

# RESEARCH BRIEF

Research Services

Vol 1706  
January 2018

Vanessa Gonzalez Hernandez, Ph.D.

## SCIENCE, TECHNOLOGY, ENGINEERING, ART AND MATHEMATICS (STEAM) SCHOOL DESIGNATION PROGRAM DESCRIPTION

### At a Glance

Since 2015, M-DCPS has emphasized the importance of Science, Technology, Engineering, Art and Mathematics (STEAM) education in students' college and career preparedness through its school designation program. Schools must meet a rigorous set of criteria in integrations, operational criteria, and academics to receive a STE(A)M designation. The District currently has 45 STEM and 48 STEAM elementary, middle, high and K-8 schools. STE(A)M schools designated as Silver or Gold met or exceeded the percentage of students scoring at a level 3 or above in science and mathematics as compared to the District overall.

### INTRODUCTION TO STE(A)M

Science, Technology, Engineering, Arts and Mathematics, or STEAM, is used to describe a method of educational focus on these subjects in schools. Most of the fastest growing occupations in the United States depend upon mastery of mathematics and scientific knowledge and skills. The standard of education must keep up with the changing times so that students are able to become qualified to a level in which they can fill jobs in this increasingly important sector.

### HISTORY OF M-DCPS STEM PROGRAM

Principals, teachers, students, Florida Department of Education personnel, and District staff convened in 2014 to embark on the STEM initiative. They achieved their goal of devising and building a STEM school designation rubric, which would give the District a way to identify and promote STEM schools to external stakeholders. The District's initial focus was on science, mathematics, Career and Technical Education (CTE) and advanced academics. In the subsequent 2016-2017 school year, Visual and Performing Arts Education was added to create a parallel STEAM designation. The acronym STE(A)M is used herein when applying to both programs.

## **STE(A)M SCHOOL DESIGNATION RUBRICS**

Schools are awarded 1 of 4 levels (Participant, Bronze, Silver, or Gold) based on their performance and participation throughout the year. These levels and their requirements are described within this report.

The STE(A)M school designation rubrics are used to assign points to schools based on certain criteria and award designations in the categories of Bronze, Silver, and Gold. They are constructed by school type, including elementary, middle, K-8, and high school. All rubrics have the common basic building blocks, incorporating integration, operation, and academic criteria.

**Integration criteria** refer to the level of integration at a given school, ranging from a class, grade, to the entire school. This means that schools with greater integration across grade and department levels receive more points toward their designation than those operating at a single grade level.

**Operation criteria** involve STE(A)M course offerings, teacher professional development, student STE(A)M competitions, and parent showcases.

- Across all school types, the rubric contains requirements for teacher professional development, partnerships, and STE(A)M competitions.
  - At a minimum, 40% of teachers are required to participate in at least one STE(A)M-focused professional development activity. Schools receive maximum points toward their designation if 60% or more of their teachers engage in STE(A)M-focused professional development.
  - Moreover, schools are required to maintain at least two business, community, or post-secondary partnerships involved with the STE(A)M program.
  - Schools are also required to participate in several Science Fairs and other STE(A)M focused events throughout the school year. Additionally, middle and high schools are required to participate in related CTE competitions.
- Naturally, science and mathematics course offerings depend on the school type since students are able to participate in more elective choices as they progress through middle and high school.
  - Elementary schools are required to have at least two science and two problem solving showcases using STEM lessons.
  - Middle schools are required to have at least 25% of 8<sup>th</sup> grade students enrolled in advanced science and mathematics courses, and 5% of 7<sup>th</sup> grade students enrolled in advanced science courses.
  - High schools are required to offer three science and three mathematics courses in the following areas: Advanced Placement (AP), International Baccalaureate (IB), Cambridge Advanced International Certificate of Education (AICE), or Dual Enrollment (DE). Additionally, they must have a minimum of 5% of total students enrolled in one of each of those courses.

- Alternately, high schools with less than or equal to 500 students must offer at least two science courses and one mathematics course.
- Middle and High schools are required to also offer Career and Technical Education (CTE).
  - Schools must offer at least one CTE course within a STEM career cluster.
  - Additionally, schools must maintain the minimum district average passing rate for the accompanying Industry Certification Exam (ICE).
- For those schools applying for a STEAM designation, there are Visual and Performing Arts (VPA) Education offering requirements as well.
  - All schools, regardless of type, are required to participate in at least one district performance or exhibition event yearly.
  - Elementary schools are required to offer at least one hour of continuous instruction per week in art and music.
  - Middle and high schools are required to offer one of the VPA strands inclusive but not limited to band, orchestra, chorus, art, drama, dance, guitar, in its complete course sequence.

**Academic criteria** involve STE(A)M equity among students and accountability in science and mathematics.

- All schools are required to increase the percentage of students scoring at Achievement Level 3 or higher on the state science and mathematics assessments by at least three percentage points. Alternatively, schools may exhibit at least 40% of the students scoring at Achievement Level 3 or higher on both Science and Mathematics state assessments.
  - Additionally, to establish equity among all students, minority and economically disadvantaged students (students eligible for the free and reduced-price lunch) are also expected to perform at the same standards on both state assessments.
- Middle schools are also required to have at least 25% of 8<sup>th</sup> grade and 5% of 7<sup>th</sup> grade minority and economically disadvantaged students enrolled in advanced science courses and 25% of 8<sup>th</sup> grade students in advanced mathematics courses.
- High schools also need to offer at least three AP/IB/AICE/DE in science and two in mathematics, with a minimum of 5% of minority and economically disadvantaged students enrolled in one of these courses.
- High schools are additionally required to show an increase of at least one percentage point on the college career acceleration success component of the school grading system. Alternatively, schools must earn a minimum of 40% points on the college career success component.

School STE(A)M liaisons submit evidence to support the fulfillment of the rubric requirements throughout the year. In addition, schools are evaluated during a yearly visit from the M-DCPS Office of Academics and Transformation. As reported, student academic performance is measured by FSA, FCAT, and EOC scores; as well as AP, IB, and Cambridge student enrollment; and Industry Certifications where applicable.

Schools are designated as Participant, Bronze, Silver, or Gold status based on the amount of points earned on each criterion by the end of the school year. Cut scores for the various school designations were established for the 2015-2016 academic year and remained the same for the 2016-2017 year. In 2017-2018, cut scores were adjusted by 5 to 10 points to provide incentives for continued academic growth. Therefore, schools are expected to earn more points to achieve or maintain their designated status in the 2017-2018 school year, than in years prior.

### **M-DCPS STE(A)M SCHOOL DESCRIPTIONS**

M-DCPS began assigning STEM designations in the 2015-2016 academic year, and both STEM and STEAM designations in the following academic year, 2016-2017. In their first year, 2015-2016, M-DCPS received over 90 STEM applications, where 77 schools completed the year-long program, and 56 (73%) received a Gold, Silver, or Bronze designation. The following year, 2016-2017, the District introduced the STEAM designation program, therefore schools were identified as either STEM or STEAM depending on the inclusion of an arts program. In 2016-2017, the District received over 115 STE(A)M applications, where 109 completed the program, and 93 (81%) were designated as STEM or STEAM. Schools that applied for a designation and were not able to achieve Bronze, Silver, or Gold status, are labeled as Participants. Figure 1 depicts the number of schools in each designation by academic year and program type. From the 2015-2016 to 2016-2017 academic year, there was an increase in the number of schools with a gold designation.

**Figure 1**  
**Number of Schools by Designation and Program Type, 2015-2016 and 2016-2017**

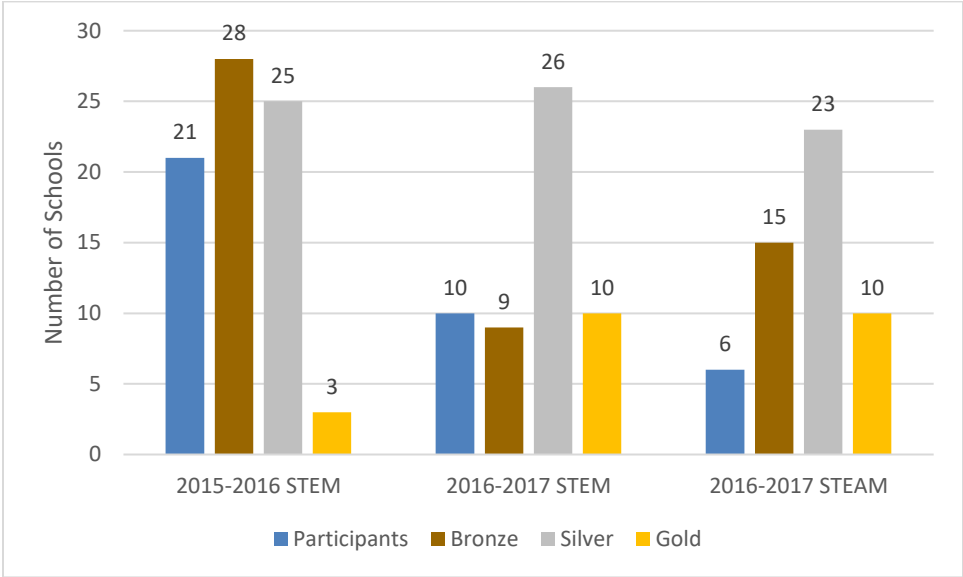


Figure 2 displays the retention rate of schools continuing to receive a STE(A)M designation from the 2015-2016 to 2016-2017 academic year. The majority of schools, 66 out of the 77, with a STEM designation in 2015-2016 remained with a designation in 2016-2017, resulting in an 86% retention rate. An additional 43 new schools achieved a STE(A)M designation in 2016-2017.

**Figure 2**  
**STE(A)M School Retention Rate, 2015-2016 to 2016-2017**

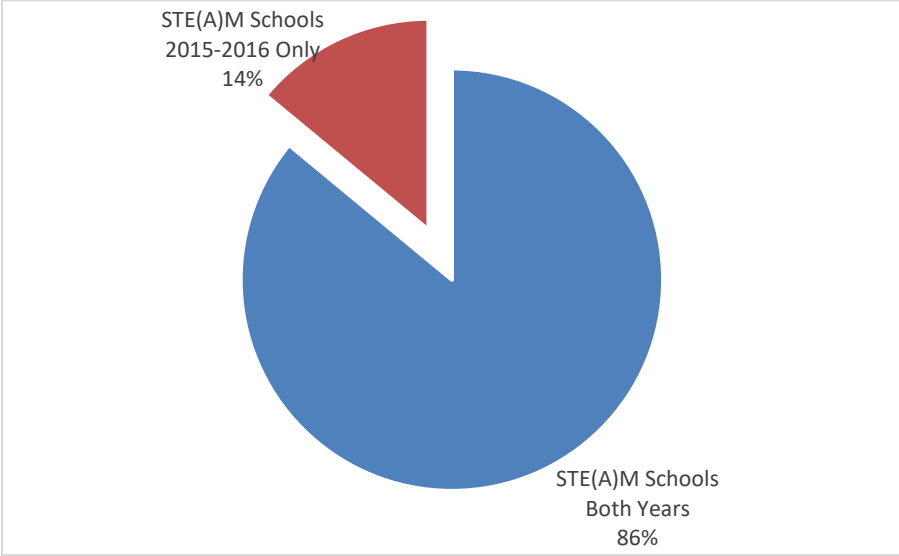
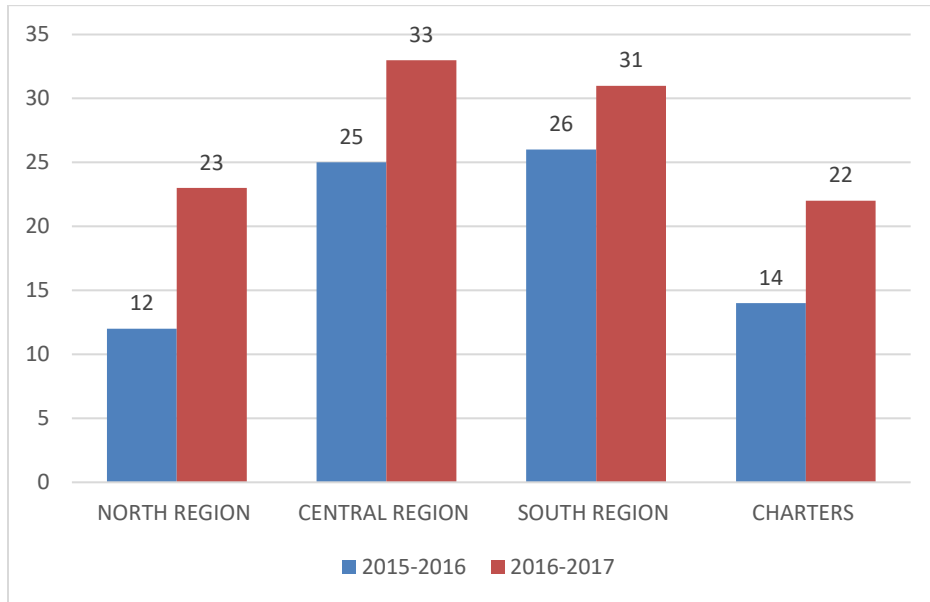


Figure 3 shows the number of STE(A)M schools by region. All regions saw an increase in the number of designated schools from 2015-2016 to 2016-2017, with the South region having the most STE(A)M schools in 2015-2016 and the Central region having the most in 2016-2017.

Figure 3  
Number of STE(A)M Schools by Region and Academic Year, 2015-2016 and 2016-2017

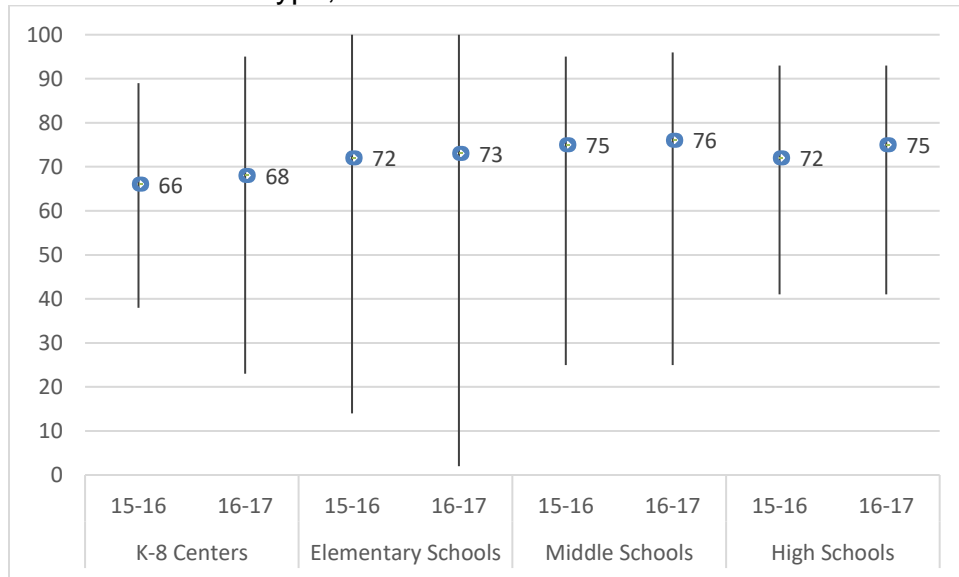


### STE(A)M STUDENT EQUITY

Part of the STE(A)M designation rubrics aim to ensure equity in enrollment of STE(A)M course offerings and academic achievement for all students, regardless of economic status. In the District, an average of 75% of students are eligible to receive free or reduced-price lunch (FRL). The majority of STE(A)M schools are found in the central region, which has an average of 78% of FRL students.

Figure 4 shows the range and the average percentage of students receiving the FRL program by school type. Rates of FRL within school type remained relatively stable from the 2015-2016 to 2016-2017 school year. In both years, the highest and lowest percentage of students receiving FRL was seen in STE(A)M elementary schools, where middle schools had the highest average percentage of FRL students.

Figure 4  
 Percentage Range of Students with Free/Reduced Price Lunch by STE(A)M School Type, 2015-2016 and 2016-2017

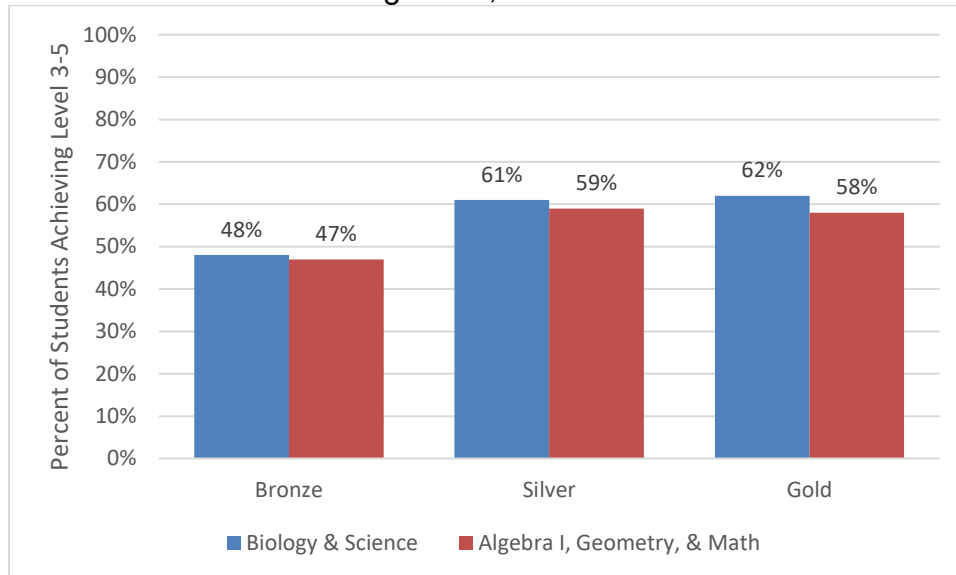


### STE(A)M ACADEMIC ACHIEVEMENT

Academic achievement in science and mathematics is assessed in grades 3-8 through the End of Course assessments in Algebra I, Geometry, and Biology, FCAT in Science, and the FSA in Math, for their respective grade levels. Based on the 2016-2017 District grades, 55% of students in the District scored a level 3 or above on science achievement, across all grade levels and subjects. In addition, 58% of students in the District scored a level 3 or above on mathematics achievement, across all grade levels and subjects.

Figure 5 displays the percentage of students who achieved a level 3 or above by each STE(A)M school designation, Bronze, Silver, or Gold, for the 2016-2017 academic year. Generally, schools designated as Bronze had the lowest percentage of students achieving a level of 3 or above on state assessments, where Silver and Gold STE(A)M schools had the highest percentage. STE(A)M schools designated as Silver or Gold met or exceeded the percentage of students scoring at a level 3 or above in science and mathematics as compared to the District overall.

Figure 5  
Percent of Students Achieving Level 3-5 on State Assessments by STE(A)M School Designation, 2016-2017



## SUMMARY

In summary, M-DCPS has a growing number of schools with a STEM or STEAM designation, located all over the District. These schools must meet a set of rigorous standards pertaining to the integration, operation, and academic accountability of their STE(A)M course offerings. Expectations in accountability promote a focus on student academic growth and achievement, seen especially in schools designated as Silver or Gold, which met or surpassed the District average on science and math state assessments in 2016-2017. In addition, students are expected to enroll in STE(A)M courses and achieve academic growth, regardless of ethnicity or economic status.

The primary goal of the M-DCPS STE(A)M designation program is to promote STEAM/STEM education and integration among its disciplines, thus impacting the community beneficially at a variety of levels. As a result of the designation process, STE(A)M schools are marketed to the community via the website and social media with the goal of establishing credibility, targeting parents and local businesses. Parents become aware of the choices available to them in selecting their child's education and preparing them for the future. Additionally, businesses can create beneficial partnerships and leverage the potential resources created as a result. Schools and teachers also benefit from the STE(A)M opportunities in professional growth. Students benefit from the variety of curriculum offerings, and exposure to community businesses that will prepare them for the workforce or post-secondary education.