10 BIG IDEAS

that can increase the challenge level for high-achieving students in

Science

CONNECTICUT STATE
DEPARTMENT OF EDUCATION

Rationale

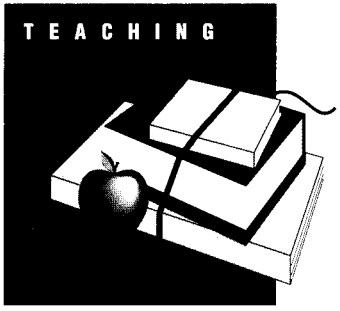
Thousands of gifted and talented young people and adolescents sit in classrooms across the state. Decades of research demonstrate that learning needs of gifted and talented students go beyond what is traditionally provided in regular classrooms. The nature of their abilities and talents, demonstrated or latent, require differentiated learning opportunities to help them realize their potential.

Connecticut educators genuinely care about *all* of their students and seek to meet the incredibly diverse learning needs of the students they face daily. Too often, however, classroom teachers do not have the tools, information, or support they need to meet these needs–particularly those of their gifted and talented students.

Connecticut educators genuinely care about all their students and want to meet the needs of the increasingly diverse learners in their classrooms.

Still, the responsibility for increasing the challenge level for gifted and talented students and for providing them with expanded learning opportunities rests largely with the classroom teacher.

This series of brochures is designed to provide classroom teachers, as well as teachers of the gifted and talented, with a number of practical ideas and resources for refining and expanding learning options to better meet these needs. The strategies were selected because they are inexpensive and readily adaptable by teachers. Although the 10 strategies listed here do not replace the powerful services of a full-time enrichment specialist and program for the gifted, we hope that all teachers will use the strategies systematically and that, over time, their use will lead to an increasing array of high-level learning options for gifted and talented students in Connecticut.



Great Links

Eisenhower National Clearinghouse (ENC) (http://enc.org)
ENC is a repository for current mathematics and science resources. The site is a consistent award-winner because it is well maintained and packed with math and science information. Sites include lessons, activities, interactive websites and journal articles. One of the richest sites is called Reform in Action (http://www.enc.org/classroom/main.htm). This ENC site links browsers to *Digital Dozen* (13 of the best science and mathematics sites, selected each month), *Innovator of the Month* (a spotlight on educators who are reinventing learning with their students), and *ENC Focus* (select resources for teaching current, hot topics).

KIDS (http://kids.library.wisc.edu/)
KIDS, Kids Identifying and Discovering Sites, is a biweekly publication produced by K-12 students as a resource to other K-12 students. It is an ongoing cooperative effort of 12 classrooms from around the United States. Since 1996-1997, students amassed an archive of sites in science, mathematics and history, including, for example: Inventions, the Holocaust and Natural Disasters. Selection criteria are included for readers and can be used by other students who want to use similar criteria for identifying and selecting Internet sites for their own web pages.

NASA (http://www.nasa.gov/kids.html)
NASA (National Aeronautics and Space Administration) maintains an award-winning website that houses a special link to Cool Web Sites for Kids. Students can access a variety of interactive, hands-on activities and resources about: airplanes, the Earth, planets, space travel, stars and galaxies.

TERC (http://www.terc.edu)
TERC is a not-for-profit education and research and development organization dedicated to improving mathematics and science learning. This website contains links to TERC projects in which students can get involved, as well as TERC papers, which explore a variety of innovative instructional strategies related to math and science teaching. A most notable link takes browers to *Hands-On*, a publication devoted to applying hands-on, inquiry-based learning to classrooms. The practical, down-to-earth articles written by practitioners are inspirational and easy to adapt.

Exploratorium (http://www.exploratorium.edu)
The Exploratorium's website, in four languages, is as interactive and hands-on as the museum in San Francisco. Thus, it's not surprising that the website has earned a variety of awards. Monthly, the staff presents "10 Cool science, art and education Sites". Recently, the sites included Neuroscience for Kids, DNA for Dinner, Understanding Color, and The Learning Matters of Chemistry.

1 Assess students' understanding of material *before* beginning an instructional unit. Preassessments can be paper-and-pencil, as well as performance-based. If critical differences are revealed in the preassessments, develop differentiated learning activities for small, flexible, within-class groups. Monitor students' progress regularly and regroup accordingly; document student progress.

2 Connect all lessons to applications in the real world. An understanding of how topics are related to the real world helps all students, including those who are highly motivated in science, see possibilities for future explorations and research.

3 Invite local scientists to speak to your class on issues related to the curriculum. Debrief students about the presentation, and make sure students understand the varied real-world applications. Ask students what new questions they formulated as a result of hearing the presentation. Encourage and support students who want to pursue an idea in more depth.

4 Promote students' specific interests in science. Teach highly motivated students advanced methodological skills and help them conduct related experiments. Seek out appropriate acceleration options within the school and community.

5 Connect science to literature. Ensure that selected literary works develop science concepts accurately and range in complexity and reading difficulty. One issue of *Focus*, an Eisenhower National Clearinghouse publication, is devoted to this topic (Volume 4, Issue 5) (http://www.enc.org/classroom/focus). Additionally, *Science and Children* annually features "Outstanding Science Trade Books for Children," a review of the year's best science books for young people, arranged by science topics. [*Science and Children,* National Science Teachers Association (NSTA), 1840 Wilson Blvd, Arlington, VA 22201-3000 (703) 243-7100 (http://www.nsta.org/pubs/sc)].

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6 Emphasize that science has a history; connect classroom investigations to the important people and chronology of critical turning points that led to our current understanding of phenomena. (See *The Timetable of Science: A Chronology of the Most Important People and Events in the History of Science*, by Alexander Hellemans and Bryan Bunch, ISBN 0671733281. Provide highly motivated students with the opportunity to investigate the history of scientific discoveries or the lives of eminent scientists.

7 Develop high-interest learning centers or corners related to science topics in the curriculum, for example: UV monitoring, violent weather, local ecosystems and environmental issues, space stations and hydroponics. Include a spectrum of open-ended tasks, ranging from easy to complex; a variety of resources; and product formats that students can use to demonstrate what they learned. Provide all students with an opportunity to visit the corner/center and opportunities to add to the activities. See the websites in the sidebar of this booklet for information about highly motivating science topics.

8 Implement after-school science clubs. Provide participants with hands-on, open-ended activities that encourage participants to go as far as they want with an experiment or task. (See the TERC website in the sidebar in this booklet, as well as any of the publications by NSTA for powerful hands-on learning activities in science.)

9 Provide mentorships for students with a passion in science. Mentors can be located at local universities/ community colleges, online, in the business sector and among parents of young people. Telementoring projects: *Scientific American's* website: http//www.sciam.com/ askexpert; Electronic Emissary's website: http://www.tapr.org/ emissary; HP E-mail Mentor Program (5th-12th grade students): http:// www.telementor.org/hp/.

10 Encourage all students to participate in suitable contests and competitions, especially those with science capabilities. *All the Best Contests for Kids*, ISBN 0-89815-451-0, and *The Ultimate Guide to Student Contests*, Grades 7-12, ISBN 0-8027-7512-8, are filled with contest ideas. (See the criteria for assessing science competitions in the box on this page.)

Sizing Up Science Competitions

Bettac, Teresa, F. (1999). Sizing up science competitions. *Science and Children, 37*(1), 24-27.

1. Match contest objectives with the grade-level district objectives.
2. Ensure that the contest product strengthens connections in science and other subject areas.
3. Match the contest with the age level and interests of the students.
4. Ensure that the contest has a workable deadline for entries in relationship to the school calendar.
5. Determine what materials will be purchased by the school and what materials will need to be provided by parents or local industry.