher and students if instructional scaffolding is used too narrowly and excludes what the learners bring to the learning. Moll (1990) noted that learning is a "social system within which we hope children will learn, with the understanding that the social system is mutually and actively created by teachers and students" (p. 11). There is a danger that scaffolds can become reductionist and behavioristic and limit the child's role in co-constructing learning. In doing so, we thwart student ownership of learning and inhibit the transfer of learning. As we have noted elsewhere (e.g., Frey et al., 2018), students should be taught to take increased responsibility for their learning. At the same time, educators need to provide experiences that increase students' confidence and competence in the curriculum.

5. **A concern is that scaffolding has become excessive.** There is a concern that scaffolding has become excessive to the point that struggle has been removed from school. Students deserve an opportunity to grapple with ideas and information. They need to wallow a bit in the learning pit (Nottingham,

2017) and they need to experience productive success and failure (Kapur, 2016). We think you'll agree that much of the struggle has been removed from learning; that we pre-teach and frontload too much. While we reduce those forms of scaffolding, let's not forget that repeated failures without learning may result in a fixed mindset about certain topics and a future resistance to learning. It's more about supporting learners in the process of learning rather than removing the struggle.

Use What You Know

Take a moment and review the five concerns around scaffolding. There is likely one of these concerns that reflects your own thoughts and feelings or the thoughts and feelings of your colleagues. Focus on that concern for now. Use the space below to draft a response to this concern that uses the features and characteristics of your context (e.g., your school, content area, grade level, or classroom). How would you respond to this concern?

CONCLUSION

Scaffolding was introduced several decades ago and has continued to be studied as an approach to supporting students' learning. The foundations of scaffolding, including the idea that students need to know that a solution is possible and what success looks like, still resonate today. That said, there are newer innovations in scaffolding that should be incorporated into the mix. In doing so, educators need to address the unintended consequences and challenges of scaffolding, including the risk of removing the struggle from learning. It's a balancing act: we must develop complex tasks and contingent plans to scaffold such that students struggle through the experience and learn along the way.

SELF-ASSESSMENT

Before moving forward, consider the success criteria for this module. You will notice these statements have been revised from "We can" statements to "Can I?" questions. Using the traffic light scale, with red being not confident, yellow being somewhat confident, and green indicating very confident, how confident are you in your new learning about the origins of scaffolding? You'll also want to take note of evidence you have for your self-assessment.

SUCCESS CRITERIA	SELF-ASSESSMENT	EVIDENCE
Can I describe how I know scaffolding is beneficial to learning?		
Can I explain the aspects of scaffolding discovered in the research?		
Can I identify concerns, challenges, or barriers with scaffolding learning?		
Can I discuss how scaffolding is related to engagement?		

online resources

Access resources, tools, and guides
for this module at the companion website:
resources.corwin.com/howscaffoldingworks