NEXT GENERATION SCIENCE STANDARDS

Changes in Science for Teachers: CCSS, STEM, and NGSS

Introduction

This guide explores the shifts in science education that have resulted from the development of the Common Core State Standards (CCSS), Science, Technology, Engineering, and Mathematics (STEM), and the Next Generation Science Standards (NGSS). These initiatives will prepare students for college and career readiness.

Common Core State Standards

The CCSS for English Language Arts and Literacy in History/Social Studies, Science, and Technical Subjects identify the literacy skills required for college and career readiness. The CCSS call for scientific investigations that promote reading to learn and reflective writing. Students must assess reasoning, evaluate data, construct arguments, and cite evidence.

For example, in the course of a nature investigation, students may write descriptions about their discoveries. They can develop conceptual understanding by reading articles or stories about nature.

COMMON CORE
STATE STANDARDS INITIATIVE
PREPARING AMERICA'S STUDENTS FOR COLLEGE & CAREER

Science, Technology, Engineering, and Mathematics

The US Government developed the STEM initiative to raise awareness of the importance of STEM fields in the global economy. Encouraging these fields of study through authentic, real-world application promotes student interest and understanding in all subjects. Students can apply science and math learning as they engage with engineering and technology tasks. For example, consider asking your students to engineer a new shoe tread. The students would learn science concepts—such as friction, using computers to create designs, and using mathematics and graphing—to explore the mathematical relationships among surface area, friction, and mass.

SCIENCE | TECHNOLOGY | ENGINEERING | MATHEMATICS

Next Generation Science Standards

The NGSS create a set of rich science learning expectations that develop and deepen over time. Students learn how science and engineering pertain to real-world problems, which prepares them for college and careers.

The standards shift the science classroom from brief coverage of many topics to deep understanding of key ideas. To achieve this, the NGSS framework is based on three interrelated dimensions: scientific and engineering practices, crosscutting concepts, and disciplinary core ideas.

Science and Engineering Practices

Science and engineering practices include asking questions, defining problems, developing models, interpreting data, constructing explanations, and engaging in argument based on evidence.

The purpose of these practices is to establish and apply behaviors of scientists and practices of engineers, thus extending the driving purpose of scientific inquiry and engineering design.

Emphasizing the relevance of the STEM fields helps students see how scientists and engineers solve challenges in society. This understanding encourages students to make connections between scientific concepts and everyday life.

Crosscutting Concepts

Crosscutting concepts are ideas that span across all sciences and engineering. Some examples include patterns, cause and effect, scale, system models, cycles, stability, and change.

These concepts—as developed in the framework—provide explicit instructional support to connect their knowledge across science fields and contexts. Highlighting the connections across science disciplines adds relevance to what students learn in the classroom. Crosscutting concepts help you reinforce those connections and gives students a deeper understanding of the world around them.

Disciplinary Core Ideas

The NGSS identify disciplinary core ideas and make explicit how science and engineering practices and crosscutting concepts relate to those ideas.

Disciplinary core ideas unite the K–12 science curriculum across four domains: the physical sciences; the life sciences; the earth and space sciences; and engineering, technology, and applications of science.

Although the topics of the core ideas remain constant, the ideas themselves expand and deepen from year to year. Performance expectations explicitly outline what your students should know and be

able to do at each step. The focused structure of the disciplinary core ideas allows students to build their own authentic understanding of science concepts from beginning to end.

Review

This guide explained the shifts in science education that have resulted from the development of the CCSS, STEM, and the NGSS.

These changes underscore the importance of your role in preparing the next generation of engaged citizens. By fostering students' love for and wonder of science, you can help develop their scientific abilities within the walls of school and as lifelong learners.