Equity in three-dimensional science assessments

EQUITY SENSE-MAKING

Ensuring that all students have the opportunity to learn and be part of scientific endeavors is one of the primary goals of *A Framework for K-12 Science Education* and all standards based on it, such as the Next Generation Science Standards (NGSS). While this has become a clear focus for three-dimensional teaching and learning, the role of assessments in ensuring equity in science education has been less clear. Limiting bias and attending to accessibility are critical and often prioritized first steps, but is this enough? By examining a wide range of tasks for how diverse learners can demonstrate progress, the Task Annotation Project in Science (TAPS) surfaced key ways science assessments can help make sure all students are supported in meeting their science learning goals.

How science assessments can be more equitable?

✓ Assessments should be relevant, authentic, and meaningful to students.

Supporting all learners, and particularly those who have traditionally been left out of science, means assessments must reveal student thinking from a wide range of students. To do so, tasks must be compelling to the students engaging in the assessment. This means assessments should:

- Be built around relevant and engaging phenomena and problems;
- Attend to the specific ideas, cultural and linguistic backgrounds, and experiences of students; and
- Value these funds of knowledge as assets to be leveraged rather than barriers to be broken.

If students are not motivated to engage in a task, they will not demonstrate their best thinking. This creates flawed feedback loops that can prevent educators from supporting all students' science learning. For more information about how to support specific groups of diverse learners, see Appendix D of the NGSS and the associated case studies.

✓ Assessments can be empowering.

Tasks that provide students with 1) choices about how to engage and what ideas to bring to the table, 2) opportunities to actively monitor their own progress, and 3) authentically apply their understanding of science and engineering practices, core ideas, and crosscutting concepts to figure out something that matters to them, can build student confidence and interest in science. Classroom-based assessment experiences in particular can be powerful mechanisms to build student agency and identity as scientists and engineers.

✓ Assessments must allow students to make their thinking visible.

The foundation of three-dimensional science standards is using evidence and scientific reasoning to make sense of the world. Assessments designed to monitor student progress toward these standards must provide all students with ways to show how their thinking is progressing. This means both giving students multiple ways to demonstrate learning that intentionally reveal facets of students' current understanding, as well as ensuring that student responses are interpreted (through both formal and informal feedback mechanisms) in culturally responsive ways.

Task features that promote equity also elicit better evidence of whether students can make sense of the world using the three dimensions.

Implications for educators and developers:

Educators should ensure that assessments are fair and equitable to all students in their classroom, paying close attention to those students who traditionally may not see science as a space in which they are important contributors. In the classroom, assessments can be tailored to the specific interests, backgrounds, ideas, and needs of a particular class of students (e.g., using a local community-based phenomenon; providing options for students to make their thinking visible through drawings and discourse). Educators can also leverage students' experiences and cultural backgrounds when interpreting student responses and providing feedback.

Developers should emphasize assessment opportunities (including feedback on progress) that are meaningful, authentic, and designed to support all students' progress; attend to research about what matters to diverse learners; ensure that assessments are fair relative to what students should have experienced in the classroom; focus on asking students to make their thinking visible as they address phenomena and problems that matter to them.

Features that promote equity in science assessments

Equitable science assessments…

- ✓ Provide students with tasks that are **relevant** to them—to their own interests and lives, or that are globally or universally meaningful.
- ✓ Encourage and support **multiple ways of knowing** as avenues to success.
- ✓ Include appropriate **scaffolds, on-ramps, and cues** that help all students connect to the task and engage in sense-making.
- ✓ Are **coherent and understandable** to all students engaging with the task.
- ✓ **Respect and advantage students' cultural and linguistic backgrounds**.
- ✓ Use **accessible language** and provide **multiple ways for students to make facets of their thinking visible,** so that all learners can demonstrate progress.
- ✓ **Cultivate students' interest in and confidence with science** by valuing students own ideas as part of the task through connections to lived and classroom experiences; providing opportunities for choices and decision-making; and opportunities for peer- and self-reflection.
- ✓ Ask students to engage in tasks for which their **learning experiences have prepared them.**
- ✓ Provide students with opportunities to **monitor and recognize their own progress.**

	Assessments should look less like…	Assessments hould look more like…
MEANINGFUL	Generic tasks that have no authentic purpose, and/or are disconnected from the lives and experiences of the students engaging in the task.	Tasks that authentically connect to students' experiences and ideas, including those that have been cultivated through common learning experiences as well as those grounded in students' cultural and linguistic backgrounds.
EMPOWERING	Tasks designed to be punitive or prevent students who do not have a fully developed understanding of the targeted material from engaging with the task.	Tasks that value student ideas; provide students with choices about which evidence to use and how to go about addressing a phenomenon or problem; and provide real opportunities for students to figure out something that matters to them.
ACCESSIBLE	Tasks that are heavily reliant on vocabulary and well-developed complex English language skills (including reading and writing); tasks that are confusing or difficult to understand.	Tasks that use easy-to-understand words, sentence structure, and scaffolding. They provide several modalities for both learners across the performance spectrum to make their thinking visible through written language, drawings, verbal responses/ discourse, etc.
FAIR	Tasks that require students to be familiar with ideas, facts, or procedures that are outside the expected learning experiences.	Tasks that students have had sufficient learning experiences to participate in fully, and include feedback that accounts for the multiple ways of knowing that students may be leveraging.

For more resources to support more equitable science teaching, learning, and assessment, explore Appendix D of the NGSS and these resources at STEM teaching tools.