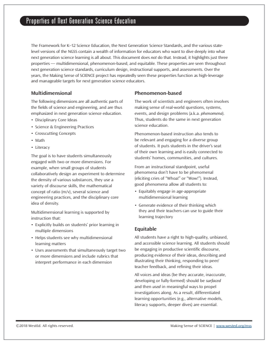
Properties of Next Generation Science Education

Making Sense of SCIENCE

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Kirsten R. Daehler and Jennifer Folsom

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RECOMMENDED CITATION:

Daehler, K., and Folsom, J. (2016). Making Sense of SCIENCE: Phenomena-Based Learning. Retrieved from: http://www.WestEd.org/mss

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The Framework for K–12 Science Education, the Next Generation Science Standards, and the various state-level versions of the NGSS contain a wealth of information for educators who want to dive deeply into what next generation science learning is all about. This document does *not* do that. Instead, it highlights just three properties — multidimensional, phenomenon-based, and equitable. These properties are seen throughout next generation science standards, curriculum design, instructional supports, and assessments. Over the years, the Making Sense of SCIENCE project has repeatedly seen these properties function as high-leverage and manageable targets for next generation science educators.

Multidimensional

The following dimensions are all authentic parts of the fields of science and engineering, and are thus emphasized in next generation science education.

- Disciplinary Core Ideas
- Science & Engineering Practices
- Crosscutting Concepts
- Math
- Literacy

The goal is to have students simultaneously engaged with two or more dimensions. For example, when small groups of students collaboratively design an experiment to determine the density of various substances, they use a variety of discourse skills, the mathematical concept of ratio (m/v), several science and engineering practices, and the disciplinary core idea of density.

Multidimensional learning is supported by instruction that:

- Explicitly builds on students' prior learning in multiple dimensions
- Helps students see why multidimensional learning matters
- Uses assessments that simultaneously target two or more dimensions and include rubrics that interpret performance in each dimension

Phenomenon-based

The work of scientists and engineers often involves making sense of real-world questions, systems, events, and design problems (a.k.a. *phenomena*). Thus, students do the same in next generation science education.

Phenomenon-based instruction also tends to be relevant and engaging for a diverse group of students. It puts students in the driver's seat of their own learning and is easily connected to students' homes, communities, and cultures.

From an instructional standpoint, useful phenomena don't have to be phenomenal (eliciting cries of "Whoa!" or "Wow!"). Instead, good phenomena allow all students to:

- Equitably engage in age-appropriate multidimensional learning
- Generate evidence of their thinking which they and their teachers can use to guide their learning trajectory

Equitable

All students have a right to high-quality, unbiased, and accessible science learning. All students should be engaging in productive scientific discourse, producing evidence of their ideas, describing and illustrating their thinking, responding to peer/teacher feedback, and refining their ideas.

All voices and ideas (be they accurate, inaccurate, developing or fully-formed) should be *surfaced* and then *used* in meaningful ways to propel investigations along. As a result, differentiated learning opportunities (e.g., alternative models, literacy supports, deeper dives) are essential.