Knowledge-Centered 1: Teaching for Depth & Progressive Formalization		
1	Title Slide	Welcome to this module, Teaching for Depth & Progressive Formalization, in the Knowledge-Centered teaching series. To advance to the next slide, select the "forward" arrow located on the play bar at the bottom of your screen.
2	Introduction	According to the National Research Council, "people construct new knowledge based on their current knowledge." Without identifying students' prior knowledge or preconceptions, it can be challenging to predict what they will take away from new information presented (NRC, 2000). Knowledge-centered environments are designed in a way that students are to obtain the skills and knowledge to complete what is expected from course learning outcomes. Instruction in the knowledge-centered environment is planned so that students will have gained a foundational knowledge base of the topic, as well as the prerequisite skills and knowledge needed to transfer the information to another context (NRC, 2000). The main idea of knowledge-centered environments is that it highlights the "big picture" concepts of a subject and emphasize the connections that stem from the foundational knowledge (NRC, 2000). In this module, we will be discussing knowledge-centered environments as it relates to teaching for depth and progressive formalization.
3	Learning Objectives	By the end of this module, the learner will be able to incorporate teaching practices that deepen student learning through Hess' Cognitive Matrix, Academic Language, and Progressive Formalization.
4	Learning with Understanding	To provide a knowledge-centered classroom environment, consideration should be given to what is taught, why it is taught, and what competence or mastery of the knowledge or skill looks like. Fully understanding what students are expected to learn should be emphasized, rather than the memorization of facts (NRC, 2000). The learning environment that is knowledge-centered provides depth in student learning by assessing comprehension rather than factual memory. This is achieved by teaching students to be aware of their own learning through metacognition, which we will discuss later in the module.
5	Teaching for Depth	Teachers must "teach some subject matter in depth, providing many examples in which the same concept is at work and providing a firm foundation of factual knowledge" (NRC, 2000). This means that shallow coverage of all topics in a subject area should be replaced with fewer, deeper topics in a discipline so that students can grasp the defining concepts or "big ideas."

6	Teaching for Depth	According to the National Research Council (2000), expert teachers align their assessments to the level of depth of understanding they wish their students to achieve, instead of overemphasizing memory or facts. Many teachers will find themselves in a redundant routine of instructional exercises, when a simple solution is to expose students to the highlights of a particular subject as they show up naturally in problems. These activities can be structured in a way that students are challenged to "explore, explain, extend, and evaluate" their own progress of learning. Ideas stick when students see a need to use them, which helps what is being taught to become more relevant to the students.
7	Hess' Cognitive Matrix	One way of ensuring that we are teaching for depth when planning lessons is through the use of Hess' Cognitive Matrix. Hess' Cognitive Rigor Matrix combines the cognitive processes of Bloom's taxonomy to Webb's Depth of Knowledge. This matrix gives examples of potential learning tasks teachers can use when creating assessments by synonymously establishing the level of thinking required with Bloom's taxonomy, along with the depth of knowledge needed from Webb's (Hess, Jones, Carlock, & Walkup, 2009). Learning taxonomies can be valuable tools in designing assessments and learning outcomes for students. Click here to familiarize yourself with Bloom's taxonomy and Webb's Depth of Knowledge. **See file**
8	Hess' Cognitive Matrix	Observe the highlighted portions of the matrix. Note how the lowest-order thinking and lowest-depth level of the matrix combines Bloom's Remember plus Webb's Recall & Reproduction, which asks students to recall or locate basic facts, details, and events. Also notice that the highest-order thinking and deepest level combines Bloom's Create plus Webb's Extended Thinking to have students synthesize information across multiple sources or texts. A cognitive matrix such as Hess' allows teachers to analyze the alignment among learning activities, instruction, and classroom assessments. This matrix examines the depth of understanding required of students when planning assessments (Brookhart, 2010). Attached in this slide you will find cognitive matrices for math and science, in addition to Career & Technical Education. After analyzing the files, pause this module and write down three ways you could use a cognitive matrix in your lesson planning routine. **See file**
9	Academic Language	Additionally, teachers should familiarize themselves with the academic language within a specific discipline, and design their assessments to test for deep understandings rather than surface knowledge. This can be achieved by "creating authentic opportunities for students to develop academic language… because as one acquires language, new concepts are also developed" (Pearson, 2018, p. 6). Academic language is defined as the language of a discipline (oral and written) that students should learn and use to engage in a content area in a meaningful way through vocabulary and discourse (Stanford Center for Assessment, Learning, and Equality, 2016).

		To learn more about how academic language teaching strategies can be incorporated or improved in your classroom, examine the files within this slide. **See files**
10	Metacognition	Another way to deepen student learning is through developing students' metacognition. Knowledge-centered environments emphasize the importance of students becoming metacognitive experts by analyzing new information that makes sense and scrutinizing information that does not by asking questions (NRC, 2000). Metacognition is a learner's capacity to assess their ability to complete a task and monitor their current level of understanding (NRC, 2000). Teaching practices that are rooted in metacognition focus on self-assessment and reflection. One specific practice that allows students to enhance their metacognition is through reciprocal teaching, where students take turns being the teacher to discuss and use strategies that involve comprehending content. Reciprocal teaching allows students to monitor their own understanding in a social context. Metacognitive practices used in the classroom such as this increase a student's ability to transfer their learning to new settings (NRC, 2000). To learn more about implementing strategies that develop metacognition in your students, click on the file within the slide. **See file**
11	Progressive Formalization	According to the National Research Council (2002), misconceptions are the starting point for new learning. As teachers, it is important to help students overcome prior misconceptions that might hinder their learning through probing what students really believe and helping them create strategies to resolve conflicting viewpoints. It is also important to understand that students' prior knowledge may be a result of informal ideas and these ideas can be used and transformed by teachers into a more formal state, or one based on scientific evidence (NRC, 2000). This process of transforming and formalizing students' ideas over time is known as progressive formalization.
12	Progressive Formalization	Progressively formalizing students' prior knowledge creates connections with what students may already know about the course content. A strategy of progressive formalization is to have students use their own words, pictures, or diagrams to describe their current understanding of scientific phenomenon. This conceptualization can then be used as a bridge between students' prior knowledge and the academic language and standard conventions of a discipline. Instead of replacing what students currently know, progressive formalization "adds" to their skill set and addresses misconceptions.
13	Progressive Formalization	Pause the module here and take a moment to brainstorm and write down two ways you can improve metacognition in your students and one way you can incorporate progressive formalization in your science or agriculture classroom.

14	Review	As we come to a close, let's consider all we have covered so far. We first began this module by discussing how incorporating a matrix of learning taxonomies in planning can lead to deeper instruction. We highlighted the importance of incorporating academic language as a tool for deeper understanding of scientific vocabulary and discourse. And finally, we focused on the importance of connecting students' prior knowledge to classroom content through progressive formalization. Incorporating these concepts should help you create a knowledge-centered environment that is inclusive and challenging.
15	Sources	National Research Council. (2000). *How people learn: Brain, mind, experience, and school.* Washington, D.C.: The National Academic Press. Bransford, J. D., Brown, A. L., & Cocking, R. R. (2000). How people learn: Brain, mind, experience, and school: Expanded edition. Washington, DC: National Academy Press. Nushi, M., & Jenabzadeh, H. (2016). *Teaching and learning academic vocabulary. Teaching and learning academic vocabulary.* California Linguistic Notes, 40(2), 51-70. Pearson (Ed.). (2018). *The Academic Language of Science.* Retrieved from https://www.pearsonhighered.com/assets/samplechapter/0/2/0/5/0205627595.pdf
16	Credits	Thank you for viewing this module.