## Innovation 4: Alignment with English Language Arts and Mathematics

|  |  |
| --- | --- |
| **Summary** | Students engage in learning experiences with explicit connections to and alignment with English language arts (ELA) and mathematics. |

From the *Framework*:

…achieving coherence within the system is critical for ensuring an effective science education for all students. An important aspect of coherence is continuity across different subjects within a grade or grade band. By this we mean “sensible connections and coordination [among] the topics that students study in each subject within a grade and as they advance through the grades” [3, p. 298]. The underlying argument is that coherence across subject areas contributes to increased student learning because it provides opportunities for reinforcement and additional uses of practices in each area. (A Framework for K–12 Science Education, 2012)

This degree of connection across content areas is a significant innovation in the NGSS. As is highlighted in [Appendix L](http://nextgenscience.org/sites/default/files/Appendix-L_CCSS%20Math%20Connections%2006_03_13.pdf) and [Appendix M](http://nextgenscience.org/sites/default/files/Appendix%20M%20Connections%20to%20the%20CCSS%20for%20Literacy_061213.pdf), the NGSS went to great lengths to ensure that the English language arts and mathematics expectations of students were grade-appropriate. The NGSS not only provide for coherence in science teaching and learning but also provide explicit connections with mathematics and ELA. The process of developing the standards also helped to highlight the many overlaps in the mathematics, ELA, and science practices. As the NGSS were being drafted, the writers ensured alignment to and identified some possible connections with the Common Core State Standards for English Language Arts in Science and Technical Subjects and Mathematics as an example of ways to connect the three subjects. In instruction within the science classroom, mathematical and literacy skills can be applied and enhanced to provide a symbiotic pace of learning in all content areas.

Instructional materials designed for the NGSS will highlight and support teachers in making connections between science, mathematics, and ELA. Grade-appropriate and substantive overlapping of skills and knowledge helps provide all students equitable access to the learning standards for science, mathematics, and ELA (e.g., see [NGSS Appendix D Case Study 4](http://www.nextgenscience.org/sites/ngss/files/%284%29%20Case%20Study%20ELL%206-14-13.pdf): English Language Learners). For examples of NGSS Innovation 4: Alignment with English language arts and Mathematics, see Table 5.

Table 5: NGSS Innovation 4: Alignment with ELA and Mathematics

*High quality instructional materials programs designed for the NGSS include:*

| **Less** | **More** |
| --- | --- |
| Providing siloed or disparate science knowledge that students learn in discipline-specific courses in isolation from reading, writing, and arithmetic—the historical “basic” knowledge. | Engaging all students in science learning experiences that explicitly and intentionally connect to mathematics and ELA learning in meaningful, real-world, grade-appropriate, and substantive ways and that build broad and deep conceptual understanding in all three subject areas. |