[slide 1] Welcome to DLM® Science Module 1: Overview of the DLM Science Framework. In this module, you will learn about the foundations of the DLM science assessment and how the DLM science Essential Elements (EEs) are linked to the general education standards.

[slide 2] After completing module 1, part 1, teachers should be able to describe the DLM science standards dimensions; distinguish between the terms domain, core idea, and topic; and identify the domain, core idea, and topic that are used in a DLM science standard (EE).

[slide 3] Teachers will also be able to describe the science and engineering practices, distinguish between different science and engineering practices, explain how science and engineering practices are used in EEs, define the term crosscutting concept, and finally, explain how crosscutting concepts are used in EEs.

[slide 4] This section describes the dimensions of the DLM science standards framework and how they are used in DLM science EEs.

[slide 5] The DLM science framework is organized by the same three dimensions as the college and career readiness grade-level expectations. The three dimensions are the disciplinary core ideas, the science and engineering practices, and the crosscutting concepts. The breadth, depth, and complexity have been reduced to make the content accessible for students with the most significant cognitive disabilities. The DLM science framework is designed to provide access to the same disciplinary core ideas, practices, and concepts at appropriate levels.

In this module, you will learn about the three dimensions and how they are used in the DLM EEs for science and the science assessment system.

[slide 6] The DLM science standards framework provides a foundation for the EEs. These EEs are specific statements of knowledge and skills linked to grade band expectations for students with the most significant cognitive disabilities. The purpose of the DLM EEs is to build a bridge from the content in the general education science framework to content appropriate for students with the most significant cognitive disabilities. As such, the EEs address a smaller number of science standards, representing a breadth, but not depth, of coverage across the entire standards framework. The EEs integrate the three dimensions of the DLM science framework. The full set of DLM science EEs can be found on the DLM website.

[slide 7] Throughout this module, we will use examples from the DLM EEs for Science document. EEs are displayed using this table format.

Before we describe the framework dimensions, we will examine the content that is displayed for each EE. The format includes the framework dimensions. These dimensions link the EEs to the grade band expectations for general education science. First, we will examine the first three rows in the blue section of the table, which relate to framework dimension 1 – the disciplinary core ideas.

[slide 8] This section describes the dimensions of the DLM science standards framework and how they are used in DLM science EEs. The first dimension is the disciplinary core ideas.

[slide 9] The figure illustrates the three-level hierarchical structure that is used in the DLM science standards framework. Disciplinary core ideas are the second level, which is in the center column of the diagram. The first level is the domain. The third level is topic. In the next slide, we will explain what each level of the structure represents.

[slide 10] A domain is an area of science. There are three domains in the DLM science EEs: physical science, life science, and Earth and space science.

A disciplinary core idea is a concept that represents core knowledge. In the DLM EE document, the disciplinary core idea is labeled "core idea." Disciplinary core ideas are the most important concepts in the domain. A topic is a component of the disciplinary core idea. Next, we will examine the disciplinary core ideas and topics for each domain.

[slide 11] Physical science EEs include four disciplinary core ideas: 1) matter and its interactions, 2) motion and stability: forces and interactions, 3) energy, and 4) waves and their applications in technologies for information transfer.

Each disciplinary core idea has one or two topics, as shown in the table. For example, the disciplinary core idea PS3 Energy has two topics: PS3.B Conservation of Energy and Energy Transfer and PS3.D Energy in Chemical Processes in Everyday Life. Disciplinary core ideas in the physical science domain are identified by the PS prefix. The letter after the period identifies the topic.

The topics used by the DLM science EEs link to the general education standards topics. However, not all topics are covered by DLM science. Topics were selected or omitted according to the needs of reduction of depth and breath for students with the most significant cognitive disabilities.

[slide 12] Life science EEs include four disciplinary core ideas: 1) from molecules to organisms: structures and processes, 2) ecosystems: interactions, energy, and dynamics, 3) heredity: inheritance and variation of traits, and 4) biological evolution.

Each disciplinary core idea has one to three topics. Disciplinary core ideas in the life science domain are identified by the LS prefix. The letter after the period identifies the topic.

[slide 13] Earth and space science EEs include three disciplinary core ideas: 1) Earth's place in the universe, 2) Earth's systems, and 3) Earth and human activity.

Each disciplinary core idea has one or two topics. Disciplinary core ideas in the Earth and space science domain are identified by the ESS prefix. The letter after the period identifies the topic.

[slide 14] Across all three domains, 11 disciplinary core ideas are represented in the DLM science EEs. The disciplinary core ideas represent the core content in physical science, life science, and Earth and space science. In this table, the disciplinary core idea codes are shown next to the disciplinary core idea names. The codes are connecting links between the general education standards and the EEs. The disciplinary core idea code is part of the EE name and the general education standard name. In the next slide, we will show an example of this link.

[slide 15] The domain, disciplinary core idea, and topic of a DLM science EE are linked to the general education standard. To illustrate this idea, let's look at an example from fifth grade.

In this example, the domain is PS, or physical science. The core idea is PS1 Matter and Its Interactions, and the topic is PS1.A Structure and Properties of Matter. These are the same for the general education standard and the DLM science EE. The name of the EE, EE.5.PS1-2, corresponds to the name of the linked general education standard, 5-PS1-2. The "PS1-2" in the EE name corresponds to the general education standard with the same code. The links between the general education standard and the EE are indicated by the codes and are reflected in the content. Let's look at this example in more detail. In the DLM EE, the phrase "weight of matter is conserved" is the link to the topic, which is structure and properties of matter. Weight is a property of matter.

[slide 16] Next, we will examine the first row in the yellow section of the table, which is related to framework dimension two – the Science and Engineering Practices.

[slide 17] This section describes dimension two of the framework, the science and engineering practices.

[slide 18] In the previous section, we explored the first dimension of the DLM science framework – the disciplinary core ideas. In this section we examine the second dimension of the DLM science framework, which are the science and engineering practices.

Science and engineering practices are broad sets of skills and subskills often used by scientists and engineers. The general education framework identifies eight science and engineering practices, which engage students in the process of doing science and engineering. The DLM science framework integrates science and engineering practices into science content. This is different from previous standards that separated practices from core ideas. The separation of practices from content led to teaching science as a collection of ideas and facts, rather than using science as a process that develops our understanding of the world. The DLM science framework integrates a science and engineering practice into every EE. The intent of this integration is for students with the most significant cognitive disabilities to engage in the science and engineering practices as they learn science ideas.

[slide 19] The framework has eight science and engineering practices. The eight practices are: (1) asking questions and defining problems, (2) developing and using models, (3) planning and carrying out investigations, (4) analyzing and interpreting data, (5) using mathematics and computational thinking, (6) constructing explanations and designing solutions, (7) engaging in argument from evidence, and (8) obtaining, evaluating, and communicating information.

Each practice represents a set of skills that scientists and engineers use to solve problems and understand the world. The skills within each practice become more complex as students progress from elementary to middle and high school. In this section, we will provide brief descriptions of each practice. Another professional development module will explain the practices in much greater detail. Practice one, Asking Questions and Defining Problems, is currently not used in any DLM science EEs. We will begin with practice two.

[slide 20] Practice two is Developing and Using Models. Scientists and engineers use and construct models to represent ideas and explanations. Models can have many different forms, including diagrams, drawings, physical replicas, mathematical representations, analogies, and simulations. Most teachers engage their students in creating models that are physical replicas. For example, students often create solar system models, such as the child is doing in this photo. However, models do not always look like the thing they represent.

[slide 21] Practice three is Planning and Carrying Out Investigations. Students plan and carry out systematic investigations as they describe the world around them and test theories about how things work. A student might be asked to decide what data needs to be gathered or what tools are needed to make a measurement. The practice of planning and carrying out investigations includes skills such as making observations or measurements and collecting data.

[slide 22] Practice four is Analyzing and Interpreting data. Scientific investigations produce data that must be analyzed to derive meaning. Scientists use a variety of tools to find patterns and trends in data, including tables, graphs, maps, or charts. Students analyze data by identifying patterns and relationships in the data. Interpreting data includes making sense of the patterns and relationships in the data. For example, a student analyzes a graph of the number of students in a class over a three-year span. Students identify a pattern in the data, such as increasing numbers of students. To analyze the data, students make sense of the pattern. In this graph, increasing numbers of students could mean that more people have moved into their town or that more babies were born in a certain year.

[slide 23] Practice five is Using Mathematics and Computational Thinking. Students use mathematics to describe objects and processes. Simple math operations can be used to quantify a change. Math and computational thinking allows students to represent, analyze, and solve problems. An example of this practice would be giving a student data and asking him or her to determine changes. A student might be given data about populations for three animals over ten years and asked to use mathematics to describe changes. Or a student could use computational thinking to create a graph that shows how much the populations changed over the ten-year period.

[slide 24] Practice six is Constructing Explanations and Designing Solutions. In science, students construct explanations when they use reasoning to connect science ideas with observations or evidence. In engineering, students demonstrate their understanding of science ideas by designing solutions. For example, a student can explain how traits help animals to survive in their environment. If a student observes that pelicans have a large bill with a pouch and that pelicans eat fish, the student could explain that a large bill and pouch helps a pelican survive because they can more easily scoop fish out of the water. Pelicans that live near water need to fish to survive. Similarly, a student could use the idea of the pelican’s bill and pouch to design an engineering solution for a fishing device that people could use.

[slide 25] Practice seven is Engaging in Argument from Evidence. Engaging in an argument using evidence involves making claims that are supported by evidence and evaluating the claims made by others. For example, a student might be asked to make an evidence-based claim that the Earth’s gravitational force pulls objects downward. The student identifies evidence from observations of the motion of a falling ball to support the claim.

[slide 26] Practice eight is Obtaining, Evaluating, and Communicating Information. Students obtain information by reading, observing, and interpreting. They evaluate information by determining if it is accurate and comparing multiple sources. Students communicate information by producing media, such as text, tables, graphs, or diagrams. For example, a student may obtain information about protecting the Earth’s resources from a grade-appropriate informational text, observations, or other representations. The student may be asked to use the information to answer science questions or to support a scientific claim.

[slide 27] Each EE is linked to a science and engineering practice. The specific science and engineering practice that is the focus of the EE matches the science and engineering practice of the linked general education standard. This table shows the number of EEs that use each science and engineering practice at each grade band. The use of the practices becomes more complex over time from elementary to high school. In high school, there is increased emphasis on mathematics and computational thinking, as well as constructing explanations and designing solutions.

[slide 28] Let's look at one DLM science EE to see how the science and engineering practices are used. For example, EE.HS.LS4-2 is connected to the science practice of constructing explanations and designing solutions. The EE asks student to explain how the traits of particular species allow them to survive in their specific environments. Students create an explanation using evidence of particular species and reasoning based on the science idea of adaptation. A typical explanation would include a claim, reasoning, and evidence.

The science and engineering practice for an EE is the same as the science and engineering practice for the linked general education standard. The general education standard HS-LS4-2 also asks students to construct an explanation. However, the depth and complexity of the practice is reduced to be appropriate for students with the most significant cognitive disabilities. The EE is less complex than the linked general education standard because the claim, evidence, and reasoning are less complex.

[slide 29] Next, we will examine the second row in the yellow section of the table, which is related to framework dimension three – the crosscutting concepts.

[slide 30] This section introduces the crosscutting concepts dimension.

[slide 31] Earlier in this section, we explored the second dimension of the DLM science framework – the science and engineering practices. Now we examine the third dimension of the DLM science framework, which is the crosscutting concepts.

Crosscutting concepts are overarching ideas that transcend multiple domains of science, and possibly non-science domains. Crosscutting concepts have application in two or more disciplinary core ideas. For example, the crosscutting concept of patterns has applications in math, science, and English language arts.

[slide 32] The general education framework identifies seven crosscutting concepts: 1) patterns, 2) cause and effect: mechanism and explanation, 3) scale, proportion, and quantity, 4) systems and system models, 5) energy and matter: flows, cycles, and conservation, 6) structure and function, and 7) stability and change. Each EE includes a crosscutting concept; however, these concepts are not yet formally assessed.

[slide 33] Let us look at one DLM science EE to see how the crosscutting concepts are used. Each general education standard includes a crosscutting concept, and the EEs also include crosscutting concepts. The EE and the corresponding general education standard use the same crosscutting concept. For example, EE.5.LS.2-1 asks students to create a model that shows the movement of matter through living things. This EE is connected to the crosscutting concept of systems and system models. The corresponding general education standard, 5-LS2-1, uses the same crosscutting concept. In this example EE, the system is a group of living things. Each EE includes a crosscutting concept; however, these crosscutting concepts are not formally assessed.

[slide 34] Thank you for completing the DLM Science Standards Framework module. Please continue to Part 2: The DLM Science Alternate Assessment System. To learn more about the Dynamic Learning Maps Alternate Assessment Consortium and the DLM Alternate Assessment System, please go to www.dynamiclearningmaps.org