



# ARIZONA

## Sciences & Life Sciences Achievement

### STUDENT ACHIEVEMENT

NAEP Grade 8	AZ	U.S. Avg.	State Rank
Science Average, 2005	140.1	147.1	37
Science, 2005 (% at or above "proficient")	20.0%	27.3%	37
Life Sciences Average, 2005	141.2	148.2	38

ACT	AZ	U.S. Avg.	State Rank
Science Average, 2008	21.3	20.8	24
Biology, 2008 (% of students ready for college level)	30%	28%	29

AP	AZ	U.S. Avg.	State Rank
Science Scores, 2008 (% with a score of 3 or higher)	48.2%	55.4%	38
Science Exams, 2008 (Exams as % of all H.S. grads)	5.2%	10.5%	43
Biology Scores, 2008 (% with a score of 3 or higher)	45.0%	49.8%	36
Biology Exams, 2008 (Exams as % of all H.S. grads)	2.2%	4.6%	46

SCIENCE TEACHER QUALITY and PROFESSIONAL DEVELOPMENT	AZ	U.S. Avg.	State Rank
Science Teachers with Major in Assigned Field, 2003–04 (% , Grades 7–12)	67%	77%	39
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

- Arizona Board of Regents
- Arizona Department of Education
- BIO5 Institute, University of Arizona (UA)
- Biodesign Institute at Arizona State University (ASU)
- Translational Genomics Research Institute (TGen)

## AZ STATE SCIENCE STANDARDS & REQUIREMENTS

### STANDARDS PROFILE

- Most recent update of K-12 Science Standards: **2004**
- Next update scheduled: **2010–2011**
- Science standards specifically mention applied laboratory or other tools for biotechnology or bioscience

### BIOSCIENCE-RELATED GRADUATION REQUIREMENTS:

Currently, two credits of science are required for graduation; starting in 2013, three credits in science will be required in preparation for proficiency on the Arizona's Instrument to Measure Standards (AIMS) test, biology is not specified



## Examples of Bioscience Education Activities

### Teacher Preparation and Professional Development

The Arizona Board of Regents offers a **loan forgiveness program for Math, Science, and Special Education Teachers**. The program is designed to encourage talented students to enter the teaching profession and teach in a middle or high school in Arizona. The loan may cover up to the cost of in-state tuition, mandatory fees, and materials. The loan can be received for up to 5 years of full-time enrollment.

The Arizona Department of Education holds **teacher professional development workshops** throughout the year for elementary, middle-, and high-school science and math teachers.

ASU offers the following professional development opportunities for science teachers:

- **BioREACH** (Biotechnology Resource for Educational Advancement of Curriculum in High Schools) provided high school teachers with the necessary training, equipment, supplies, and resource personnel to conduct biotechnology laboratories in the high school classroom. The program offered summer workshops and provided teachers with materials, supplies, and personnel to conduct hands-on, inquiry-oriented labs in the high school classrooms.
- **Summer Research Experience for Teachers: High School Biotechnology** in 2008 paired high school teachers from schools with existing and emerging bioscience/biotechnology programs with 29 Biodesign Institute researchers willing to mentor a teacher and student intern in laboratory science. The teacher, in turn, assisted with mentoring high school students in the Summer Internship Program (SIP).

Each teacher participating in the program received a \$5,000 stipend.

The UA offers the following programs:

- **BIOTECH Project** consists of three components: professional development workshops for teachers, classroom visits for modeling hands-on biotechnology activities, and extensive materials support for teachers to carry out biotechnology experiments independently. Through professional development and classroom support, the BIOTECH Project has worked with more than 100 Arizona teachers to conduct molecular genetics activities with thousands of students each year.
- **AZ-START** is a professional development program that links the Arizona K-12 science teachers with the science research infrastructure throughout the state. Through coursework, research internships, and curricular and community support, the project's goal is to update, refresh, and rejuvenate biology teachers, providing them with quality experiences that build their strengths as science teachers.
- **Web-delivered teacher certification program** is designed for individuals interested in becoming science teachers at the secondary-school level. Applicants must have completed a bachelor's degree from an accredited institution of higher education in either a science or engineering field, must meet the UA Graduate College entrance requirements for acceptance as a nondegree student, and obtain valid fingerprint clearance card issued by the Arizona Department of Public Safety.
- **General Biology Program for Teachers** offers graduate-level courses and enrichment opportunities for biology teachers. The



program provides graduate-level courses for middle- and high-school biology teachers, taught at times when they can participate: evenings, weekends, and school vacations.

**STEM Teacher Education Resource Center at Biosphere 2.** Science Foundation Arizona (SFAz) has awarded a 3-year, \$1.5 million grant to the UA's B2 Institute, located at Biosphere 2, to establish a teacher resource and training center that will expand the quality and retention of science, technology, engineering, and mathematics (STEM) teachers in Arizona. The Phileology Foundation is partnering and providing a matching grant to fully fund the Center.

#### Experiential Learning and Outreach

In 2008, ASU conducted a **High School SIP** that provided a 6-week research opportunity for high school upperclassmen. Twenty-nine students representing 24 area high schools participated in the program. The interns worked side-by-side with Biodesign Institute researchers.

The **Helios Scholars Program at TGen** is an 8-week paid internship. Students work under the mentorship of an experienced investigator and their scientific teams. Interns conduct authentic research; receive training in biosafety, ethics, career choices, and science communication; give an oral presentation to their peers on their research; and create and present a scientific poster.

The UA's **KEYS (Keep Engaging Youth in Science) Research Internship** offers a unique summer opportunity to motivated high school students who possess a strong interest in pursuing advanced education in bioscience or biomedical science. Over the course of the internship, students go through a week-long, hands-on institute; perform independent research in an active laboratory; and learn science

communication through weekly workshops with the other interns and KEYS personnel. The summer culminates with a poster session where they showcase their research to the academic community and their friends and family.

#### Bioscience-focused Schools and Programs

Currently, 32 Arizona schools offer a bioscience course or program of study. In the 2009–2010 school year, the number will jump to 52 schools. Two major bioscience education endeavors are the Mesa Public Schools Biotech Academy and Phoenix Union Bioscience High School in downtown Phoenix. Similar schools or academies are “on the drawing board.”

The **Mesa Public Schools Biotech Academy** is a 3-year program designed to create a community of learners in a “school-within-a-school” format. The academy provides academics combined with a career focus, a team of teachers and bioscience industry involvement. The mission of the academy is to provide students with the skills and knowledge necessary to be competitive within the 21st century global economy and bioscience industry.

**Phoenix Union Bioscience High School**, which opened in 2006, is a math and science–focused school that seeks to prepare students for careers in medicine, research, and related science and education endeavors.

For the 2009–2010 school year, the Arizona Department of Education is working to offer three bioscience options through the Career and Technical Education (CTE) program: biomedical, bioenvironmental, and bioinnovations. Bioscience is an emerging program; at present, the largest number of students participating in bioscience career pathways is in agriculture, primarily in plant sciences. Approximately 20 districts currently offer bioscience-related CTE courses to high school students participating in dual or concurrent enrollment programs.





## Basic Skills Achievement and Other Summary Metrics

### STUDENT ACHIEVEMENT

NAEP Grade 8	AZ	U.S. Avg.	State Rank
Math Average, 2007	275.5	280.2	37
Math, 2007 (% at or above "proficient")	26.3%	31.0%	38
Reading Average, 2007	254.8	261.0	43
Reading, 2007 (% at or above "proficient")	24.3%	29.2%	42
Writing Average, 2007	148.2	154.3	36
Writing, 2007 (% at or above "proficient")	22.6%	30.6%	38

ACT	AZ	U.S. Avg.	State Rank
Percentage of Graduates Tested	15%	43%	44
Math Average, 2008	22.1	21.0	16
Reading Average, 2008	22.3	21.4	20
English Average, 2008	21.3	20.6	23

SAT	AZ	U.S. Avg.	State Rank
Percentage of Graduates Tested	32%	48%	26
Math Average, 2008	522	515	30
Critical Reading Average, 2008	516	502	30
Writing Average, 2008	500	494	31

AP	AZ	U.S. Avg.	State Rank
Math Scores, 2008 (% with a score of 3 or higher)	58.9%	65.2%	40
Math Exams, 2008 (Exams as % of all H.S. grads)	4.9%	8.7%	39
English Scores, 2008 (% with a score of 3 or higher)	56.7%	59.2%	37
English Exams, 2008 (Exams as % of all H.S. grads)	12.5%	18.9%	36

### SUMMARY STATE EDUCATION METRICS

Selected Indicators	AZ	U.S. Avg.	State Rank
High School Graduation Rate, 2005–06	70.5%	73.4%	39
Student/Teacher Ratio, 2006–07	20.2	15.5	48*
Low-income Students, 2006–07 (% of all students)	42.8%	41.6%	–
Expenditure per Student (\$), 2005–06	\$6,515	\$9,154	49

**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).