Mathematics Evaluation Methodology

The evaluation of the Mathematics Program began in 2016-17 with the development of an evaluation design. A planning committee met regularly throughout the year to develop the evaluation questions that would guide data collection for this report. Committee members included staff from Planning and Evaluation, the Mathematics Office, schools, and members of the Mathematics Advisory Committee. Data collection for the evaluation occurred during the 2017-18 school year. This evaluation employed various methodologies to collect data with which to examine the success of the Mathematics Program. In particular, this report addresses the following three components outlined in Arlington Public Schools (APS) policy and procedures (A-6.31) for accountability and evaluation:

1. A description of the department, program, or service (**Appendix A1**)
2. Evaluation questions that ask:
    a. How effectively was the Mathematics program implemented?
    b. What were the outcomes?
3. Recommendations

The executive summary and appendices are located online at www.apsva.us/evaluationreports

Evaluation Design and Questions

Program/Service Objective	Program/Service Question	Data Source(s)
Evaluation Question 1: Implementation – How effectively was the Math Program implemented?		
Objective 1: Best instructional practices for emotional support, classroom organization, instructional support, and student engagement are evident across instruction in math classrooms.	1a To what extent are best instructional practices evident in math instruction?	● Classroom Assessment Scoring System (**CLASS**)
Objective 2: Math instruction in APS aligns with best instructional practices specific to mathematics.	2a To what extent are best instructional practices specific to mathematics evident in APS math instruction?	● Math Observation Tool
	2b To what extent does math instruction facilitate math discourse to: ● deepen students' understanding of mathematics, ● access higher levels of critical thinking skills, ● develop a community of mathematics learners?	● Math Observation Tool ● Teacher survey

	2c To what extent do math instructional staff collaboratively plan with others, including grade-level team members and school-based math coaches?	● Staff survey
	2d To what extent do elementary students have access to personalized learning opportunities delivered through the math workshop model? 2e To what extent do secondary students have access to personalized learning opportunities?	● Math Observation Tool
Objective 3: APS students are appropriately **challenged** and **supported** in learning mathematics.	3a To what extent do math teachers differentiate instruction for students to effectively infuse depth and complexity into their math learning for all learners?	● CLASS ● Math observation tool ● Staff survey
	3b To what extent do math teachers monitor student progress and use data to plan instruction to target the needs of diverse learners? (Sub-question: How are students being grouped based on formative assessments? – within math instruction and in addition to regular math instruction)	● Staff survey
	3c What are the various math pathways that students are taking in APS? ● What courses are students taking over time? ● What courses are students re-taking? ● What is the number of math courses taken from 6-12? ● How many students take two math classes at once (e.g. block algebra or geometry, or strategies)	● Longitudinal enrollment data ● Secondary enrollment
	3d To what extent do all students participate in higher level mathematics courses?	● Secondary enrollment

	3e How long does it take high school students who are LEP or who have disabilities to enroll in credit-bearing math courses? 3f How successful are LEP students once they reach credit-bearing math courses? (grades, SOL scores) 3g What math courses are HILT A and B students taking? ● Who teaches their classes? What is their certification? (HR data) ● makeup of class (enrollment data)	● Placement data – look at different pathways that LEP/SWD take, including up to graduation (combine with question above about pathways – disaggregate LEP and SWD).
Objective 4: APS math teachers possess the necessary content knowledge to effectively help students learn the APS math curriculum.	4a To what extent do math teachers possess the necessary content knowledge to effectively help students learn the math curriculum? 4b To what extent are secondary teachers becoming dually certified in math and ESL?	● HR data: endorsements ● Math observation tool ● Teacher survey
	4c To what extent do elementary teachers participate in content academies?	● Staff survey
	4d To what extent do participants in elementary content academies report an increase in their confidence about teaching math?	● Staff survey
Objective 5: APS manages math resources effectively.	5a To what extent are math teachers satisfied with school- and division-level support? (PD, coaches, resources, apps, feedback?) 5b To what degree are teachers using Power School or similar resources to create formative assessments? 5c How are teachers using formative assessments?	● Staff survey
	5d Which centrally-provided curriculum resources being used and to what extent?	● Staff survey ● Math observation tool
	5e What is the role of math coaches and lead teachers?	● Teacher survey

Program Service/Objective	Program/Service Question	Data Source(s)
Evaluation Question 2: Outcomes – What were the outcomes for the targeted population?		
Objective 6: APS students demonstrate achievement in mathematics.	6a To what degree do students and student groups demonstrate achievement in mathematics?	APS K-1 assessments (APSnet) SOLs (pass proficient/pass advanced) ● AP/IB ● SAT (check availability) ● Math Inventory *3-5 years of data, disaggregated by demographic groups*
	6b What is the impact of middle school math acceleration on longitudinal math achievement? (in comparison to students following non-accelerated path)	● Longitudinal study of cohort, including: o Course placement o Grades? o Test scores (EOC SOLs) (look at correlation between previous year score and next year score?) o SAT scores/ACT scores o AP/IB placement/scores o Dual enrolled placement and pass rates o Are they re-taking Algebra I? o diploma type if we go far back enough
	6c To what extent do teachers report that their current students who took an accelerated pathway are adequately prepared for their current math class?	● Teacher survey
Objective 7: Students complete Algebra I successfully by Grade 8.	7a To what extent do students and student groups successfully complete Algebra I or above by 8th grade? 7b To what extent are middle school students adequately prepared for Algebra I when they take the class? 7c To what extent are students who take Algebra I in middle school adequately prepared to succeed in subsequent math coursework?	● Enrollment ● SOLs ● Summer school/year data to see how many students repeat course ● how will grade expunging impact availability of data? (will grades be available?) ● teacher survey - how prepared are their students when they arrive in Algebra II, etc? ● how many ms students take algebra I and strategies?

Study Measures

Data sources used to inform this evaluation are described in detail below.

Classroom Assessment Scoring System (CLASS)

Arlington Public Schools uses the Classroom Assessment Scoring System (CLASS) observation tool to assess the quality of interactions between teachers and students for all program evaluation areas. It was developed by the University of Virginia's Curry School of Education as an early childhood observation tool, and later expanded to include other grade levels. CLASS observations were conducted in K-5 elementary classrooms during ELA instruction and secondary English Language Art classes throughout the 2016-17 school year at all grade levels. The domains and dimensions of the CLASS tool are described in detail in **Appendix B1**. **Appendix B2** describes the alignment between CLASS dimensions and APS best instructional practices. A summary of CLASS observations conducted for this evaluation is available in **Appendix B3.**

APS-Developed Observation Tools

The Mathematics Office, the Office of Planning and Evaluation, and the Mathematics evaluation planning committee adapted and developed observation tools (separate tools for Elementary, Middle School and High School) to assess the prevalence of best instructional practices specific to Mathematics.

Recently retired Mathematics teachers from Virginia school districts were hired to observe classes. Observers were assigned to either Elementary, Middle School or High School and participated in an all-day training. Observations occurred during the 2017-18 school year.

The tool can be found in **Appendix B4**. Full results for these observations can be found in **Appendix B5.**

Secondary Course Enrollment

The Hanover Research Council (HRC), an information research and analytics form, was contracted by APS to prepare a longitudinal study evaluating the various mathematics course pathways APS student stake from middle school through high school. The report includes two cohorts of students – those who graduated from APS at the end of the 2016-17 school year and those who graduated from APS at the end of the 2017-18 school year.

The full study is available in **Appendix C1**. Disaggregated advanced course enrollment numbers can be found in **Appendix C2**.

Surveys

A survey was administered to students, staff and administrators in the spring of 2017. This data is available in **Appendix B6**.

Student Outcome Data

Kindergarten and Grade 1 Assessment Data – **Appendix D1**
Standards of Learning (SOL) Scores – **Appendix D2**
Mathematics Inventory Assessments – **Appendix D3**
Advanced Placement (AP) Scores – **Appendix D4**
International Baccalaureate (IB) Scores – **Appendix D5**