

EXECUTIVE SUMMARY

Making Middle School Science Whole

Transitioning to an Integrated Approach to Science Instruction



NGSS Early Implementers Initiative: Bringing science to life as a core subject in K–8 classrooms

A diverse group of eight California school districts and two charter management organizations is actively implementing Next Generation Science Standards in grades K–8. These NGSS Early Implementers are supported by the K–12 Alliance at WestEd, and work in partnership with the California Department of Education, the California State Board of Education, and Achieve. The S. D. Bechtel, Jr. Foundation commissions WestEd’s STEM Evaluation Unit independently of the K–12 Alliance to evaluate the Initiative in the eight public school districts. This document summarizes the content and findings of the fifth evaluation report in the Initiative series, published in October 2018. Access the complete series and learn more at K12alliance.org.

The Case for Integration

The world around us is integrated. Fully understanding it therefore requires the application of multiple science disciplines. For years, middle school science courses in the United States have been configured to focus predominantly on one science discipline per grade (a discipline-specific model) — typically Earth science in grade 6, life science in grade 7, and physical science in grade 8. This discipline-specific approach exposes students to pieces of science in isolation and often leaves them unable to connect these fragments into a holistic understanding of science phenomena.

The Next Generation Science Standards (NGSS) advocate an integrated model of science instruction for middle schools in which the science disciplines are connected rather than separate. This model, used by other countries that are consistently successful in science, has several key benefits, including enhanced student learning and better preparation for the new California Science Test (CAST).

The California Board of Education voted in 2013 to make integrated science the state’s “preferred” model. The K–8 NGSS Early Implementers Initiative was designed to support middle school science teachers and their administrators in integrating the sciences. From the start of the Initiative, all participating districts adopted the state’s integrated science model. This fifth Early

Implementer evaluation report examines how schools and districts in the Initiative are negotiating the transition to the integrated science model. The report draws on substantial data collected from teachers, administrators, and Initiative leaders through surveys, interviews, and classroom observations. This report also provides two detailed examples of integrated instruction through vignettes of classroom observations conducted in grades 6 and 8.

The Transition Takes Time and Planning

District progress varies. No district or school can switch entirely from a discipline-specific model to the integrated model in a single year. Most Early Implementer districts have detailed plans for making the switch to the integrated model, but their progress in executing them varies. After four years in the Initiative, some districts report being “very far along,” with all teachers in the district on board and implementing mostly integrated instruction. Others, however, report less consistent progress, with teachers distributed across stages of integration, from coordinated but still discipline-specific science instruction, to a partially integrated approach, to the fully integrated model.

Professional learning is helping participants integrate the sciences. The Initiative is supporting the transition in ways that have fostered understanding and planning at the district level and helped teachers integrate science instruction in the classroom. For instance, Teacher Leaders have experienced planning and teaching integrated lessons through two of the Initiative's main professional learning components: Summer Institutes and district-based lesson studies during the school year.

Participants receiving extensive professional learning from the Initiative reported having a better understanding of integration than the "expansion" teachers and principals (i.e., those who have not participated in the Initiative's professional learning):

- 100 percent of surveyed administrators on the Core Leadership Team reported understanding "how to address more than one science discipline in a science unit"; a smaller proportion of the site principals not receiving training reported understanding integration.
- 89 percent of Teacher Leaders in grades 6–8 indicated understanding "fairly well" or "thoroughly" how to integrate multiple science disciplines in instruction; fewer expansion teachers indicated these levels of understanding.

Challenges to Integration

Not all lessons lend themselves equally well to authentic integration. A core strategy for helping Early Implementer teachers shift to NGSS involves focusing instruction on real-world phenomena that authentically draw on more than one science discipline. While evaluators and Initiative leaders and administrators have noticed a shift toward integrated teaching and learning based on real-world phenomena, Teachers Leaders report that not all individual lessons, or in some cases, units, fully lend themselves to authentic integration. In these instances, they recognize that integration between only two rather than all three science disciplines may be all that is possible.

Classroom configuration impacts science integration.

While Teacher Leaders reported they generally have been transitioning to integrated science instruction over the last two years, there has been notably less movement in grade 6. At this grade level, many teachers are in self-contained classes in which they teach all subjects, or block-type classrooms in which they teach other subjects alongside science. Classroom configuration was found to strongly correlate with teacher understanding of how to integrate multiple science disciplines in instruction. For instance, a majority of expansion teachers teaching multiple science-only classes felt they understood integrated science

instruction "fairly well" or "thoroughly." A majority of those in the other types of classroom configurations (i.e., block and self-contained) felt that they understood it "poorly."

Overcoming Obstacles

While Early Implementer districts have made progress toward implementing the preferred integrated model, some challenges have impeded complete success. For instance, substantial collaborative planning, especially between the middle grades, is crucial to ensure vertical alignment with what is taught at each grade so that students move on to high school without gaps in coursework. Teachers also face significant challenges, including having to teach new or less familiar science content, and having to let go of content and lessons that they have emotional connections to after having taught them for years.

Recommendations for Administrators

The report includes ways administrators can support the transition to integrated science instruction:

- Gain a basic understanding of integration
- Advocate for science integration
- Develop a multi-year transition plan
- Provide professional development
- Do not count on seeing integrated instruction in a single class observation
- Provide time, circumstances, and the expectation for substantial collaboration
- Provide time both to create model instructional units and to become familiar with, evaluate, and adapt any new materials
- Facilitate the shifting of supplies, facilities, and equipment, if needed
- Shift all classes to science-only courses with science teachers



Read the full report, access other evaluation reports and resources, and learn from NGSS Early Implementers at [K12alliance.org](https://www.k12alliance.org).