

Appendix

National Science Education Standards Teaching Standards

Complete information about the NSES may be obtained from contacting the National Academy Press, 2101 Constitution Avenue, N.W., Box 208, Washington DC 20055, 1-800-624-6242 or 1-202-334-331, or on the web at <http://www.nap.edu>.

(Text below from:

<http://books.nap.edu/html/nses/html/overview.html#teaching>)

The science teaching standards describe what teachers of science at all grade levels should know and be able to do. They are divided into six areas:

- A. The planning of inquiry-based science programs.**
- B. The actions taken to guide and facilitate student learning.**
- C. The assessments made of teaching and student learning.**
- D. The development of environments that enable students to learn science.**
- E. The creation of communities of science learners.**
- F. The planning and development of the school science program.**

TEACHING STANDARD A:

Teachers of science plan an inquiry-based science program for their students. In doing this, teachers:

- Develop a framework of yearlong and short-term goals for students.
- Select science content and adapt and design curricula to meet the interests, knowledge, understanding, abilities, and experiences of students.
- Select teaching and assessment strategies that support the development of student understanding and nurture a community of science learners.
- Work together as colleagues within and across disciplines and grade levels.

TEACHING STANDARD B:

Teachers of science guide and facilitate learning. In doing this, teachers:

- Focus and support inquiries while interacting with students.
- Orchestrate discourse among students about scientific ideas.
- Challenge students to accept and share responsibility for their own learning.
- Recognize and respond to student diversity and encourage all students to participate fully in science learning.
- Encourage and model the skills of scientific inquiry, as well as the curiosity, openness to new ideas and data, and skepticism that characterize science.

Coordinating people, ideas, materials, and the science classroom environment are difficult, continual tasks. This standard focuses on the work that teachers do as they implement the plans of Standard A in the classroom.

TEACHING STANDARD C:

Teachers of science engage in ongoing assessment of their teaching and of student learning. In doing this, teachers:

- Use multiple methods and systematically gather data about student understanding and ability.
- Analyze assessment data to guide teaching.
- Guide students in self-assessment.
- Use student data, observations of teaching, and interactions with colleagues to reflect on and improve teaching practice.
- Use student data, observations of teaching, and interactions with colleagues to report student achievement and opportunities to learn to students, teachers, parents, policy makers, and the general public.

The word "assessment" is commonly equated with testing, grading, and providing feedback to students and parents. However, these are only some of the uses of assessment data. Assessment of students and of teaching--formal and informal--provides teachers with the data they need to make the many decisions that are

required to plan and conduct their teaching. Assessment data also provide information for communicating about student progress with individual students and with adults, including parents, other teachers, and administrators.

TEACHING STANDARD D:

Teachers of science design and manage learning environments that provide students with the time, space, and resources needed for learning science. In doing this, teachers:

- Structure the time available so that students are able to engage in extended investigations.
- Create a setting for student work that is flexible and supportive of science inquiry.
- Ensure a safe working environment.
- Make the available science tools, materials, media, and technological resources accessible to students.
- Identify and use resources outside the school.
- Engage students in designing the learning environment.

Time, space, and materials are critical components of an effective science learning environment that promotes sustained inquiry and understanding. Creating an adequate environment for science teaching is a shared responsibility. Teachers lead the way in the design and use of resources, but school administrators, students, parents, and community members must meet their responsibility to ensure that the resources are available to be used. Developing a schedule that allows time for science investigations needs the cooperation of all in the school; acquiring materials requires the appropriation of funds; maintaining scientific equipment is the shared responsibility of students and adults alike; and designing appropriate use of the scientific institutions and resources in the local community requires the participation of the school and those institutions and individuals.

TEACHING STANDARD E:

Teachers of science develop communities of science learners that reflect the intellectual rigor of scientific inquiry and the attitudes and social values conducive to science learning. In doing this, teachers:

- Display and demand respect for the diverse ideas, skills, and experiences of all students.
- Enable students to have a significant voice in decisions about the content and context of their work and require students to take responsibility for the learning of all members of the community.
- Nurture collaboration among students.
- Structure and facilitate ongoing formal and informal discussion based on a shared understanding of rules of scientific discourse.
- Model and emphasize the skills, attitudes, and values of scientific inquiry.

The focus of this standard is the social and intellectual environment that must be in place in the classroom if all students are to succeed in learning science and

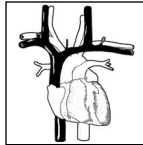
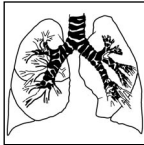
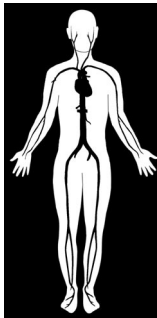
have the opportunity to develop the skills and dispositions for life-long learning. Elements of other standards are brought together by this standard to highlight the importance of the community of learners and what effective teachers do to foster its development. A community approach enhances learning: It helps to advance understanding, expand students' capabilities for investigation, enrich the questions that guide inquiry, and aid students in giving meaning to experiences.

An assumption of the Standards is that all students should learn science through full participation and that all are capable of making meaningful contributions in science classes. The nature of the community in which students learn science is critical to making this assumption a reality.

TEACHING STANDARD F:

Teachers of science actively participate in the ongoing planning and development of the school science program. In doing this, teachers:

- Plan and develop the school science program.
- Participate in decisions concerning the allocation of time and other resources to the science program.
- Participate fully in planning and implementing professional growth and development strategies for themselves and their colleagues.



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