NSTA Position Statement

The Role of E-Learning in Science Education

Introduction

The National Science Teachers Association (NSTA) supports and encourages the use of e-Learning experiences for preK–16 science students, as well as for science educators engaging in professional development in the traditional, informal, or distance learning environment. NSTA defines e-Learning as the effective learning process created by combining digitally delivered content with learning support and services (Waller 2001). E-Learning can and should significantly enhance science teaching and learning.

NSTA does not confine or limit e-Learning solely to distance-based online courses and instruction where the learner and instructor are separated by place and time, but considers the following experiences to be within the scope of e-Learning: traditional classroom instruction that incorporates the planned and effective use of collaborative and/or interactive digital tools and resources, blended learning experiences that incorporate various combinations of technology-mediated and traditional classroom instruction, and distance delivered courses or programs.

E-Learning is an increasingly prevalent, viable, and fully recognized method for teaching and learning science (Dede, Brown-L'Bahy, Ketelhut, and Whitehouse 2004). NSTA supports e-learning as a promising way to

- more effectively provide access to certain science concepts and pedagogy when appropriate tools are incorporated for scientific observation, measurements, and investigations (NRC 1996);
- give science educators opportunities to experience firsthand the appropriate use of technology in teaching and learning, and increase their confidence in using these tools in their own practice;
- meet the needs of students who have learning styles conducive to and preferences for learning and interacting in an online environment (Dede 2005);
- reduce the isolation of science educators—especially those in rural areas or teaching specialized science subjects—by providing and expanding access to colleagues and experts;
- provide diverse learners—both preK–16 students and educators—with equitable access to high-quality courses, content, learning experiences, and instructors by overcoming barriers of place and time (Linn and Hsi 2000);
- engage a greater number of teachers in ongoing, high quality professional development;

- provide remote access via computers and networks to scientific instruments that allows students and teachers to conduct scientific investigations that might otherwise be unavailable to them (NACOL 2008), and
- provide future workers with strong skills and fluency in the convergence of media, which are critical to succeed in the 21st-century workplace (BHEF 2005).

For these reasons, NSTA supports e-Learning as a component of everyone's experience in learning science in the 21st century.

Declarations

NSTA considers the following elements key to effective, high-quality e-Learning experiences for teachers and students. E-Learning experiences should

- be thoughtfully designed and delivered with goals and outcomes clearly stated;
- be accurate, interesting, engaging, relevant, and standards-based;
- be facilitated or guided by fully accessible teachers or instructors skilled in both science content and pedagogy in an e-Learning environment;
- incorporate instructional design practices that allow for individual decision making and accommodate differences among learners and their contexts;
- strengthen science teaching and learning through digitally delivered content that has the potential to provide active or constructive learning experiences that enable the learner to gather, analyze, and display data (NRC 2000) and fully engage in simulated real-world problem contexts (AAAS 1993);
- connect learners—both students and science educators—to experiences that mimic the process and advancement of science in the real world (AAAS 1993);
- provide access to meaningful collaborative learning experiences with experts and other learners;
- promote frequent interaction between teacher and learner to allow continuous monitoring and adjustment of the dynamic learning environment; and
- conduct ongoing evaluation and assessment of program effectiveness, learners performance, and academic achievement to ensure the highest possible quality of science education. Both formative and summative evaluations should be used to guide continuous improvement of instruction.

NSTA supports e-Learning as an important component of teacher preparation and teacher professional development.

When designed properly, online courses and programs for teacher education and professional development have the ability to provide high-quality opportunities for science educators to learn content and pedagogy. NSTA makes the following declarations regarding e-Learning as a component of teacher preparation and teacher professional development:

- Teachers, science supervisors, district leaders, and higher education faculty should be educated consumers of online opportunities, programs, and tools to

effectively evaluate their quality and to encourage both preservice and inservice teachers to better understand the value of e-Learning.
- Science educators should incorporate the effective use e-Learning tools to promote sharing of information, discourse, critical analysis, and collaboration between students and teachers at various locations throughout the world.
- School districts and science supervisors should seek, evaluate, and provide teachers of science with high-quality, meaningful learning experiences employing e-Learning technologies.
- E-learning experiences should provide teachers of science with accurate, up-to-date information relating to science content and pedagogy.
- E-learning experiences should model and be explicit about good inquiry and active learning practices in e-Learning programs and experiences.
- E-Learning experiences should give educators opportunities to reflect on the implications of what they are learning to their own practice.

NSTA supports e-Learning for blended instructional approaches for K–16 students.

Instructional technology accessibility and applications in the traditional classroom, as well as virtual schools and courses, are emerging as viable and effective models for teaching important science content and for meeting diverse student needs. E-Learning offers expanded instructional options for science educators when appropriate for the learning goals and the learners. NSTA makes the following declarations regarding e-Learning for blended instructional approaches for K–16 students:

- Students should have ample opportunities to engage in inquiry experiences, and these opportunities may be increased and enhanced through e-Learning (NSTA 2004).
- A wide range of active scientific investigative experiences should be integrated into the instructional process for all students. These experiences should allow students to use scientific methods for developing research questions and hypotheses, designing investigations, observing phenomena, gathering and analyzing data, and developing scientific explanations based on evidence (NSTA 2007).
- School districts should support e-Learning experiences for all students and provide necessary resources.
- E-Learning experiences and resources, when appropriate, should accurately portray the nature of science (NSTA 2000).
- K–16 schools should support the use of well-designed virtual labs that have the ability to enhance understanding.
- Students should use e-Learning tools in the classroom in the same ways that they will be expected to effectively use these tools in the workplace.

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References

American Association for the Advancement of Science. 1993. *Benchmarks for science literacy*. New York: Oxford University Press.

Business-Higher Education Forum (BHEF). 2005. *A commitment to America's future: Responding to the crisis in mathematics and science education*. Washington, DC: Business-Higher Education Forum.

Dede, C. 2005. Planning for "neomillennial" learning styles: Implications for investments in technology and faculty. In *Educating the net generation*, eds. J. Oblinger and D. Oblinger, 226–247. Boulder, CO: EDUCAUSE Publishers.

Dede, C., T. Brown-L'Bahy, D. Ketelhut, and P. Whitehouse. 2004. Distance learning (virtual learning). In *The internet encyclopedia*, ed. H. Bidgoli, 549–560. New York: Wiley.

Linn, M. C., and S. Hsi. 2000. *Computers, teacher, and peers: Science learning partners*. Mahwah, NJ: Erlbaum.

National Research Council. 2001. *Classroom assessment and the National Science Education Standards*. Committee on Classroom Assessment and the National Science Education Standards, eds. J. Myron Atkin, Paul Black, and Janet Coffey. Center for Education, Division of Behavioral and Social Sciences and Education. Washington, DC: National Academy Press.

National Research Council. 2000. *How people learn: Brain, mind, experience, and school*. Committee on Developments in the Science of Learning. eds. John Bransford, Ann Brown, and Rodney Cocking. Commission on Behavioral and Social Sciences and Education. Washington, DC: National Academy Press.

National Research Council. 1996. *National science education standards: Observe, interact, change, learn*. Washington, DC: National Academy Press.

National Science Teachers Association (NSTA). 2007. NSTA Position Statement: The Integral Role of Laboratory Investigations in Science Instruction.

National Science Teachers Association (NSTA). 2004. NSTA Position Statement: Scientific Inquiry.

National Science Teachers Association (NSTA). 2000. NSTA Position Statement: The Nature of Science.

North American Council for Online Learning (NACOL). 2008. Goals, Guidelines, and Standards for Student Scientific Investigations.

Waller, V., eLearning Network, and J. Wilson, The Forum for Technology in Training. *Open and Distance Learning Quality Council (ODLQC). Newsletter.* A Definition for E-Learning. October 2001.