



# MASSACHUSETTS

## MA STATE SCIENCE STANDARDS & REQUIREMENTS

### Sciences & Life Sciences Achievement

#### STUDENT ACHIEVEMENT

NAEP Grade 8	MA	U.S. Avg.	State Rank
Science Average, 2005	160.7	147.1	6
Science, 2005 (% at or above "proficient")	40.6%	27.3%	5
Life Sciences Average, 2005	161.5	148.2	6

ACT	MA	U.S. Avg.	State Rank
Science Average, 2008	22.5	20.8	2
Biology, 2008 (% of students ready for college level)	40%	28%	2

AP	MA	U.S. Avg.	State Rank
Science Scores, 2008 (% with a score of 3 or higher)	66.0%	55.4%	5
Science Exams, 2008 (Exams as % of all H.S. grads)	16.0%	10.5%	3
Biology Scores, 2008 (% with a score of 3 or higher)	60.0%	49.8%	4
Biology Exams, 2008 (Exams as % of all H.S. grads)	7.1%	4.6%	3

SCIENCE TEACHER QUALITY and PROFESSIONAL DEVELOPMENT	MA	U.S. Avg.	State Rank
Science Teachers with Major in Assigned Field, 2003–04 (% , Grades 7–12)	84%	77%	8
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.

### Key Organization(s) Promoting Bioscience Education

**Massachusetts Biotechnology Education Foundation (MassBioEd)**, founded in 2001, is a nonprofit charitable organization committed to supporting science and biotechnology education in Massachusetts through school programs, workforce training, and lifelong learning.

#### STANDARDS PROFILE

- Most recent update of K-12 Science Standards: **Prior to 2005**
- Next update scheduled: **Beyond 2011**
- Research scientists provided input in developing standards
- Science standards specifically mention applied laboratory or other tools for biotechnology or biosciences. With a general notice in the Life Sciences section, the standards refer as follows:
  - "Biotechnology is a rapidly expanding field of biology that uses a growing set of techniques to derive valuable products from organisms and their cells. Biotechnology is already commonly used to identify potential suspects in crimes or exonerate persons wrongly accused, determine paternity, diagnose diseases, make high-yield pest-resistant crops, and treat genetic ailments. Educators should recognize the importance of introducing students to biotechnology as a way of better understanding the molecular basis of heredity. Educators should also provide students with methods and critical thinking skills to evaluate the benefits and risks of this technology."

*Massachusetts Department of Education, Massachusetts Science and Technology/Engineering Curriculum Framework, October 2006*

#### BIOSCIENCE-RELATED GRADUATION REQUIREMENTS:

No units of biology are required



## Examples of Bioscience Education Activities

MassBioEd's **BioTeach program** is designed to enable every public high school in the state to teach biotechnology methods in its biology classes and to engage high school students with hands-on lab experience. High schools selected to participate receive the following:

- \$7,800 in new equipment to update science labs for biotechnology
- Up to \$1,000 annually in supplies and maintenance for sustainability
- Ongoing teacher training that keeps pace with biotech discovery
- Access to engaging, “real-life” curricula so every student can experience a biotechnology lab through the core biology curriculum.

Schools selected receive support for 7 years. BioTeach makes 50 awards totaling \$440,000 annually for teacher professional development, supplies, and outreach programs. In 2008–2009, BioTeach added 49 schools to its program.

**BioTeach contracts with Boston University's (BU's) MobileLab** to provide mentoring to each of the BioTeach schools. BU's Mobile Lab is a 40-foot traveling science lab whose mission is to increase community access to biotechnology. The lab allows teachers and students to participate in hands-on lab investigations.

Certain BioTeach schools have been selected to participate in the **Life Science Career Development Initiative**, a model that supports the development of academic, personal, and employability skills for students pursuing careers in the life science and biotechnology field at the postsecondary level. Life Science Career

Development Schools provide students with an organized scope and sequence (grades 9-12) of academic, technical/technological, and work-based learning experiences while exploring career choices in biotechnology, bioengineering, and biomanufacturing.

### Teacher Preparation and Professional Development

The MassBioEd Foundation, with funding from the Massachusetts Board of Higher Education, provides professional development training for middle and high school teachers from low-income areas to enable them to easily integrate biotechnology content and activities into biology, chemistry, and physics classes through its **Improving Teacher Quality: Biotechnology Teacher Professional Development Program**.

### Experiential Learning and Outreach

**MassBioEd** offers job shadowing, after-school programs, an industry speakers bureau, and access to biotechnology labs.

- MassBioEd maintains a comprehensive Web site, [www.massbioed.org](http://www.massbioed.org), that provides information on biotechnology career pathways, college offerings, jobs and internships for students, and professional development opportunities for teachers.

### Bioscience-focused Schools and Programs

Several vocational technical schools offer **Biotechnology Career Academies** including Greater Lawrence Technical School, Minuteman Regional High School, and Cambridge Rindge and Latin School.



## Basic Skills Achievement and Other Summary Metrics

### STUDENT ACHIEVEMENT

NAEP Grade 8	MA	U.S. Avg.	State Rank
Math Average, 2007	297.9	280.2	1
Math, 2007 (% at or above “proficient”)	50.7%	31.0%	1
Reading Average, 2007	273.3	261.0	1
Reading, 2007 (% at or above “proficient”)	43.0%	29.2%	1
Writing Average, 2007	166.8	154.3	3
Writing, 2007 (% at or above “proficient”)	45.5%	30.6%	3

  

ACT	MA	U.S. Avg.	State Rank
Percentage of Graduates Tested	17%	43%	40
Math Average, 2008	23.9	21.0	1
Reading Average, 2008	24.0	21.4	1
English Average, 2008	23.5	20.6	1

  

SAT	MA	U.S. Avg.	State Rank
Percentage of Graduates Tested	85%	48%	3
Math Average, 2008	525	515	27
Critical Reading Average, 2008	514	502	31
Writing Average, 2008	513	494	25

  

AP	MA	U.S. Avg.	State Rank
Math Scores, 2008 (% with a score of 3 or higher)	76.0%	65.2%	4
Math Exams, 2008 (Exams as % of all H.S. grads)	11.8%	8.7%	3
English Scores, 2008 (% with a score of 3 or higher)	77.9%	59.2%	4
English Exams, 2008 (Exams as % of all H.S. grads)	16.6%	18.9%	22

### SUMMARY STATE EDUCATION METRICS

Selected Indicators	MA	U.S. Avg.	State Rank
High School Graduation Rate, 2005–06	79.5%	73.4%	18
Student/Teacher Ratio, 2006–07	13.2	15.5	9*
Low-income Students, 2006–07 (% of all students)	29.2%	41.6%	–
Expenditure per Student (\$), 2005–06	\$12,564	\$9,154	7

**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).

