



Academy of Science
21326 Augusta Drive Sterling, VA 20164
Phone (571)434-4470
George Wolfe, Director
George.wolfe@lcps.org
Jayne Fonash, School Counseling Director
Jayne.fonash@lcps.org
www.lcps.org/aos



The Academy of Science (AOS) is a math and science magnet school program for students in the Loudoun County Public School District. The Academy of Science is located in Loudoun County Virginia, a suburban community 25 miles northwest of Washington, D.C. Of the 267 students who attend the Academy of Science, 67 are members of the senior class. LCPS high schools are accredited by the Southern Association of Colleges and Secondary Schools and the Virginia Board of Education. The Academy of Science is a member of the National Association of College Admission Counselors and complies with the NACAC *Statement of Principles of Good Practice*. The Academy of Science is also a member of the National Consortium of Secondary STEM Schools (NCSSS).

History and Mission: Loudoun County Public Schools (LCPS) opened the Academy of Science in the 2005-06 academic year; the current senior class is the ninth group of students to complete four years of study at the AOS. Students attend the AOS for the science/math/research core while attending their home high schools on alternating days. The mission of AOS is to provide an academic environment where students are encouraged to develop creative scientific endeavors of their own design, while having the opportunity to pursue a rich, well-rounded high school experience. This schedule enables students to maintain involvement in academic and extra-curricular activities at their home school while participating in a rigorous, research-based math and science program.

Admissions: Students are offered admission to the Academy of Science through a competitive process during the eighth grade year. Students and their parents/guardians must be residents of Loudoun County at the time of their application. Students are selected on the basis of a holistic review of their application, standardized test scores, middle school transcript, teacher recommendations, and personal essays. The 2015-16 admissions cycle offered enrollment to 13 percent of applicants. Student motivation and a passion for science and mathematics are the most valuable characteristics of successful AOS applicants. Highly motivated students who are consistent, dedicated learners have the greatest chance of success.

Instruction: The faculty of the AOS is developing a national model for teaching inquiry-based, interdisciplinary science and math. The cornerstone of instruction is a two-year inquiry-based, integrated physical science course, which includes the study of Earth Science, Chemistry, and Physics followed in junior year by a project-based Biology course. Students participate in a three-year science research program beginning with an introductory research course in tenth grade. The science research courses are geared toward developing scientific habits of mind, as well as integrating math, writing, and communication skills into scientific experimentation. Students are required to develop a two-year research project of their own design working independently and collaboratively with peers, mentors, and scientists. Guidance is provided by faculty mentors on campus and from scientists from the regional network of universities and organizations as needed. The cornerstone of math instruction throughout the program is a unique math/science integration that accentuates the understanding of math principles rather than repetition of rote process. Juniors are enrolled in a minimum of AP Calculus AB or BC and by senior year, BC or multivariable calculus. Some students will extend past multivariable calculus. A concentration of modeling/statistics is incorporated at all levels.

Transcripts and Academic Records: Admitted students attend the AOS for their science/math/research core while attending their home high school on alternating days. Transcripts are issued by the student's home high school, and include all courses taken at the AOS and the home high school. GPA and class rank are calculated by the student's home high school; the AOS does not provide a separate GPA or rank. The student's cumulative GPA and class rank includes all LCPS high school credit-bearing courses listed on the transcript. All AOS courses are designated with the prefix "AOS" in the course title.

COURSE DESCRIPTIONS

AOS Integrated Physical Science: This 9th and 10th grade course blends the equivalent of a full year each of physics, earth science and chemistry into a two-year inquiry-based integrated physical science program. The goals of this course are to give students a strong background in the physical sciences, prepare students for advanced study in the physical sciences, present these materials in an integrated fashion, and prepare students for independent research by having them design many of their own laboratory activities.

AOS Sophomore/Junior/Senior Research: The goals of this sequence of three courses are to expose students to a series of interdisciplinary science research activities, to involve students in the application and use of inquiry-based methodology, to introduce the use of techniques, equipment and protocols typically utilized in scientific research laboratories, and to enhance the ability of students to read and write scientific papers at the publication level. Students are expected to complete a two-year research project of their own design under the supervision of a faculty mentor with additional off-campus professional mentorships from educators or researchers from the education and scientific community as needed.

AOS Biology: The course is the next logical step for students who have spent two years in an integrated, inquiry based science program. AOS Biology is an honors level, project/problem based program where a series of scientific dilemmas are posed to students, the students identify what they need to know in order to answer the question, the teacher leads them through the content they need in order to answer the question, and lab activities are planned that will be relevant to the topic covered. This approach not only covers content but helps students develop creativity that is so essential to scientific inquiry.

AOS Analytic Geometry, Functions, and Trigonometry with Transformations: This course begins with an introduction to transformations and matrices with a sampling of applications. The early work is then integrated into a study of the creation and interpretation of linear and quadratic models for data. The work with quadratics includes a transformations based introduction to the complex number system. Transformation ideas are also applied to provide a full introduction to triangle trigonometry with applications. Modeling ideas are extended with the introduction of a variety of the families of exponential, logarithm, and power functions to describe patterns in a broader range of data sets. The overriding aim of this course is to help students focus on the difference between knowing how to perform special techniques and understanding the underlying mathematics so that the techniques can be applied in a variety of settings.

AOS Analysis AB: This course begins with the study of a families of probability density functions used to model the distribution of means computed from data collected from observations. At the same time students are introduced to the design of switching circuits. The work with these topics is followed by a second encounter with several families of functions used to model dynamic processes. The analysis is centered in applications from economics, demographics, medicine and physics. The work with modeling includes tools used to model patterns in rates of change. This is the setting for an introduction to derivatives with several relevant applications. This course prepares students to take an Advanced Placement Calculus course the following year.

AOS Analysis BC: This course includes all of the content of AOS Pre-Bioscience Analysis. In addition students have their first experience with formal definitions of the core calculus concepts of continuity and differentiability and how those concepts are related. This course prepares students to take an Advanced Placement Calculus course the following year.

AOS AB Calculus with Statistics: This course covers all the topics in the College Board's description of an AB level AP Calculus course. In addition, the students experience use of one or more differential equations to create models for a variety of dynamic processes of the types studied in the physical and biological sciences. After the AP exam in May, the students are introduced to classical methods of statistical inference.

AOS BC Calculus with Statistics: This course covers all of the topics in the College Board's description of a BC level AP Calculus course. In addition, the students experience use of one or more differential equations to create models for a variety of dynamic processes of the types studied in the physical and biological sciences. After the AP exam in May, the students are introduced to classical methods of statistical inference.

AOS Multivariable Calculus: This is a course in vector calculus. There is a special emphasis on using vector fields to model motion of particles and fluids in two and three dimensions. The software tool *Mathematica* is used throughout the course to create interactive graphics to enhance the meaning of calculations. In this context students discover methods for computing or approximating double and triple integrals. The work includes the use of the theorems of Gauss, Green, and Stokes to measure flow and turbulence.

AOS Multivariable Calculus with Topics from Differential Equations: This course includes all the topics in the AOS Multivariable Mathematics. In addition the students write differential equations for a variety of oscillating motions including those with damping and exterior forcing. As they explore techniques for getting exact or appropriate solutions of these equations they will work with several techniques included in a first college level course in differential equations.

CLASS OF 2016

POST HIGH SCHOOL EDUCATION

62 Graduates
4-year college.....99%

COLLEGE ADMISSION TEST RESULTS

SAT (OLD)	CR	M	W	TOTAL
VA	494	482	508	
US	520	498	517	
AOS	697	751	696	2144

ACT

VA	23
US	21
AOS	33

NATIONAL RECOGNITIONS

- 12 National Merit Finalists
- 3 National Hispanic Scholars
- 26 National Merit Commended Students
- 1 Coca-Cola Scholar
- 1 Davidson Institute Fellow
- 1 Intel ISEF Dudley R. Herschbach SIYSS Award
- 1 Intel ISEF Best of Category Award in Environmental Engineering

MERIT BASED SCHOLARSHIP AWARDS

Class of 2016 Awarded \$3.1 M
Accepted \$1.4 M

GRADUATION REQUIREMENTS

Required Units

Advanced Studies Diploma

English.....	4
Math	4
Social Studies	4
Laboratory Science	4
World Language	3
Health and Physical Education	2
Fine Arts or Career & Tech Ed.....	1
Economics & Personal Finance.....	1
Electives	3
Total Credits.....	26
9 Verified Units of Credit	

LCPS GRADING SCALE

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Grading Scale Adopted 2009	

Letter Grade	Numeric Grade
A+	98-100
A	93-97
A-	90 - 92
B	87-89
B	83-86
B-	80-82
C+	77-79
C	73-76
C-	70-72
D+	67-69
D	63-66
D-	60-62
F	0-59

CLASS RANK

- The AOS does not calculate class rank.
- AOS students are included in class rank at their home high schools
- AP courses receive a 1.0 weighting
- All AOS courses receive a .5 weighting

SOL STATEMENT

Scores on Virginia Standards of Learning (SOL) Tests are NOT factored into student's grades

SPECIAL CURRICULUM FEATURES

Advanced Placement (AP) -contains at least first-year college level work.

The following are the highest level courses offered in:

Math: AOS AP Calculus AB, AOS AP Calculus BC, AOS Multivariable Calculus.

Science: AOS AP Biology, AOS AP Chemistry, AOS AP Physics, AOS AP Environmental Science

AOS STUDENTS RECEIVED LETTERS OF ACCEPTANCE FROM

THE FOLLOWING COLLEGES/UNIVERSITIES IN 2012-16:

Auburn University	MIT	UC Berkeley
Bowdoin College	New College of Florida	UC San Diego
Brigham Young	NJIT	University of Chicago
Brown University	New York University	University of Illinois
Carnegie-Mellon	North Carolina State	University of
Case-Western Reserve	Northeastern	Louisville
Christopher Newport	Northwestern	University of Maryland
Columbia University	Ohio University	UMBC
College of William & Mary	Ohio State University	UNC Chapel Hill
Columbia University	Ohio Wesleyan	University of Notre
Cooper Union	Penn State University	Dame
Cornell University	Princeton University	University of Pennsylvania
Dartmouth College	Purdue University	University of Pittsburgh
Dennison University	RPI	University of Richmond
Drexel University	Rice University	University of South Carolina
Duke University	RIT	University of Southern
Emory University	Rose Hulman Institute	California
Olin College	Rutgers University	University of Texas
George Mason	Shenandoah University	University of Vermont
George Washington	Stanford University	University of Virginia
Georgetown	Stevens Institute of	University of Washington
Georgia Tech	Technology	University of Wisconsin
Hampshire College	Swarthmore	VCU
Harvard	Trinity College Dublin	Virginia Tech
Harvey Mudd College	Tufts University	Washington U St. Louis
James Madison	U.S Naval Academy	Wheaton College
Johns Hopkins	University of Alabama	Williams
Lehigh University	UCLA	WPI
		Yale College