

## Diagnostic Learning Environment Framework

We began constructing this framework as a way to help describe the extent to which a teacher has created a Diagnostic Learning Environment in their classroom. While this tool is not intended to be a classroom observation tool, it is useful in guiding the sorts of things to look for in a classroom observation. To place a teacher along the continuum in this framework, we use data from classroom observations, interviews, assessment data and surveys. This first table describes the key components with a space to place the teacher.

Component		Low-Level DLE	Mid-Level DLE	High-Level DLE
1. Teacher Content Knowledge	a. Deep conceptual understanding of content taught			
	b. Knowledge of the learning objectives and big ideas of the unit being taught			
2. Teacher Knowledge of Student Ideas and Thinking	a. Initial ideas			
	b. Conceptual development of the ideas			
3. Assessment Practices	a. Data collection strategies			
	b. Formative use of student data in instruction			
	c. Meta-cognitive strategies and growth			
4. Pedagogical Practices	Instructional strategies used in the classroom			
5. Classroom Learning Culture	Expectations for learning			

In the next table are the descriptions for the low, mid and high levels for each component. These descriptions came out of an applied research project funded by the National Science Foundation. The full report can be found at [www.facetinnovations.com](http://www.facetinnovations.com) on the publications page.

Component	Low-Level Diagnostic Learning Environment	Mid-Level Diagnostic Learning Environment	High-Level Teacher/Student/Instructional Traits of a DLE
1. a. Deep conceptual understanding of content taught	Teacher has minimal or incorrect understanding of the important principles and concepts in the domain.	Teacher knows the subject matter at the level of stating the principles and concepts in the domain.	Teacher has an understanding of the subject matter at the level of <i>how we know</i> the principles and concepts in the domain.
1. b. Knowledge of the learning objectives and big ideas of the unit being taught	Teacher knowledge of the specific concepts taught in each lesson is restricted to the objective statement. Limited understanding of how each lesson achieves its objective or how the lesson objectives fit together with the big ideas of the unit.	Teacher knows the conceptual objectives for each lesson in the prescribed curriculum and the key components of the lesson that achieve the objective. Knowledge of how these lesson objectives support the big ideas of the unit.	Teacher has knowledge of the conceptual story behind each lesson that goes beyond the stated objective. This includes how each lesson may challenge (or not) particular facets of student thinking. This also includes knowledge of sequences of lessons beyond the curriculum that would also lead to the construction the conceptual building blocks of the big ideas of the unit.
2. a. Initial ideas	Teacher has no knowledge of what sorts of conceptions students have of the concepts before they have formally studied them in class.	Teacher knows of some misconceptions students might have before beginning the unit, but view these as a bad thing.	Teacher knows a variety of ways students might think about the topic and concepts prior to instruction and the strengths and weaknesses in these ideas at the beginning of the unit.
2. b. Conceptual development of the ideas	Teacher has no knowledge that student pre-conceptions will influence how they learn the material.	Teacher knows that the misconceptions will remain or solidify during instruction if they are not addressed. However, teachers' resources to address these initial ideas are limited to pointing out what is wrong with their students' thinking and presenting the correct model.	Teacher knows that student thinking evolves during instruction and knows of problematic facets that can emerge as a result of instruction. Teacher knows of strategies to help students move from their initial ideas to the more scientific models.
3. a. Data collection strategies	Quizzes/tests are only given at the end of a unit to check to see if a student has it correct or not.	Teacher may use quizzes and tests during the unit as well at the end. However, data is still interpreted at the level of right or wrong. Some informal assessment strategies are in place throughout the unit, but at the level a general sense of the class getting it or not. Teachers often describe this as knowing by the look on their faces, or level of contribution to class discussion.	Teacher uses coordinated assessment strategies throughout instruction to monitor the development of ideas in all students at the level of their facets of understanding. These include discussion questions, individual questions, written responses to prompts, Diagnoser assignments, concept maps, projects, portfolios, etc... The defining characteristic of the data is that it shows what students are thinking beyond if the student is answering correctly or not.
3. b. Formative use of student data in instruction	Formative use of assessment data by the teacher is non-existent. Student data is primarily used only to assign grades.	Teacher uses data during the unit from both formal and informal sources, but changes to instruction are limited to slowing down, repeating, or reviewing. Teacher describes using data to improve instruction the next year.	Teacher uses knowledge of students' changing ideas to adjust instruction continuously throughout the unit. Adjustments to the curriculum include posing additional guiding questions and designing investigations that relate specifically to the models students are constructing of the concepts.
3. c. Meta-cognitive strategies and growth	Students in the classroom do not participate in thinking about or reflecting on their learning.	Students in the classroom are given some opportunities to see how their learning has grown over the course of a unit. For example, students may be given access to the scoring rubrics prior to assessment of their learning. Or, students may participate in grading their work or their peers.	Students in the classroom are active participants in monitoring and evaluating their learning through discussions and written work (e.g., portfolios, journals, construction of rubrics, etc...). Assessment data collected early in the unit is saved, displayed and used by teachers and students to illustrate changing ideas.
4. Instructional strategies used in the classroom	Teacher uses a variety of instructional strategies from the curriculum, but mainly relies on a didactic approach. As a consequence, vocabulary and key principles are often presented to students prior to investigating these ideas and conclusions are given to the students at the end of each lesson.	Teacher uses a variety of instructional strategies but relies on the activities from the curriculum to lead the student to correctly construct most of the concepts. However, the teacher may not be sure what will be missing in the student model if a lesson is skipped. And not sure what to do if the student does not end up with the correct model.	Teacher uses a variety of instructional activities, and recognizes that each student may need different leading questions and prompts to help them make meaning even if they are using well-sequenced guided-inquiry activities from the curriculum designed to help them construct a correct model for the big ideas. The teacher has a metaphorical toolbox of instructional strategies to use in response to how students are interacting with the basic sequence of lessons.
5. Expectations for learning	Students have attitudes, beliefs and behaviors consistent with the teachers' pedagogy-- knowledge comes from an authority. Students are given information as requested.	Students are encouraged to take responsibility for their learning and ask questions, but ultimately teacher will generally affirm or correct student thinking. This is often because students have not completely bought into the idea that they are responsible for their learning.	Students take full responsibility for their learning and gain confidence in their abilities to judge the soundness of their models. Ultimately, students may not even turn to the teacher for affirmation, instead relying on their critical thinking skills to work through inconsistencies.