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Proven Science Programs

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THE SEPUP ASSESSMENT SYSTEM

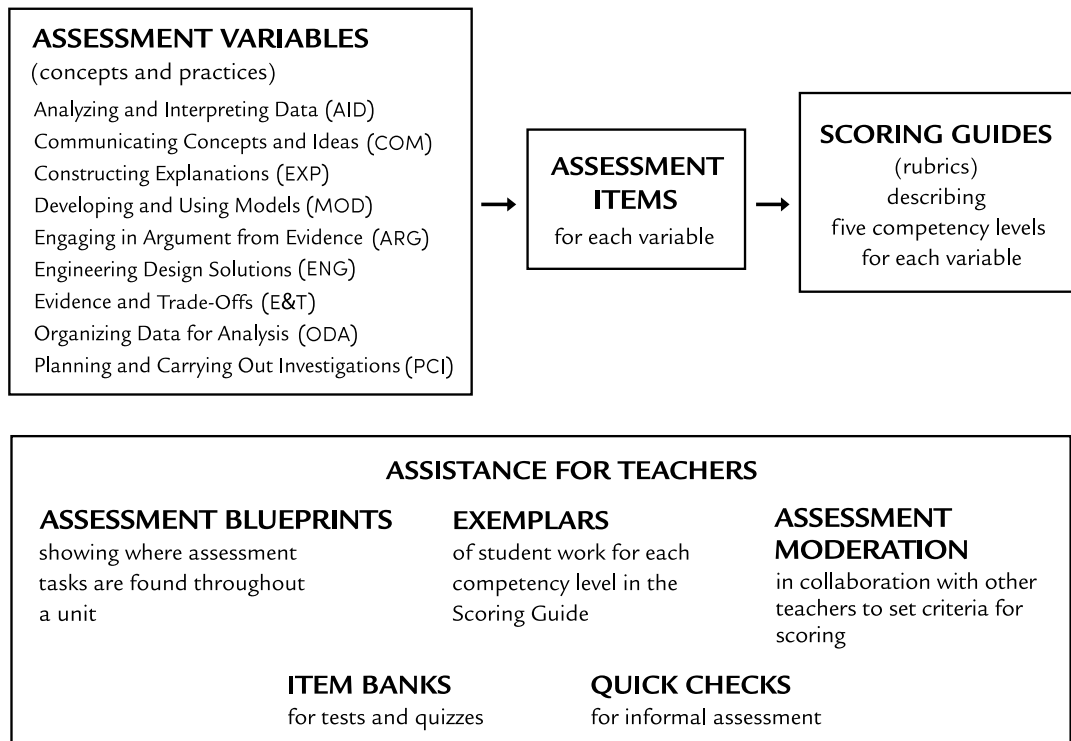
COMPONENTS OF THE SEPUP ASSESSMENT SYSTEM

The SEPUP Assessment System incorporates both formative and summative assessments. Assessment tasks are embedded in *Issues and Science* and are an integral part of the learning activities:

- Formative assessments typically occur during the learning process, as students are acquiring new knowledge. They are especially useful in ensuring that students are learning specific concepts and practices. Teachers can use these assessments to inform and adjust their instruction, with the aim of helping to enhance student learning.
- Summative assessments occur at the end of a learning period, such as at the end of a learning sequence, unit, or grade band. They can provide evidence of students’ integrated learning of the DCIs and CCCs and can also be used as evidence of their use of the SEPs and CCCs across multiple units. In this way, summative assessments can be used to inform future instruction.

Both formative and summative assessment items can be assessed with the SEPUP Assessment System. This is done through the use of purposefully designed assessment variables, assessment items, and Scoring Guides—the three core components of the System, as shown in the following diagram. Each component is described in more detail below.

COMPONENTS OF THE SEPUP ASSESSMENT SYSTEM



ASSESSMENT VARIABLES

The nine assessment variables, listed in the first box in the diagram, are the key areas across which students are expected to progress throughout a unit or sequence of units. These variables provide continuity across the SEPUP middle school program and ensure that SEPs and CCCs are integrated into students' performance. While they are organized by SEP, Scoring Guides also integrate DCIs and CCCs in order to assess three-dimensional performance.

In addition to a focus on the key process skills identified in the NGSS, the EVIDENCE AND TRADE-OFFS (E&T) variable supports students' decision making about socioscientific issues and problems in SEPUP's issue-oriented approach. For more on the role of evidence and trade-offs in SEPUP materials, see **1 - Issue-Oriented Approach**.

ASSESSMENT ITEMS

Assessment items are questions and tasks, related to the assessment variables, which are designed to gather evidence about students' progress. They may take the form of an Analysis item that prompts students to reflect on and then communicate about a new idea, analyze data from an experiment, model concepts and relationships, or make predictions. For example, after completing an investigation about the water cycle, students are asked to draw, label, and explain a diagram that models the processes involved. Using the diagram, they then predict what happens when humans disrupt one aspect of the cycle. In an engineering design challenge, students are assessed on their use of the design process and their problem-solving skills as they collaboratively design a heart valve according to specific criteria and constraints.

Literacy strategies may also be used for formative assessment. When students complete, for example, an Anticipation Guide or a Talking Drawing, teachers gain information on what students already know, what preconceptions they may have, and what problems they might encounter going forward. For more about SEPUP's embedded literacy strategies, see Literacy Strategies in **4 - Comprehensive Teacher Support**.

SCORING GUIDES

The nine SEPUP Scoring Guides are designed to support the range of science and engineering process skills that students learn and use in *Issues and Science*:

- ANALYZING AND INTERPRETING DATA (AID)
- COMMUNICATING CONCEPTS AND IDEAS (COM)
- CONSTRUCTING EXPLANATIONS (EXP)

- DEVELOPING AND USING MODELS (MOD)
- ENGAGING IN ARGUMENT FROM EVIDENCE (ARG)
- ENGINEERING DESIGN SOLUTIONS (ENG)
- EVIDENCE AND TRADE-OFFS (E&T)
- ORGANIZING DATA FOR ANALYSIS (ODA)
- PLANNING AND CARRYING OUT INVESTIGATIONS (PCI)

Scoring Guides directly correspond to the nine assessment variables and are used to interpret students' responses. They are formatted as holistic scoring rubrics; however, they can easily be converted to analytic scoring rubrics by adding criteria specific to each specific assessment question or task. Scoring Guides are used in each unit of *Issues and Science*, allowing teachers and students to monitor students' growth and encourage their progression from novice to expert on each variable.

Students' responses are categorized into five competency levels:

SCORE	INDICATES STUDENT WORK IS:
4	Complete and correct
3	Almost there
2	On the way
1	Getting started
0	Missing or off task

To achieve a particular score level, a response must fulfill all the requirements of that level. A score of Level 4 indicates that the student has mastered the practice or concept. See the following Using the SEPUP Scoring Guides section for more information on using the guides in the classroom.

ASSESSMENT BLUEPRINTS

The Assessment Blueprint is the schedule of assessments in a given unit. It provides an overview of the activities in which assessment occurs, the specific activity and item in which the assessment appears, and the corresponding Scoring Guide. It is a helpful tool for planning assessments over the length of a unit. The Assessment Blueprint can be found in the Assessment section of each Teacher Edition.

EXEMPLARS

A Level 4 “Complete and correct” sample student response is provided for all assessments and Quick Checks in each Teacher Edition, in either the Teaching Steps or the **Sample Responses to Analysis** section. For an example of a student response at all levels, see the Exemplar Student Responses (Levels 1–4) section below. A complete set of Level 1–4 exemplars for all nine SEPUP Scoring Guides in *Issues and Science* can be found in the Assessment Tools tab of the **Additional Resources** section.

ASSESSMENT MODERATION

In this process, teachers convene as a group to discuss the scoring and interpretation of students' work, with the goal of reaching consensus regarding standards of performance and methods for reliably judging student work and to identify patterns of challenges that students encounter. Instructions and support for facilitating an assessment moderation group are provided in the Assessment Tools tab of the **Additional Resources** section.

ITEM BANKS

Item banks provide one-, two-, and three-dimensional questions in the form of multiple-choice, short-answer, and longer-form questions. The questions can be used as formative assessments during the unit to determine whether students know the DCIs and can integrate them with the SEPs and/or CCCs to engage in two- and three-dimensional performance. This gives teachers information on the concepts that students have not yet fully grasped, so they can adjust their instruction accordingly. Some item bank questions requiring extended responses may also be used as summative assessments and scored with a Scoring Guide. Item banks can be found in the Assessment section of each Teacher Edition.

Sample item bank questions from LAND, WATER, AND HUMAN INTERACTIONS

1. Geological processes happen:
 - a. slowly and over large areas
 - b. quickly and over small areas
 - c. quickly and over large areas
 - d. all of the above
2. Describe at least three environmental changes to water you would expect as a result of human activity.
3. Draw a sketch illustrating the movement of water from Earth's surface to a cloud. Include in your sketch:
 - a. which changes of state occur and where they occur
 - b. where gravity or energy from the sun play an important role

QUICK CHECKS

Quick Checks are embedded tasks that can be used as checkpoints of students' learning along one, two, or three dimensions. When Quick Checks appear in an activity, they are integrated into the Teaching Steps, as shown in the example below, which assesses students' skills in the SEP of *engaging in argument from evidence* using the ENGAGING IN ARGUMENT FROM EVIDENCE (ARG) Scoring Guide.

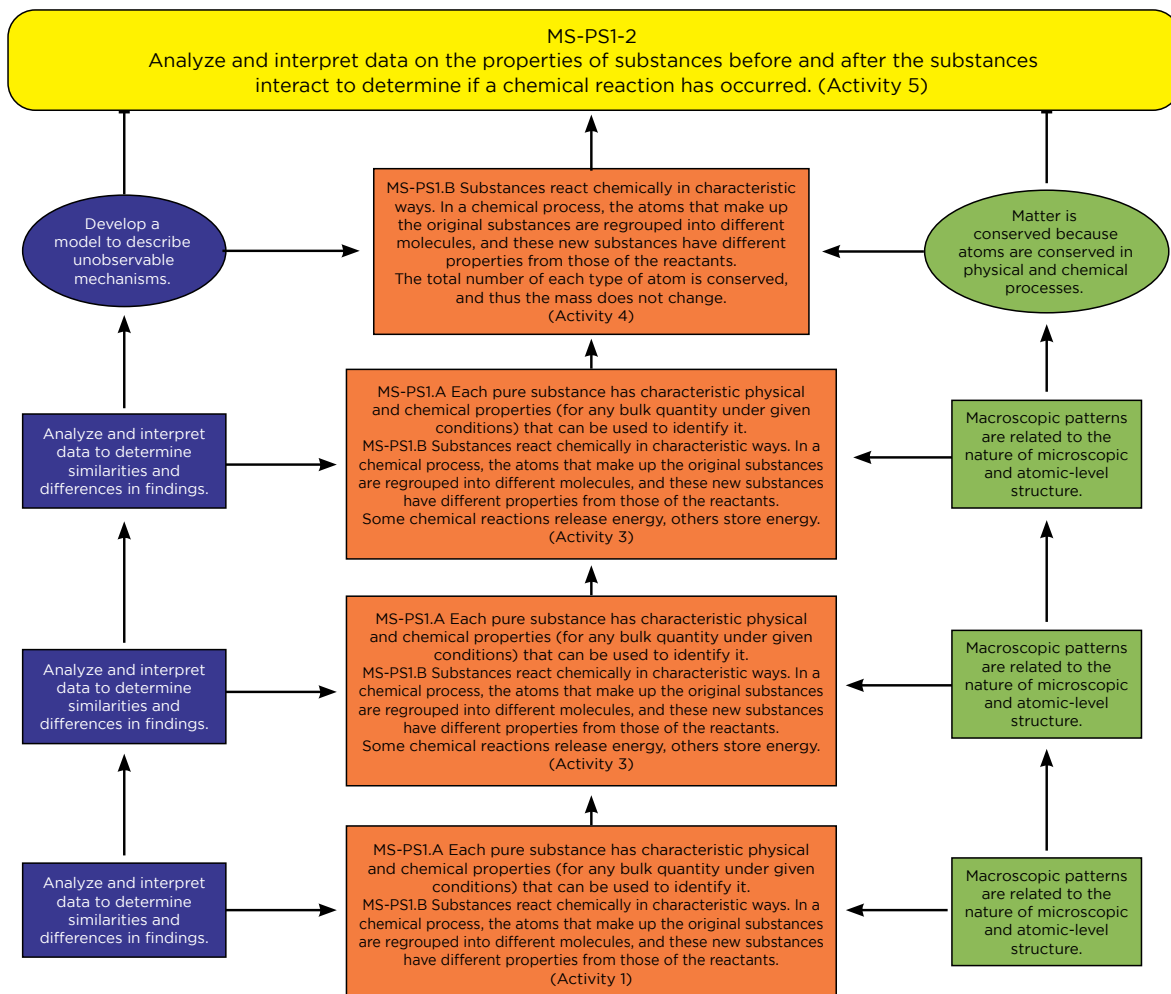
2. (ARG QUICK CHECK) **Revisit the issue:** How would you explain what has happened to the river in Boomtown between now and the last time Jayden’s grandmother visited it several years ago?

All Quick Checks (and some other embedded assessments) are intended to be formative in nature, as they generally appear before students have had sufficient opportunity to master a concept.

ASSESSMENT AND LEARNING PATHWAYS

As noted in **2 - Curriculum Design for NGSS**, each unit includes a series of Learning Pathways that prepare students to succeed in regard to specific NGSS performance expectations. Each instructional sequence ends with a summative assessment of the performance expectation identified in the Learning Pathway. Along the way, there are numerous opportunities for teachers to formatively assess students’ use of the related SEPs, CCCs, and DCIs.

The diagram below shows part of a Learning Pathway for the NGSS MS-PS1-2: “Analyze and interpret data on the properties of substances before and after the substances interact to determine if a chemical reaction has occurred.”



This pathway shows a linear sequence of activities leading to the summative assessment for the performance expectation, shown in the yellow shape. (*Note:* Not all Learning Pathways follow a linear sequence like this one.) In this example, students are assessed with the ANALYZING AND INTERPRETING DATA (AID) Scoring Guide. They encounter three-dimensional instruction for the performance expectation in Activities 1–3, and related instruction in Activity 4. Formative assessments in the form of Analysis items are given in Activities 2 and 4. Once students reach the activity represented at the top of the diagram (Activity 5), they are given a three-dimensional summative assessment on the performance expectation.

Each assessment along the pathway is indicated on the Assessment Blueprint found in the Teacher Edition. This information can help a teacher plan for assessment by providing a clear overview of the opportunities to assess students' knowledge and their ability to see patterns before students get to the final three-dimensional assessment of the performance expectation. In the MS-PS1-2 pathway above, an example of students *analyzing and interpreting data* would be students analyzing lab data and identifying evidence of a chemical reaction in advance of the culminating assessment.

Below is an example of a three-dimensional assessment question for this pathway, which will be scored using the ANALYZING AND INTERPRETING DATA (AID) Scoring Guide. In this Analysis item, students use the SEP of *analyzing data* and the CCC of finding *patterns* in data to show their understanding of the DCIs about the properties of substances before and after they interact. To support this performance expectation, a similar question can be found in the unit's item bank.

Analysis Item 3 from Activity 5 of CHEMICAL REACTIONS

3. A student begins with Substance A, which is a white solid. The solid is in the form of hard pebble-like chips. The chips do not dissolve in water. They have a density of 2.71 grams per cubic centimeter (g/cm^3).
The student mixes Substance A with hydrochloric acid. The mixture bubbles, and the white solid disappears. The student allows all the liquid to evaporate and is left with Substance B. Substance B is a solid white powder. It has a density of 2.15 g/cm^3 . Substance B dissolves in water. Substance B does not bubble if mixed with hydrochloric acid.
 - a. Prepare a data table to show the properties of Substances A and B.
 - b. Did a chemical reaction take place when Substance A was mixed with hydrochloric acid? Explain your answer based on your analysis of the data collected about Substances A and B.
 - c. Explain what happened to Substance A and hydrochloric acid at the atomic/molecular level. Your response can be a general description; it does not need to include molecular formulas or drawings.

Item Bank Question 15 from CHEMICAL REACTIONS

15. A scientist mixes Substance A with water and Substance B with water. Then she mixes the solutions of Substance A and B. A solid precipitate forms. The scientist wants to know whether the solid precipitate is evidence that a reaction took place. The properties of Substance A, B, and the precipitate are shown below.

Substance	Appearance	Dissolves in water?	Melting point (°C)	Density (g/cm ³)
A	White solid	Yes	1,000	2.5
B	Blue-green solid	Yes	500	3.4
Precipitate	Blue-green solid	No	300	3.3

Did a chemical reaction take place? Explain your answer.

USING THE SEPUP SCORING GUIDES

The SEPUP Assessment System is designed to track students' progress over the course of several units. The focus during the school year should be on progress, and each student's goal should be to improve with each subsequent assessment. Students' comfort with the System will evolve through the year, and they will gradually understand its value in improving the quality of their work.

SETTING CRITERIA

Before using a Scoring Guide, teachers must make sure that the criteria for each scoring level are clear to themselves and their students and that everyone understands the distinctions between levels.

Teachers' expectations for each score level should remain consistent over the course of the school year. By maintaining the integrity of their scoring, teachers help both low- and high-performing students improve the quality of their work. For most students, achieving consistent improvement of one level or more in an assessment area over the course of a unit is an indicator of academic progress. As students gain experience with the System and the Scoring Guides, they develop the ability to evaluate their own work and take on more ownership of their own learning.

SCORING STUDENT RESPONSES

Before reading students' responses, teachers may find it helpful to construct sample responses for Levels 1–4 (similar to the ones shown in Exemplar Student Responses [Levels 1–4] below) in addition to reviewing the Level 4 sample student response provided in the Teacher Edition.

While developing these sample responses and during scoring, teachers should focus on the actual requirements of the assessment task. For example, a student response related to the Constructing Explanations variable may demonstrate complete and correct understanding of the concept but include misspellings and poor grammar. Since the CONSTRUCTING EXPLANATIONS (EXP) Scoring Guide does not include criteria for grammar, those mistakes should not lower the student's score. Instead, a teacher could choose to additionally apply the COMMUNICATING CONCEPTS AND IDEAS (COM) Scoring Guide to provide a second score that assesses grammar or organization.

Initially, it is not reasonable to expect students to perform at Levels 3 and 4. The targets for a score may vary over the course of a unit and a school year. Likewise, it is not always useful to use students' work to set the standards for each scoring level. For example, the best student response should not automatically be given a score of 4.
