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Please enjoy this complimentary excerpt from *How Learning Works*, by John Almarode, Douglas Fisher and Nancy Frey.

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3

WHAT ARE THE BARRIERS TO LEARNING?

LEARNING INTENTION

We are learning about challenges to the acquisition, consolidation, and storage of learning.

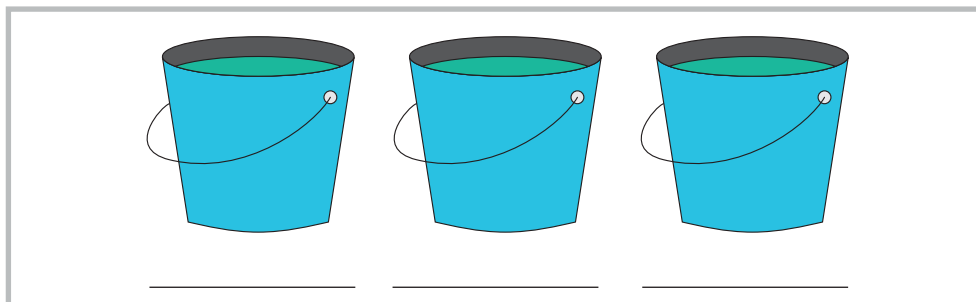
SUCCESS CRITERIA

I will know we have successfully completed this module when

- I can describe the different challenges to learning.
- I can recognize challenges to learning in my classroom using student data.
- I can hypothesize approaches to overcoming the challenges to learning in my classroom.

One way of thinking about the learning process is to break the process down into three main parts. Take a moment and write those three main parts, one on each of the buckets in Figure 3.1.

3.1 THREE PARTS OF THE LEARNING PROCESS



Source: Adapted from Mayer (2011). Image source: aljoy313/pixabay.com



ACQUISITION

When our students acquire new learning, they gain new content, skills, and understandings across all domains of learning. In science, this acquisition includes disciplinary core ideas, science and engineering practices, and crosscutting concepts (NGSS Lead States, 2013). In mathematics, this acquisition includes concepts, procedures, and the application of concepts and thinking (National Council of Teachers of Mathematics, 2014). In the visual arts, this includes acquiring critical thinking skills in the analysis, interpretation, and evaluation of the work of self and others (Virginia Department of Education, 2020). At the same time, learners acquire content, skills, and understandings related to language, social-emotional, and behavioral learning. For example, learners must acquire what it means to appropriately engage in a “morning meeting” and acquire the appropriate means for social interacting and relating to their peers.

There are several key points related to the acquisition part of the learning process that we want to emphasize:

- ➔ Learning acquisition is always happening, unconsciously or consciously. Flip back to page 13 in Module 1. Learning by chance is unconscious acquisition.
- ➔ In our classrooms, we strive for formalized learning through the design and implementation of learning experiences and tasks—not by chance, but by design. Again, returning to page 13 in Module 1, learning by design is conscious acquisition.
- ➔ There are many factors that influence acquisition, some internal and some external. We will address internal factors in this module and the external factors in subsequent modules.
- ➔ The acquisition of learning requires effective feedback. Learners must have the opportunity to engage in trial and error to acquire content, skills, and understandings.

Make a list of internal factors that influence acquisition. These are factors related to inner strengths or challenges in learners. Make a second list of external factors. These are factors within the learning environment and not the inner strengths or challenges in learners.

Internal Factors

External Factors

Take a moment and return to the closing task in the previous module. Edit and revise your definition, description, and examples of acquisition.

CONSOLIDATION

Learning takes time. After the initial acquisition of learning, our students need time to actively process this newly acquired content, skills, and understandings, as well as make meaning of their learning. For our classrooms, this involves us providing scaffolded learning experiences or tasks. These scaffolds should specifically align with the internal and external factors that influenced the initial acquisition of the learning. For example, if motivation was one of the internal factors you listed on the previous page, then consolidation should continue to scaffold or provide approaches to keep a learner motivated in the learning. How do we motivate learners to engage in science content, utilize mathematical processes, and apply critical thinking skills in the analysis of works of art?

Scaffolds are only scaffolds if they are withdrawn over time to promote self-regulated learning. Thus, with consolidation, these scaffolds should eventually be removed as learners internalize the content, skills, and understandings and are able to extend, apply, and transfer their learning.

Return to the previous lists of internal and external factors that influence learning acquisition. What role do these factors play in consolidating learning?



Take a moment and return to the closing task in the previous module. Edit and revise your definition, description, and examples of consolidation.



STORAGE

Effective acquisition and consolidation lead to learning storage. Often referred to as long-term storage, this is when the content, skills, and understandings are internalized and available for retrieval to then extend, apply, and transfer to other contexts. While initial acquisition and the subsequent consolidation are important, moving this learning to long-term storage is critical in extending, applying, and transferring learning. Now, to be clear, this does not mean that the content, skills, and understandings are permanently available for retrieval once storage occurs. Over time, there must be continued maintenance to support long-term storage. Think back to something that you acquired, consolidated, and stored. If enough time passes between the last retrieval of this learning from long-term storage, this learning may fade away.

Let's return to previous examples. Just because a learner has consolidated his or her learning about human impact on ecosystems does not immediately imply that he or she will, without intermittent retrieval and application of this consolidation. In mathematics, while solving systems of linear inequalities was at one time retrievable and available for transfer in solving, over time this learning is transient. If the critical thinking skills in the analysis, interpretation, and evaluation of the work of self and others are left alone for too long, these skills will need to be re-learned. And finally, appropriately engaging in social interactions, well, by the very nature of schools and life, is likely to stick around.

Return to the previous lists of internal and external factors that influence learning acquisition. What role do these factors play in long-term storage?

Take a moment and return to the closing task in the previous module. Edit and revise your definition, description, and examples of storage. Now, let's look at the factors influencing each of these parts of the learning process, in particular, the barriers to successful acquisition, consolidation, and storage.

CHALLENGES TO LEARNING BY DESIGN



For more resources related to cognitive challenges, visit the companion website at resources.corwin.com/howlearningworks.

In November 2020, Stephen Chew and his colleague William Cerbin compiled 20 years of research on teaching and learning by design, not by chance. Although they do not use the specific terminology of design and chance, they assert that the goal of pedagogical research is to amplify student learning through effective teaching. Yet, as we pointed out in the introduction of this playbook, learning is complex, multidimensional, and requires the careful design of learning experiences that result in both the learning of these ideas and the transfer of this learning to new contexts. To successfully design these learning experiences, we have to know who our learners are so that we can make the necessary adaptations based on the local context of our classrooms. This means that we must be aware of the specific challenges to learning by design. The result of Chew and Cerbin's compilation of research are nine specific challenges (see Figure 3.2).

3.2 OVERVIEW OF NINE SPECIFIC CHALLENGES TO LEARNING BY DESIGN

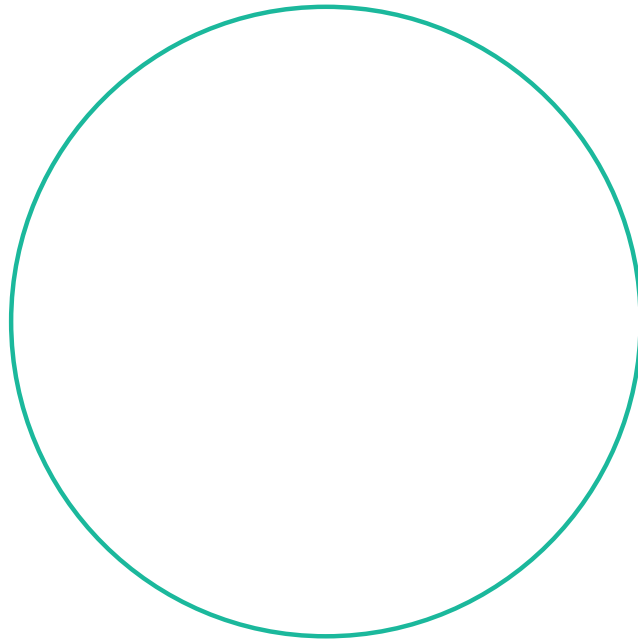
Challenge	Description
Student Mindframes	This refers to our learners' beliefs, attitudes, or dispositions about topics, content, or subject matter.
Meta-Cognitive Skills and Self-Regulation	This challenge refers to the capacity of our learners to self-monitor, self-reflect, and self-evaluate their knowledge, skills, and understandings.
Student Fear	How our learners feel about the classroom and content heavily influences their perception of learning experiences and tasks.
Insufficient Prior Knowledge	When our learners arrive in our classrooms with limited background knowledge, prior knowledge, and previous experiences, they may struggle in all three parts of learning.
Misconceptions	This challenge comes from learners having prior beliefs about specific topics, content, or subject matter that are inaccurate or incomplete.
Ineffective Learning Strategies	Challenges to learning can come from our learners relying on strategies that simply do not support the acquisition, consolidation, and storage of learning. These ineffective learning strategies create an illusion of learning.
Low Potential for Transfer	Learners may not have the capacity, yet, to transfer content, skills, and understandings.
Selective Attention Constraints	Challenges to learning may come from learners multitasking or not focusing on the relevant information or focusing only on part of the relevant information.
Working Memory Capacity	The challenge refers to the amount of mental effort available to learners and the limited capacity in their work memory. Too much information or information that is too complex will overwhelm learners.

Source: Adapted from Chew and Cerbin (2020).

There are three major points that we want to make sure are highlighted in our work in this playbook:

1. The nine challenges listed in Figure 3.2, in no particular order, can undermine the acquisition, consolidation, and storage of learning.
2. Our role in learning by design, not by chance, requires us to gather evidence about our learners with regard to these nine challenges. We must then use that evidence to create, fashion, and execute great learning according to plan—by design.
3. Student learning is not solely on the shoulders of the teacher, nor are these challenges so great that teaching and learning are not possible. Learners should aim to find the best way to learn from their teacher.
4. Using the blank pie chart below, color in the percentage that reflects your belief about the responsibility for learning that falls to the teacher and the percentage of responsibility for learning that falls to the student. If possible, use two different colors. For example, you may believe that 90% of the responsibility falls to the teacher and 10% falls to the learner.

Let's revisit your pie chart from Module 1. In Module 1, you were asked to color in the percentage that reflects your belief about the responsibility for learning that falls to the teacher and the percentage of responsibility for learning that falls to the student. Has your belief changed as a result of your work in this playbook? If so, color in the percentages that reflect your current thinking. If not, simply replicate your response from Module 1.



As we close out this module, let's review where we are at this point in learning by design. Learning by design requires that we must make *adaptations* to principles or practices from the science of learning that reflect the *local context of the classroom* and then *generate evidence* that allows both us and our learners to determine if learning has occurred. These adaptations must reflect challenges to learning, those nine challenges uncovered by Chew and Cerbin (2020). The final task of this module is to think about and plan how you will generate and gather evidence from your learners about these challenges. How will you know which challenges you *and your students* must address as you strive to move learning forward in your classroom?

Use the space provided to plan how you will generate and gather evidence for each challenge. Some examples are provided to get your thinking started.

Challenge	Approaches for Generating and Gathering Evidence
Student Mindframes	Develop an interest survey, discuss student responses during one-on-one conferences.
Meta-Cognitive Skills and Self-Regulation	
Student Fear	
Insufficient Prior Knowledge	
Misconceptions	
Ineffective Learning Strategies	Interview students about their “favorite” study strategy.
Low Potential for Transfer	
Selective Attention Constraints	
Working Memory Capacity	Student observation with various leveled problems or tasks.

»» Checks for Understanding

Take a moment and return to the success criteria for this module. As you did in the previous modules, respond to the following questions by “showing what you know.”

Know	Show (Generate a response to the question that “shows what you know”)
Can I describe the different challenges to learning?	
Can I recognize challenges to learning in my classroom using student data?	
Can I hypothesize approaches to overcoming the challenges to learning in my classroom?	

Now, let’s take what we have learned about learning and leverage that to move learning forward in our students.