## Innovation 1: Making Sense of Phenomena & Designing Solutions to Problems

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| **Summary** | Making sense of phenomena or designing solutions to problems drives student learning. |

From the *Framework*:

The learning experiences provided for students should engage them with fundamental questions about the world and how scientists have investigated and found answers to those questions.

Making sense of phenomena and designing solutions to problems are central to the work of scientists and engineers, and the *Framework* and the NGSS make that work central to student learning as well. This is more than an occasional engagement strategy that hooks students in with an exciting event or concludes with a fun building project after they have already learned the science they need to know. By centering instruction on the goal of students making sense of phenomena and designing solutions to problems, students have a reason to learn beyond acquiring information they are told they will later need. The focus of learning shifts from *learning* *about a topic* to *figuring out* *why or how something happens*. Making sense of phenomena and designing solutions to problems allows students to build science ideas through their application to understanding phenomena in the real world. This leads to deeper and more transferable knowledge and moves us closer to the vision of the *Framework*.

Students making sense of phenomena and designing solutions to problems are not entirely new processes for instructional materials, but the way that they are used in materials designed for the NGSS represents an innovation in teaching and learning. Making sense of phenomena and designing solutions to problems should be more than just instructional techniques to engage students, extensions, or sidebars—they are *central to the student learning experience.* In instructional materials programs designed for the NGSS, this should be obvious in the organization and flow of learning in student materials and a clear focus of the teacher supports for instruction and monitoring student learning. (See Table 1 for additional ways that making sense of phenomena and designing solutions to problems are different in the NGSS.) This focus should be clear in a quick scan through instructional materials designed for the NGSS and, after a closer look, central to student learning within lessons and units and coordinated over the whole program in a way that is coherent for both students and teachers.

For more resources on how making sense of phenomena and designing solutions to problems are important for teaching and learning designed for the NGSS, visit <https://www.nextgenscience.org/resources/phenomena>.

Table 1 Innovation 1: Making Sense of Phenomena & Designing Solutions to Problems

Instructional materials programs designed for the NGSS include:

| **Less** | **More** |
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| Focus on delivering disciplinary core ideas to students, neatly organized by related content topics; Making sense of phenomena and designing solutions to problems are used occasionally as engagement strategies, but are not a central part of student learning. | Engaging all students with phenomena or problems that are meaningful and relevant; that have intentional access points and supports for all students; and that can be explained or solved through the application of targeted grade-appropriate SEPs, CCCs, and DCIs as the central component of learning. |
| Making sense of phenomena and designing solutions to problems separated from learning (e.g., used only as an engagement tool to introduce the learning, only loosely connected to a disciplinary core idea, or used as an end of unit or enrichment activity). | Students using appropriate SEPs and CCCs (such as systems thinking and modeling) to make sense of phenomena and/or to design solutions to give a context and need for the ideas to be learned. |
| Instructions for students to “design solutions” as a step-by-step directions-following exercise. | Students learning aspects of how to design solutions while engaged in the design process. |
| Only talking or reading about phenomena or how other scientists and engineers engaged with phenomena and problems.  | Students experiencing phenomena directly or through rich multimedia. |
| Leading students to just getting the “right” answer when making sense of phenomena. | Using student sense-making and solution-designing as a context for student learning and a window into student understanding of all three dimensions of the standards.  |