

## Quality Assessment in Science Project Dimensions and Examples of Assessment and Data Use



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Each Dimension is scored on a 5-point scale ranging from “Fully Present or Realized” to “Not Present or Realized.”

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Fully Present or Realized	Sufficiently Present or Realized	Moderately Present or Realized	Barely Present or Realized	Not Present or Realized
5	4	3	2	1

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Dimension 1: *Setting Clear Learning Goals*

Dimension 2: *Alignment of Assessments to Learning Goals & Science Standards*

Dimension 3: *Frequency of Assessment*

Dimension 4: *Variety of Assessment*

Dimension 5: *Cognitive Complexity*

Dimension 6: *Reflection of Scientific Practices*

Dimension 7: *Student Involvement in Their Own Assessment*

Dimension 8: *Feedback to Students*

Dimension 9: *Use of Information for Instructional Decisions*

(10) *Overall Assessment Practice*

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**Dimension 1: *Setting Clear Learning Goals***

Degree to which the evidence in the notebook suggests that the teacher sets explicit and clear learning goals and/or performance expectations for the unit as a whole, and for the individual lessons and tasks. Connections among the learning goals for individual lessons are apparent. **(NOTE: The focus is on goals set in advance; teacher responses in the yellow sticky notes do not “count” as evidence of clear and explicit goals; evidence needs to come from the materials themselves)**

<p>5. Fully Present or Realized</p>	<p>The learning goals and/or performance expectations for the unit and the individual lessons are <u>explicit</u> and clear, proximal to the learning unit, and connections among the learning goals are apparent.</p> <p><u>Example:</u> The <i>forces and motion</i> unit goal states that students will be able to apply Newton’s Laws to explain the motion of objects. Initial lesson goals focus on students’ ability to describe an object’s position, velocity, and acceleration. Goals for subsequent lessons are focused on students applying each of Newton’s Laws to objects in motion or at rest.</p>
<p>4.</p>	
<p>3. Moderately Present or Realized</p>	<p>Unit and individual lesson learning goals are often available, but connections among them are not apparent; *OR* learning goals are specific and explicit for only some tasks, but connections among these are apparent.</p> <p><u>Example:</u> The <i>forces and motion</i> unit goal states that students will be able to apply Newton’s Laws to explain the motion of objects. The lesson goals are not stated or they start describing position and velocity, but then move onto forces without covering acceleration.</p>
<p>2.</p>	
<p>1. Not Present or Realized</p>	<p>No evidence of an effort to set explicit and clear goals and expectations for student performance for the unit or for individual lessons.</p> <p><u>Example:</u> The teacher includes only a copy of the state standards for the unit on <i>forces and motion</i>, but does not explicitly state any goals for the unit or lesson plans; *OR* teacher lists standards as learning goals, but there is no explicit connection between the standards and contents taught.</p>

**Dimension 2: Alignment of Assessments to Learning Goals & Science Standards**

Degree to which the collection of formal and informal assessments provides information about the extent to which students have achieved the learning goals for the unit or the lesson; i.e. alignment between the learning goals and assessments both in terms of content and cognitive demand. And, that the goals and assessment are aligned to science standards

**(NOTE: You should rate alignment using as reference the learning goals as best you can determine them; statements on the yellow sticky notes for individual assessments can be used as a source of evidence for judging alignment.)**

5. Fully Present or Realized	In combination, the collection of formal and informal assessments provides complete information about the extent to which students have achieved the learning goals for the unit that are based on appropriate science standards  <u>Example:</u> The <i>forces and motion</i> unit goals ask students to analyze forces and relate them to resulting motion. Some quizzes involve multiple-choice questions and defining terms, but other tasks require students to break down force diagrams. At the end of the unit, students conduct a lab activity and are asked to identify within it instances of Newton’s 3 laws of motion. Finally, students complete an assessment showing how the forces they identified would change the motion of various objects.
4.	
3. Moderately Present or Realized	The collection of formal and informal assessments provides some information about the extent to which students have achieved the learning goals for the unit OR assessments are aligned to goals clearly, but the goals are not fully aligned with science standards.  <u>Example:</u> The <i>forces and motion</i> unit goals ask students to analyze forces and relate them to resulting motion. Quizzes throughout the unit involve multiple-choice questions and defining terms. At the end of the unit students analyze a three-panel cartoon strip where there are only instances of Newton’s 2 <sup>nd</sup> and 3 <sup>rd</sup> law; students are not required to connect the causal forces to an object’s motion.
2.	
1. Not Present or Realized	The collection of formal and informal assessments provides little or no information about the extent to which students have achieved the learning goals for the unit OR the assessments and goals are totally misaligned with science standards.  <u>Example:</u> In a unit test on <i>forces and motion</i> , students are asked to provide definitions for different kinds of forces and different kinds of motion.

**Dimension 3: Frequency of Assessment**

Degree to which the evidence in the notebook suggests that the teacher makes frequent use of assessment in the classroom.

5. Fully Present or Realized	Assessment of one form or another is a regular occurrence in the classroom throughout the unit; at least one informal assessment is present nearly every day throughout the unit and at least one formal assessment is present every 3-5 days.  <u>Example:</u> In a unit on <i>space</i> , the teacher begins each day reviewing material from the previous lesson or with a warm up activity to assess prior knowledge on the topic to be covered. Most lessons include either an in-class individual assessment or an exit card. The unit ends with a test.
4.	
3. Moderately Present or Realized	Informal assessment occurs on about half of the days during the unit and formal assessments are every 5-10 days.  <u>Example:</u> In a unit on <i>space</i> , the teacher assigns in-class work, quizzes, or homework two or three times a week. The unit ends with a test.
2.	
1. Not Present or Realized	Minimal evidence of assessment of student learning and progress.  <u>Example:</u> In a unit on <i>space</i> , the teacher administers a quiz midway through the unit, and a test at the end.

**Dimension 4: *Variety of Assessment***

Degree to which the evidence in the notebook suggests that the teacher uses of a variety of formal and informal assessment methods, activities, and forms.

5. Fully Present or Realized	<p>The teacher uses a wide variety of formal and informal assessment methods (quiz, test, projects, oral q&amp;a) and forms (multiple choice, short answer, open ended, thumbs up/down, clickers).</p> <p><u>Example:</u> Throughout the unit the teacher asks students to answer direct questions and sometimes asks the whole class to show thumbs-up or down as a check for understanding. Quizzes use multiple-choice format, but also include open-ended lab problems, diagrams, or graph analysis. The end of unit assessment combines closed form questions (T/F, multiple choice, and relational), and performance assessment tasks.</p>
4.	
3. Moderately Present or Realized	<p>Some variety of assessment methods.</p> <p><u>Example:</u> Throughout the unit the teacher administers several multiple choice quizzes and an end of unit test that includes multiple choice questions and an open-ended task. The teacher uses some student questioning throughout her lectures as a check for understanding.</p>
2.	
1. Not Present or Realized	<p>Minimal variety of assessment methods.</p> <p><u>Example:</u> The teacher only administers multiple-choice quizzes and tests throughout the unit.</p>

### Dimension 5: Cognitive Complexity

Degree to which the evidence in the notebook suggests that student assessment requires more than recall of facts and includes higher order cognitive processes such as the application, analysis, or explanation of complex scientific concepts. Students also can make developmentally appropriate connections among ideas and generalize from scientific facts to scientific concepts.

5. Fully Present or Realized	<p>Higher order cognitive processes, such as applying, analyzing, or explaining complex scientific concepts are a central focus of the assessment. Higher order questions are novel to students, not the reconstruction of ideas constructed entirely by the teacher.</p> <p><i>Note: A high rating does not require that each individual assessment emphasize high levels of cognitive complexity. Assessments may include a combination of high and low cognitive levels.</i></p> <p><u>Example:</u> In a unit on <i>chemical reactions</i>, the series of informal and formal assessment tasks require that students define terms, describe chemical reactions, and explain these reactions on a molecular level using complex scientific vocabulary; students observe a set of reactions and are asked to differentiate between chemical and physical changes, and discuss the relation between these changes. The end of unit test includes open-ended questions asking students to describe how atomic properties relate to molecular bonding.</p>
4.	
3. Moderately Present or Realized	<p>Higher order cognitive processes (e.g. understanding, generalization, and connections among concepts) are sometimes included, but are not a central focus of assessment.</p> <p><u>Example:</u> In a unit on <i>chemical reactions</i> a series of quizzes ask students to define terms related to chemical reactions and describe different types of reactions. The end of unit test asks students to discuss the difference between chemical change and physical change.</p>
2.	
1. Not Present or Realized	<p>Assessment emphasizes recall of discrete pieces of scientific information, definitions, formulas, and procedural steps. No evidence of probing for higher order cognitive processes such as understanding, connections among concepts, or generalization.</p> <p><u>Example:</u> In the unit on <i>chemical reactions</i>, assessment focuses on recall of formulas for single and double replacement reactions and the definition of terms involved in chemical reactions.</p>

### **Dimension 6: Reflection of Scientific Practices**

Degree to which the evidence in the notebook suggests that students engage in scientific explanation and at least one other scientific practice throughout the unit. As science seeks to develop causal explanations about the natural and material world, students assume roles in which they ask questions, develop models, plan and carry out investigations, analyze and interpret data, use mathematics, engage in arguments from evidence, or evaluate information as a means to developing these explanations.

5. Fully Present or Realized	Assessments require students to engage and show competency in scientific practices. Assessments collectively indicate students' ability to engage in at least one practice identified in the Next Generation Science Standards as a means to construct explanations about the natural and material world. Assessments collectively indicate that scientific practices are central to science achievement. <i>Note: A high rating in this dimension does not require that each individual assessment require the construction of explanations or other scientific practices.</i>  <u>Example:</u> Throughout the unit on <i>forces and motion</i> , students perform small experiments related to the motion of a car. The lab reports ask student to discuss the degree to which the data support their hypotheses using scientific concepts and vocabulary. At the culmination of the experiments, students have to construct an explanation of how friction affects the motion of the car.
4.	
3. Moderately Present or Realized	Assessments collectively show that students sometimes explain their reasoning, but that they rarely construct causal explanations. Assessments collectively indicate that the science practices occur sporadically, but are not considered central parts of student achievement.  <u>Example:</u> Throughout the unit on <i>forces and motion</i> , students perform several small experiments related to the motion of a car. The teacher asks each lab group to determine whether their data support their hypotheses, but scientific evidence or explanation are not required. On quizzes and the unit test students are rarely asked to explain their reasoning.
2.	
1. Not Present or Realized	Assessments emphasize “giving the right answers”. Assessments do not require that students construct explanations or engage in other scientific practices.  <u>Example:</u> For a unit on <i>forces and motion</i> , students work word problems related to position, velocity, acceleration and Newton’s 2 <sup>nd</sup> Law. On each assessment students are graded on whether they calculated the correct value. The end of unit quiz asks students to define acceleration and solve word problems.

### **Dimension 7: Student Involvement in Their Own Assessment**

Degree to which the evidence in the notebook suggests that students are engaged in assessing their own work and reflecting on their progress toward the learning goals (i.e. metacognitive processes).

<p>5. Fully Present or Realized</p>	<p>Student self assessment is a consistent feature in the classroom; self-assessment goes beyond summative judgment and involves reflecting on the quality of understanding and progress toward the learning goals.</p> <p style="text-align: center;"><i>Note: Self- assessment does not require assigning grades or an explicit evaluative use.</i></p> <p><u>Example:</u> The teacher uses KWLs to help students relate their learning to concepts covered in a unit on <i>states of matter</i>. The teacher provides students a protocol to discuss answers to quizzes and tests in small groups focusing on the strengths and weaknesses of responses, and common misunderstandings. At the end of the unit students complete a self-reflection analyzing their progress in understanding in relation to the learning goals for the unit.</p>
<p>4.</p>	
<p>3. Moderately Present or Realized</p>	<p>The evidence suggests that there is some student engagement in evaluating their own work and reflecting on their progress toward the learning goals</p> <p><u>Example:</u> Throughout a unit on <i>states of matter</i> students sometimes correct their own homework or that of others using answers provided on an overhead projector. Students are allowed to ask questions about answers that they do not fully understand.</p>
<p>2.</p>	
<p>1. Not Present or Realized</p>	<p>No evidence of student engagement in assessing and reflecting on their own work</p> <p><u>Example:</u> In a unit on <i>states of matter</i>, the teacher grades student work and returns it to them. No time is spent looking at student work in class, or engaging students in reflecting on or discussing their work.</p>



**Dimension 8: Feedback to Students**

Degree to which the evidence in the notebook suggests that students receive specific feedback from teachers or their peers about their learning relative to the goals of the unit, highlighting potential strengths and weaknesses.

5. Fully Present or Realized	<p>Students consistently receive feedback from their teacher or peers that focuses on their learning, highlights potential strengths and weaknesses.</p> <p><u>Example:</u> In a series of lessons on chemical reactions the teacher provides some type of written feedback on all graded work. The teacher always marks incorrect answers, and often poses short questions that students should think about if they are to meet the learning goals. Students trade homework to review, and use a rubric provided by the teacher to give feedback to their peers on what was done well and what needs improvement.</p>
4.	
3. Moderately Present or Realized	<p>Students sometimes receive feedback from their teacher or peers that focuses on some aspects of their learning, or highlights potential strengths and weaknesses.</p> <p><u>Example:</u> In a unit on <i>chemical reactions</i>, the teacher provides an overall grade for each piece of work. She also marks individual problems right or wrong and uses circles, checkmarks, X's, and underlines to indicate parts of problems that are done well or may need review.</p>
2.	
1. Not Present or Realized	<p>Regardless of frequency, feedback to students focuses on correctness of answers or grades assigned.</p> <p><u>Example:</u> In a unit on <i>chemical reactions</i>, the teacher provides only letter grades on homework, quizzes, and tests.</p>

**Dimension 9: Use of Information for Instructional Decisions**

Degree to which the evidence in the notebook suggests that the teacher uses information collected through assessment to inform instructional decisions relative to the unit goals for the current students (e.g., pacing; introducing or revisiting topics; using different materials, activities, or examples to give students additional opportunities to learn or increase student interest; providing additional help, work, or attention to individual students).

5. Fully Present or Realized	<p>The teacher consistently uses the information collected through assessment to inform decisions to adapt and improve instruction and assessment for their current students.</p> <p><i>Note: A high rating in this dimension does not require that teachers use every individual assessment to inform instructional decisions.</i></p> <p><u>Example:</u> In a <i>density and buoyancy</i> unit, the teacher notes that student answers on the first quiz and in class suggest they confused density and mass when thinking about what makes objects sink or float. In a later reflection the teacher notes she covered this topic again but the problem persisted; the teacher then added a lab experiment involving dropping two objects of the same mass, but different volumes into a tub of water. The teacher conducts a small follow up session for students who did not demonstrate understanding in the end of unit quiz.</p>
4.	
3. Moderately Present or Realized	<p>The teacher sometimes uses the information collected through assessment to inform decisions to adapt and improve instruction and assessment for their current students. *OR* the teacher uses information regularly but it is primarily to plan and adapt instruction and assessment for future students.</p> <p><u>Example:</u> On the second day of a <i>density and buoyancy</i> unit, the teacher's reflection mentions that students are confusing density and mass. She writes that the next time she teaches this lesson she will address this misconception with a demonstration that involves two objects of the same mass, but different volumes dropped into a tub of water.</p>
2.	
1. Not Present or Realized	<p>No evidence that the teacher uses the information collected through assessment for instructional decision-making.</p> <p><u>Example:</u> Throughout the unit teacher reflections make no mention of plans to adapt or modify current or future instruction or assessment practices based on the information about student learning and achievement collected through assessment; there is no evidence of modifications in the lesson plans for this unit.</p>

### **Dimension 10: Overall Assessment Practice**

Degree to which the evidence in the notebook embodies the model of assessment practice reflected in the previous nine dimensions.

*Note: This is not the arithmetic average of your ratings on the previous nine dimensions. The rating on this dimension should reflect your holistic qualitative judgment about the evidence of assessment practice in the notebook in relation to the model of assessment reflected in the previous nine dimensions.*

5-Advanced Assessment Practice

4-Proficient Assessment Practice

3-Adequate Assessment Practice

2-Marginal Assessment Practice

1-Inadequate Assessment Practice