Equitable and Accessible Science Instruction for All

BACKGROUND

What is equitable and accessible science instruction for all and how does it help students?

"Science learning is a right of all individuals and must be accessible to all students in equitable ways. Independent of grade level, geography, gender, economic status, cultural background, or any other demographic descriptor, all K–12 students are capable of science learning and science literacy. Science learning is most equitable when students have agency and can engage in practices of science and sense-making for themselves, under the guidance and mentoring of an effective teacher and within an environment that puts student experience and identity at the center of instruction. Moreover, all students are capable learners of science, and all grades and classes should provide authentic, developmentally appropriate science instruction" (SEEd Standards, Utah State Board of Education, 2018, p. 10). Educational equity also requires the valuing and respect of the linguistic, cultural, and cognitive diversity our students bring to the classroom along with instructional, classroom, and systemic supports for learning (Lee, 2005).

Why is equitable and accessible science instruction important to three-dimensional science instruction?

"Learning science depends not only on the accumulation of facts and concepts but also on the development of an identity as a competent learner of science with motivation and interest to learn more," (NRC, 2012. p. 286). Attending to equity ensures that all students have access to and support in rigorous science courses. "Instruction that builds on prior interest and identity is likely to be as important as instruction that builds on knowledge alone... the benefits are particularly salient for those who would feel disenfranchised or disconnected from science should instruction neglect their personal inclinations," (NRC, 2012. p. 286).

CLASSROOM APPLICATION

When observing a classroom in which the instruction is equitable, the following **student actions** should be visible:

- All students actively engage in Science and Engineering Practices (SEPs).
- Students have the necessary materials to gather data and make sense of phenomena.
- Students have choice in how they present data and explanations/models.
- Students are using language and content scaffolds to support student discourse.
- All students are making connections to home, family, and community.

To support instruction that is *equitable*, **teachers plan** by using inclusive instruction that:

- Builds on and leverages students' prior interest and identity (pre-assessment).
- Uses culturally-relevant phenomena to drive instruction.
- Provides learning opportunities that support all ability levels.
- Creates collaborative learning opportunities for all students.
- Attends to the intensive language demands of 3D science and literacy-laden practices (ie. developing and using models, constructing explanations, arguing from evidence, etc.).
- Recognizes that student competency of science concepts is not based on their academic vocabulary.
- Creates a safe and supportive culture by valuing multiple modes of expression and making diversity visible in authentic ways without using "token" representation.

IMPLEMENTATION RUBRIC

Basic	Emerging	Effective	Exceptional
Teachers provide one type of instructional method and/or limits opportunities for students with varying abilities.	Teachers provide some variety in instructional methods which provide limited supports for linguistically, culturally, and cognitively diverse students.	Teachers use a variety of instructional methods and phenomena for linguistically, culturally, and cognitively diverse students that support student choice and voice.	In addition to demonstrating effective criteria, teachers also use culturally relevant phenomena, ensure diverse representation is authentic, and allow for student choice and voice as much as possible.

RESOURCES

A Framework for K-12 Science Education: Practices, Crosscutting Concepts, and Core Ideas (Chapter 11)

Brown, B. A. (2020). Science in the city: Culturally relevant STEM education. Harvard Education Press.

Socioeconomic Gaps in Science Achievement Article from International Journal of STEM Education

STEM Teaching Tool #15: How can we promote equity in science education?

STEM Teaching Tool #25: How can formative assessment support culturally responsive argumentation in a classroom community?

STEM Teaching Tool #59: Creating science learning experiences that support learners receiving special education services

STEM Teaching Tool #71: How can you advance equity and justice through science teaching?

STEM Teaching Tool #88: Fostering meaningful conversations about equity grounded in teacher practice

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