MARYLAND

Sciences & Life Sciences Achievement

STUDENT ACHIEVEMENT

NAEP Grade 8	MD	U.S. Avg.	State Rank
Science Average, 2005	144.7	147.1	31
Science, 2005 (% at or above "proficient")	25.8%	27.3%	27
Life Sciences Average, 2005	147.0	148.2	28

ACT	MD	U.S. Avg.	State Rank
Science Average, 2008	21.4	20.8	22
Biology, 2008 (% of students ready for college level)	34%	28%	15

AP	MD	U.S. Avg.	State Rank
Science Scores, 2008 (% with a score of 3 or higher)	58.2%	55.4%	16
Science Exams, 2008 (Exams as % of all H.S. grads)	15.5%	10.5%	4
Biology Scores, 2008 (% with a score of 3 or higher)	50.6%	49.8%	23
Biology Exams, 2008 (Exams as % of all H.S. grads)	6.9%	4.6%	4

SCIENCE TEACHER QUALITY and PROFESSIONAL DEVELOPMENT	MD	U.S. Avg.	State Rank
Science Teachers with Major in Assigned Field, 2003–04 (%, Grades 7–12)	77%	77%	21
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

MdBio Foundation, a private charitable organization, provides and supports bioscience awareness, education, and workforce development in the state of Maryland.

MD STATE SCIENCE STANDARDS & REQUIREMENTS

STANDARDS PROFILE

- Most recent update of K-12 Science Standards: **2007**
- Next scheduled update: **2012**
- Research scientists provided input in developing standards
- Science standards specifically mention applied laboratory or other tools for biotechnology or biosciences
  - Maryland's High School Technology Education Voluntary State Curriculum requires that students "Develop an understanding of agricultural and biotechnologies."
  - Maryland's Grades 3-8 Voluntary State Curriculum—Biology includes the following objectives:
    - Describe current opportunities for employment in biology-related careers, e.g., teaching, research, medicine, engineering, public health, sanitation, food science, environmental science, animal science, agriculture, biotechnology, forensic science.
    - Describe the levels of education required for various careers in the biological sciences.

BIOSCIENCE-RELATED GRADUATION REQUIREMENTS:

One unit of biology is required for graduation

Maryland students must pass four assessment tests to graduate from high school, one of which is biology.

Examples of Bioscience Education Activities

Teacher Preparation and Professional Development

Johns Hopkins University offers a part-time **Flexible Masters of Art in Teaching (FlexMAT)** that is designed for career changers and for individuals who did not prepare for teaching as undergraduates. Candidates can become eligible for certification in elementary education (grades 1–6 and middle school); or secondary education in a number of disciplines, including four sciences (biology, chemistry, earth science, and physics). Successful candidates receive certification eligibility and the degree of Master of Arts in teaching (MAT) in 2 to 5 years.

The **University of Maryland (UM) offers a Masters Certification Program (MCERT)**, an intensive year-long program that enables someone with a bachelor's degree to obtain a master's of education degree and become certified to teach in elementary or secondary schools.

The **UM Science Teaching Center** offers programs for Maryland state teaching certification at the middle and secondary levels in biology, chemistry, physics, and earth/space science. The program requires that the student complete a double major in education and the scientific field in which he or she wants to teach.

The University of Maryland Biotechnology Institute (UMBI) offers **professional development opportunities for middle and high school teachers**. Throughout the school year, UMBI trains teachers to incorporate biotechnology activities into their classroom curricula. In an innovative partnership with the University System of Maryland and Montgomery County Public Schools, UMBI scientists work with teachers to explore the role of inquiry in science and translate their experiences into classroom activities. UMBI also offers summer professional development for teachers to explore the use of inquiry-based lab activities in teaching science.

Experiential Learning and Outreach

MdBioLab is a custom-built mobile bioscience laboratory that provides hands-on inquiry-based laboratory experiences for high school students and their teachers throughout the state of Maryland. In addition to increasing science literacy, MdBioLab focuses on student awareness of career opportunities in bioscience. MdBioLab is an initiative of the Tech Council of Maryland and UMBI.

UMBI offers a number of additional outreach and experiential learning opportunities. These include the following:

- The **Maryland Loaner Lab (MDLL)** offers comprehensive biotechnology curriculum and lab activities available in a self-contained kit. Each kit, delivered via Fed Ex, contains all of the reagents, equipment, background information, and protocols for students to conduct inquiry-based science activities in the classroom. Since it began in 2004, the MDLL has served more than 16,400 students in 20 of the 24 Maryland school districts.
- The **SciTech Education Program** offers students the opportunity to experience biotechnology first-hand in UMBI's dedicated student laboratory located in the Center of Marine Biotechnology (COMB) in Baltimore's Inner Harbor. SciTech has served more than 25,000 students since its inception in 1995. All of UMBI's curricula are aligned with Maryland's Voluntary State Curriculum.

- **Internships** for high school and undergraduate students are offered at UMBI's four centers, which include the COMB and the Medical Biotechnology Center (MBC) located in Baltimore, the Center for Biosystems Research (CBR) in College Park and Rockville, and the Center for Advanced Research in Biotechnology (CARB) in Rockville.

The **J. Craig Venter Institute** offers a variety of education programs for students and teachers including a mobile lab for middle schools in the DC Metro region, professional development for teachers, and fellowships.

The **National Institutes of Health (NIH) Office of Science Education** provides access to free K-12 science curriculum supplements, posters, videos, NIH Speakers Bureau, and many additional outreach and education activities.

The **Werner H. Kirsten Student Intern Program**, located at the **National Cancer Institute in Frederick (NCI-Frederick)**, is designed to expose Frederick or Washington County Public School System and St. John's Literary Institute at Prospect Hall seniors to research through hands-on laboratory training. Students work full-time (40 hours per week) for nine consecutive weeks during the summer and continue during the school year (3 hours per day) as a student volunteer for high school graduation credit. During the summer, each student in this program receives a stipend. NCI-Frederick also has an **Elementary Outreach Program** that provides the opportunity for elementary school students to receive supplemental science training through hands-on experiences. The program is supported by the NCI-Frederick and its system of support contractors who have entered into a formal partnership agreement with the Frederick County Public School System.

Bioscience-focused Schools and Programs

Maryland is working to offer **Project Lead the Way's Biomedical Sciences Program** at high schools across the state. The program is currently offered at 10 high schools located in 10 school districts.

Career Technical Education

Two hundred and fifty students in 10 Maryland high schools are enrolled in biotechnology R&D career pathways and 2,873 students are enrolled in therapeutic services career pathways at 16 Maryland high schools.

Basic Skills Achievement and Other Summary Metrics

STUDENT ACHIEVEMENT

NAEP Grade 8	MD	U.S. Avg.	State Rank
Math Average, 2007	285.7	280.2	16
Math, 2007 (% at or above "proficient")	36.5%	31.0%	14
Reading Average, 2007	265.2	261.0	20
Reading, 2007 (% at or above "proficient")	33.2%	29.2%	21
Writing Average, 2007	N/A	154.3	–
Writing, 2007 (% at or above "proficient")	N/A%	30.6%	–

ACT	MD	U.S. Avg.	State Rank
Percentage of Graduates Tested	16%	43%	43
Math Average, 2008	22.0	21.0	17
Reading Average, 2008	22.3	21.4	20
English Average, 2008	21.6	20.6	17

SAT	MD	U.S. Avg.	State Rank
Percentage of Graduates Tested	70%	48%	12
Math Average, 2008	502	515	41
Critical Reading Average, 2008	499	502	35
Writing Average, 2008	497	494	35

AP	MD	U.S. Avg.	State Rank
Math Scores, 2008 (% with a score of 3 or higher)	70.7%	65.2%	14
Math Exams, 2008 (Exams as % of all H.S. grads)	13.9%	8.7%	1
English Scores, 2008 (% with a score of 3 or higher)	61.8%	59.2%	26
English Exams, 2008 (Exams as % of all H.S. grads)	29.9%	18.9%	4

SUMMARY STATE EDUCATION METRICS

Selected Indicators	MD	U.S. Avg.	State Rank
High School Graduation Rate, 2005–06	79.9%	73.4%	16
Student/Teacher Ratio, 2006–07	14.6	15.5	24*
Low-income Students, 2006–07 (% of all students)	32.3%	41.6%	–
Expenditure per Student ($), 2005–06	$10,909	$9,154	11

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).