



Student Use of Technology in Science Units and Lessons

Students should be provided regular opportunities to use technology to engage with the Science and Engineering Practices.

Asking questions and defining problems: Curiosity requires no technology, but technology allows students to share questions more easily through online discussions or question-voting systems (where students use online tools to vote on questions they want to explore).

Developing and using models: Students can use tools such as NetLogo, StarLogo, spreadsheets, and other tools to develop computer models. Other software exists to help visually represent conceptual models such as concept maps. While hand-drawn models and diagrams are valuable, their digital counterparts are extremely easy to archive and revise. The ease of revision allows a shift from the initial model development to the process of progressive model refinement.

Planning and carrying out investigations: Simulations allow students to investigate processes on size and time scales that are not possible with direct investigation in the classroom. Students can take virtual fieldtrips using Google Earth or collect measurements from satellite data. Technology has even transformed hands-on labs through tools such as probeware that acquire real-time data that is more accurate than traditional analog methods.

Analyzing and interpreting data: Digital technology allows students to bring data together for collaborative analysis. For example, students can enter data into a collaborative online spreadsheet and see how their findings compare to classmates'. Computer tools also allow students to visualize and analyze vast quantities of digital data.

Using mathematics and computational thinking: Students can rapidly visualize their mathematical thinking by plotting data, adding trend lines, and calculating experimental error rapidly using spreadsheets and other tools. This allows teachers to shift the focus from the mechanics of mathematical thinking to its applications. Ultimately, the intuition developed from applying mathematics will motivate students when it comes time to build mathematical skills.

Constructing explanations: Computer media allows students to more easily integrate a range of evidence into their explanations. They can insert photos, videos, and diagrams to illustrate different aspects of phenomena and their explanations.

Designing solutions: Computers allow for rapid prototyping as students create digital prototypes in computer modeling environments or using 3-D printers.



Engaging in argument from evidence: Communications technology allows for students to get more practice with argumentation. Online discussion tools allow students to engage in pair or small group discussions while still allowing a teacher to monitor all the classroom discussions (something not possible while circulating around a classroom in person).

Obtaining, evaluating, and communicating information: Technology enhances all aspects of information sharing, including student-student, teacher-student, student-teacher, and student-scientist. Students can use a full range of new media to communicate their solutions, including video, presentations, infographics, and interactive websites. The internet also provides students access to previous solutions to problems, and students need digital literacy skills to find and evaluate this flood of information. Twenty-first century communication tools are inherently participatory, meaning that students are more likely to be engaged in posting comments that evaluate information than simply being producers or consumers of media.

Disclaimer: The New Jersey Department of Education neither promotes nor endorses educational products. The names of specific tools and resources in this document are for informational purposes only.

Credit: California Science Framework. (Pre-publication edition). [Chapter 11: Instructional Strategies for the Next Generation Science Standards for California Public Schools, Kindergarten through Grade Twelve Teaching and Learning in the 21st Century.](#)