



VERMONT

Sciences & Life Sciences Achievement

STUDENT ACHIEVEMENT

NAEP Grade 8	VT	U.S. Avg.	State Rank
Science Average, 2005	161.8	147.1	3
Science, 2005 (% at or above "proficient")	40.6%	27.3%	4
Life Sciences Average, 2005	163.0	148.2	2

ACT	VT	U.S. Avg.	State Rank
Science Average, 2008	22.1	20.8	9
Biology, 2008 (% of students ready for college level)	38%	28%	7

AP	VT	U.S. Avg.	State Rank
Science Scores, 2008 (% with a score of 3 or higher)	59.7%	55.4%	13
Science Exams, 2008 (Exams as % of all H.S. grads)	11.9%	10.5%	14
Biology Scores, 2008 (% with a score of 3 or higher)	59.3%	49.8%	5
Biology Exams, 2008 (Exams as % of all H.S. grads)	5.9%	4.6%	7

SCIENCE TEACHER QUALITY and PROFESSIONAL DEVELOPMENT

	VT	U.S. Avg.	State Rank
Science Teachers with Major in Assigned Field, 2003–04 (% , Grades 7–12)	91%	77%	1
Science Teachers Certified, 2006 (% , Grades 7–8)	N/A%	N/A%	–
Biology Teachers Certified, 2006 (% , Grades 9–12)	N/A%	88%	–

Note: NAEP = National Assessment of Educational Progress, AP = Advanced Placement
N/A = Data not available.

Examples of Bioscience Education Activities

Teacher Preparation and Professional Development

The goal of the **Vermont Science Initiative (VSI)**, a statewide program housed at Johnson State College, is to achieve scientific literacy among all of Vermont's children through improved instruction in science. The VSI consists of a two-tiered

VT STATE SCIENCE STANDARDS & REQUIREMENTS

STANDARDS PROFILE

- Most recent update of K-12 Science Standards: **2007**
- Science standards specifically mention applied laboratory or other tools for biotechnology or bioscience. The standards require that "Students understand that people control the outputs and impacts of our expanding technological activities in the areas of communication construction, manufacturing, power and transportation, energy sources, health technology, and biotechnology."

Vermont Framework of Standards and Learning Opportunities: Updated October 1, 2008

BIOSCIENCE-RELATED GRADUATION REQUIREMENTS:

Three units of science required; biology is not specified



professional development model:

- A Tier I component that consists of a 3-year sequence of intensive science learning experiences leading to a master's degree in science education for K-8 teachers. To date, more than 40 teachers have participated in the program and another 20 teachers will enter the program shortly.
- A 1-year Tier II component that focuses on helping K-12 teachers to increase their science content knowledge, acquire science-teaching skills, and improve general teaching practice. Now in its third year, Tier II has trained more than 80 teachers in 33 schools and 9 school districts.

As part of VSI, scientists and science educators from several of the state's higher education and K-12 institutions, the Vermont Department of Education, Vermont Institutes, and Learning Innovations at WestEd have developed and implemented a series of intensive science learning experiences for K-8 teachers.

Green Mountain College offers an online Master's of Environmental Studies that makes continuing education accessible for the state's K-12 teachers.

Saint Michael's College offers a course in Biology for Elementary Education majors. As part of the course, students plan lab exercises for elementary school students.

Vermont has created an “**alternative route to licensure**” for those who wish to become licensed educators but have not completed a traditional educator preparation program at a college or university. Vermont's alternate route is called License by Evaluation or “Peer Review.” Peer Review is for individuals who hold a bachelor's degree and have acquired the knowledge and skills needed to meet the 16 Principles for Vermont Educators and the competencies and

requirements for the endorsements they seek through coursework and experiences, rather than through a preparation program.

The State of Vermont offers **partial or complete loan cancellation** under its student loan program for a borrower who is employed for a complete school year who is teaching full-time in mathematics, science, or computer science during a year when there is a critical shortage of licensed teachers in that area. Secondary mathematics and science have been listed as areas of critical shortage in recent years.

Experiential Learning and Outreach

The **Vermont Genetics Network (VGN)** at the University of Vermont (UVM) is dedicated to building biomedical research infrastructure, including by conducting outreach to both undergraduate and K-12 students. Examples of outreach activities include: tours of the DNA and Microarray Facilities, seminars, and hands-on activities.

The **Microscopy Imaging Center at UVM**, under the auspices of the New England Society for Microscopy (NESM), began participating in the nationwide outreach program—**Project MICRO**—in 1999. With a kit (microscopes and supplies) provided by NESM, staff of the Imaging Center visit local middle schools and set up Microscopic Festivals during which students rotate through 10 learning activities, investigating sand, fabrics, fingerprints, pond life, bugs, crystals, and other small specimens for a total of 2 hours. The program is totally staffed by volunteers (MIC staff, graduate students, office personnel, etc.) and depends heavily upon the involvement of parent volunteers during the Festivals. Since 1999, 4,261 students and 150 teachers have participated in Project MICRO.

The **HELIX/EPSCoR Program** provides an opportunity for high school students and



teachers to be a part of the **VT EPSCoR Streams Project**, a collaborative study of the streams of the Lake Champlain basin. The project will place teams, consisting of two students and a high school teacher, with a faculty member. The team will be taught the skills necessary to participate in the Streams Project during the summer of 2009 and furnished with the equipment and supplies necessary to continue the project over the summer and academic year. Participants will present their results at a Research Symposium in spring 2010 at UVM. The teams will not only learn cutting-edge techniques used in specific areas of science, technology, engineering, and

mathematics (STEM), they will also understand how a research team functions and experience firsthand the scientific process.

Middlebury College's Biological Sciences K-12 Outreach for Students and Teachers brings students from middle and high schools to the campus to participate in workshops and tour science facilities; the program also hosts workshops for K-12 teachers.





Basic Skills Achievement and Other Summary Metrics

STUDENT ACHIEVEMENT

NAEP Grade 8	VT	U.S. Avg.	State Rank
Math Average, 2007	291.0	280.2	4
Math, 2007 (% at or above "proficient")	41.4%	31.0%	3
Reading Average, 2007	273.0	261.0	2
Reading, 2007 (% at or above "proficient")	42.1%	29.2%	2
Writing Average, 2007	161.5	154.3	4
Writing, 2007 (% at or above "proficient")	40.4%	30.6%	4

ACT	VT	U.S. Avg.	State Rank
Percentage of Graduates Tested	26%	43%	33
Math Average, 2008	22.4	21.0	11
Reading Average, 2008	23.3	21.4	5
English Average, 2008	22.4	20.6	7

SAT	VT	U.S. Avg.	State Rank
Percentage of Graduates Tested	67%	48%	15
Math Average, 2008	523	515	28
Critical Reading Average, 2008	519	502	29
Writing Average, 2008	507	494	29

AP	VT	U.S. Avg.	State Rank
Math Scores, 2008 (% with a score of 3 or higher)	68.0%	65.2%	20
Math Exams, 2008 (Exams as % of all H.S. grads)	9.2%	8.7%	16
English Scores, 2008 (% with a score of 3 or higher)	71.8%	59.2%	6
English Exams, 2008 (Exams as % of all H.S. grads)	15.0%	18.9%	27

SUMMARY STATE EDUCATION METRICS

Selected Indicators	VT	U.S. Avg.	State Rank
High School Graduation Rate, 2005–06	82.3%	73.4%	8
Student/Teacher Ratio, 2006–07	10.8	15.5	1*
Low-income Students, 2006–07 (% of all students)	26.8%	41.6%	–
Expenditure per Student (\$), 2005–06	\$12,805	\$9,154	5

Note: NAEP = National Assessment of Educational Progress, AP = Advanced Placement
N/A = Data not available. * Lowest value receives highest ranking.

TABLE SOURCE NOTES:

NAEP Assessments, grade 8: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics (NCES), National Assessment of Educational Progress (NAEP), 2005; **ACT Exam:** ACT, Inc., 2008; **SAT Reasoning Test:** The College Board, 2008.

Advanced Placement (AP): Battelle analysis of data from the College Board, 2008; AP test takers as a share of high school graduates includes graduate data from U.S. Department of Education, NCES for both public (Common Core of Data) and private high schools (Private School Survey).

Science Teacher Indicators: Council of Chief State School Officers (CCSSO) analysis of State Departments of Education data on public schools, 2007; U.S. Department of Education, NCES Schools and Staffing Survey, 2003–04 as reported by CCSSO, 2007.

Summary State Education Metrics: U.S. Department of Education, National Center for Education Statistics (NCES), Common Core of Data (CCD) on public elementary and secondary education.

Note: High school graduation rates are averaged freshman graduation rates—the rate is the number of graduates divided by the estimated count of freshmen 4 years earlier. U.S. figure for share of students eligible for free or reduced-price school lunch ("low-income" students) is available for 2005–06 only (state data are for 2006–07).