Quality Science Education and 21st-Century Skills

Introduction

Rapid changes in the world—including technological advancement, scientific innovation, increased globalization, shifting workforce demands, and pressures of economic competitiveness—are redefining the broad skill sets that students need to be adequately prepared to participate in and contribute to today's society (Levy and Murnane 2005; Stewart 2010; Wilmarth 2010). NSTA acknowledges the need for and importance of 21st-century skills within the context of science education and advocates for the science education community to support 21st-century skills consistent with best practices across a preK–16 science education system.

National organizations, including the Partnership for 21st Century Skills (P21) and the National Research Council (NRC), have sought to identify and define 21st-century skills, explore their integration within the education system, and address the intersection of 21st-century skills and the teaching of core disciplines (P21 December 2009; NRC 2010). For the purposes of this statement, NSTA references and supports definitions of 21st-century skills provided by both P21 and NRC, which have different emphases but collectively encompass core subject knowledge; learning and innovation skills; information, media, and technology skills; life and career skills; adaptability; complex communication/social skills; nonroutine problem solving; self-management/self-development; and systems thinking.

One could argue that 21st-century skills have always been important. There is now a need, however, for these skills to be possessed by the majority of the population. As a result, these skills should receive priority in today's education system (NRC 2010, Bybee 2010a). The growing base of human knowledge—and the need to understand and use modern tools for communicating and sharing what is learned—further increases the imperativeness for these skills.

NSTA recognizes the inherent and strong connection of many 21st-century skills with science education. Consider, for example, the goals of each: Science education reform focuses on fostering deep content knowledge through active intellectual engagement and emulating disciplinary practices and thinking, and 21st-century skills focus on developing broadly applicable capacities, habits of mind, and preparing knowledge workers for a new economy (Windschitl 2009). Exemplary science education can offer a rich context for developing many 21st-century skills, such as critical thinking, problem solving, and information literacy especially when instruction addresses the nature of science and promotes use of science practices. These skills not only contribute to the development of a well-prepared workforce of the future but also give individuals life skills that help them succeed. Through quality science education, we can support and advance relevant 21st-century skills, while enhancing science practice through

infusion of these skills. It is essential, however, that quality science education is not diminished in support of 21st-century skills.

The following declarations are in concert with other position statements published by NSTA that outline goals for quality science education.

Declarations

NSTA recommends that the science education community support 21st-century skills consistent with best practices across a science education system, including curriculum, pedagogy, science teacher preparation, and teacher professional development (NRC 1996). It further proposes that quality science education and 21st-century skills support each other when

- science leaders cultivate 21st-century skills that best align to good science teaching;
- science instruction aligns with the *National Science Education Standards, Benchmarks for Science Literacy, Science Framework for the 2011 National Assessment of Educational Progress,* and *Science College Board Standards for College Success;*
- students meet the standards for scientific inquiry and technological design (NSTA 2004);
- students have a complete, accurate, and working understanding of the nature of science (NSTA 2000);
- ongoing professional development opportunities and effective preservice and induction programs for science educators support the integration of 21st-century skills in classroom teaching (NSTA 2006; NSTA 2007; Windschitl 2009);
- quality inquiry-based curricula and support materials promote science learning and 21st-century skills (NSTA 2004);
- assessments are aligned with 21st-century curriculum and instruction, and appropriately measure students' progress toward skills acquisition in addition to mastery of core content (NRC 2001);
- a wide range of technologies serve as tools to engage students with real-world problem solving, conceptual development, and critical thinking;
- instruction includes a variety of opportunities for students to investigate and build scientific explanations, such as laboratory experiences (NSTA 2007); and
- science leaders build on the opportunities that already exist in school programs and teaching practices to support 21st-century skills (Bybee 2010a, 2010b).

—Adopted by the NSTA Board of Directors
June 2011

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