Strategic Plan for Advancing Science, Technology, Engineering, and Mathematics (STEM) Education In the District of Columbia

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I. Introduction: The Current Landscape of STEM Education

Now more than ever, as we continue to move towards a highly global and competitive economy, Americans need to be prepared with a strong science, technology, engineering, and math (STEM) background. This is especially critical if we want to ensure the growth of innovation and productivity within the United States (U.S.). [1] However, despite the growing demand for STEM-ready professionals, Americans are not studying or obtaining STEM related degrees at the rate needed for these roles. [2] Young adults often graduate unequipped with the 21st century skills demanded of our global economy. [3] Skills such as (a) critical thinking, (b) problem solving, (c) creativity, and (d) communication are not being cultivated and developed in ways that are needed in the current and future job market.[4] Consequently, as labor opportunities continue to expand (i.e., within STEM and occupations not traditionally associated with STEM, but requiring STEM related skills) Americans will be unable to fill the void.[5] Though the District of Columbia boasts one of the most educated workforces in the country, employees with STEM skills remain in high demand.[6] In 2013 alone, more than 55 percent of jobs posted required a strong background in STEM.[7]

Even in a troubled economy, the District remains a place with stability in employment, with an overall unemployment rate of 7.6 percent. Despite this number, certain zip codes have been hit hard in the District with unemployment rates 3-13 percent higher[8] than the August 2014 overall national rate of 6.1 percent.[9] Furthermore, DC residents most likely to be unemployed are youth, minorities, and those with low levels of education. These residents often become stuck in low-wage occupations and cannot shake off the poverty that a solid education can help overcome. Initiatives that are focused on closing this gap must remain a priority. Establishing a strategic STEM plan to aid in bridging this gap will prepare youth academically in the District for the more than 94,000 STEM related careers that will be housed in DC by 2018.[10]

The District of Columbia has a unique educational governance structure. With more than 80,000 students enrolled in the 62 Local Education Agencies (LEAs) in the District, and roughly 8,000 teachers educating our students, it is imperative that STEM efforts are implemented with fidelity to ensure students can benefit from the opportunities afforded to them.

DC's One City Action Plan[11] outlines three strategic goals focused on three core areas: (a) economic development, (b) education and workforce development, and (c) quality of life for District residents. The plan proposes a new technology innovation hub to be established in Ward 8, along with technology incentive programs for businesses and the development of a 100-gigawatt network. These efforts have gained momentum and established DC as a nationally recognized "Tech Hub," opening up career opportunities in the field of Information Technology (IT); making it one of DC's most promising areas of

[1] (Committee, January 2014)
[2] (Akua Carraway, 2012)
[3] (Harvard Graduate School of Education, 2011)
[4] (Harvard Graduate School of Education, 2011)
[5] (Committee, January 2014)
[6] (Washington Post, 2014)
[7] (Brookings Institute Report, 2014)
[8] (DC Department of Unemployment Services, August 2014 Update)
[9] (Bureau of Labor Statistics, 2014)
[10] (STEM Connector Report, 2011)
[11] (DC One City Action Plan, 2012)

employment. Similarly, implementation of the Sustainable DC vision has stimulated local demand for (a) renewable energy; (b) increased renewable energy retrofits; and (c) improvements in transportation, health and wellness; leading to increased demand for high skilled STEM professionals to meet the needs of the local STEM economy.

Employment projections from the Bureau of Labor Statistics demonstrate a greater demand nationally for workers in STEM occupations in comparison to non-STEM fields within the next decade. These STEM opportunities will require a more educated and trained workforce, emphasizing the importance of some type of postsecondary education or training.[12] As a city boasting a STEM-rich economy, the District is well-positioned to be an exemplar in education preparation for careers in these fields; however, pathway systems currently in place to prepare and enable our youth to lead productive and prosperous lives operate incongruently with the needs of our economy.[13] Thus, there is a need for strong preparation across STEM disciplines and connected learning experiences to engage and prepare youth for postsecondary study. It is critical for all DC stakeholders to understand the complexity of the current and future work environment, including the priority to provide equitable opportunities through broadening access to reach all DC students. Although the District has made consistent progress toward outlined goals, a coordinated system of support is needed to continue actualizing a cohesive vision for PK-16 STEM education that is aligned both horizontally and vertically. The DC STEM Network will serve to unite stakeholders in the STEM system.

The STEM Education Climate

The need for a highly adept STEM workforce and a scientifically, mathematically, and technologically literate population has become evident in the 21st century. Keeping up with other nations as they make rapid advances in science and technology is a matter of national urgency.[14] Despite America's historical record of achievement, the country now lags behind other nations in elementary and secondary STEM education. When comparing students' performance in science and math internationally, the U.S. consistently places in the middle to lower ranges.[15] In order to ensure the U.S. has a STEM-proficient workforce that is able to meet the needs demanded of the labor market, preparation needs to occur in order to ensure that all students will be proficient in STEM subjects and motivated to pursue STEM careers.[16]

DC has made substantial improvements in math and science performance since 2007; however, in order to meet DC's proficiency goals by 2020, ongoing and measureable actions continue to be required. Proficiency data in math and science of students in 5th and 8th grades and high school on the District of Columbia's statewide assessment, the DCCAS, indicate that although the District is making progress, we still lag behind other states.

Closing the achievement gap and increasing proficiency in STEM subjects must remain a priority. Doing so requires increasing the number of qualified STEM teachers in the classroom, a chronic challenge in the K-12 education system.[17] Often times schools lack STEM teachers who are able to teach and impart instruction effectively. Teaching STEM subjects require deep content knowledge and mastery of the

[12] (Committee, January 2014)
[13] (Harvard Graduate School of Education, 2011)
[14] (President's Council of Advisors on Science, September 2010)
[15] (President's Council of Advisors on Science, September 2010)
[16] (John Thomasian, Black Point Policy Solutions, LLC, December 2011)
[17] (John Thomasian, Black Point Policy Solutions, LLC, December 2011)

pedagogical skills needed to relay the content matter.[18] Moreover, attracting and retaining highly effective STEM teachers requires recognizing and consequently rewarding such talent. When educators lack the support they need, they are often lured by the higher wages available to them outside of the educational arena.[19] Effective educators are the key to mitigating this exodus from the STEM pipeline. [20] They can prepare students with a strong foundation in STEM and facilitate their pursuit of STEM occupations. Similarly, they can inspire students to persist in the field and invoke their interest. [21]

Securing and maintaining effective STEM educators is a major challenge in the K-12 education system, but it is not the only inhibiting factor impacting the STEM pipeline.[22] Although students may shy away from STEM majors for many reasons, it is not just a lack of math and science proficiency that leads to higher rates of diversion to other fields, but also a lack of interest in STEM itself.[23] Often lacking the opportunities to experience and explore STEM concepts at a deeper level than the academic classroom provides, students become unmotivated and are unable to connect to the subject matter. Out of class and extended day activities in science, technology, engineering, and math can serve to counter this effect. [24] Since these types of activities can be experienced in a multitude of forms and are positively correlated to increasing students' interest in the field, engaging in them creates positive experiences for students regardless of their achievement in a formal learning environment.[25] This is especially true for female and minority students who are disproportionately underrepresented in STEM fields. [26] For these students, they have come to believe very early in their educational career that they are unable to excel in STEM. However, out of class and extended day activities can change these perceptions and build interest through hands on projects; helping to bridge the gap between seemingly abstract theories and real world applications. [27]

Out of class and extended day activities are equally important for low and high-achieving students, for it is not just low achieving students who lose interest in pursuing STEM careers. High achieving students also run the risk of desisting from the STEM pipeline.[28] Approximately 28 percent of high school freshman express an interest in STEM related careers; however, of these students, nearly 60 percent lose interest by the time they graduate high school.[29] Out of class activities could serve as an outlet for these students to exercise their abilities and undertake new challenges.[30]

In the elementary years most students begin to identify and express their interests in STEM fields. Once they reach secondary school, solidifying those interests and searching for opportunities that would make those STEM dreams a reality becomes the priority.[31] Nonetheless, without the right exposure and further development of that interest in the subject matter, students will likely forego STEM occupations

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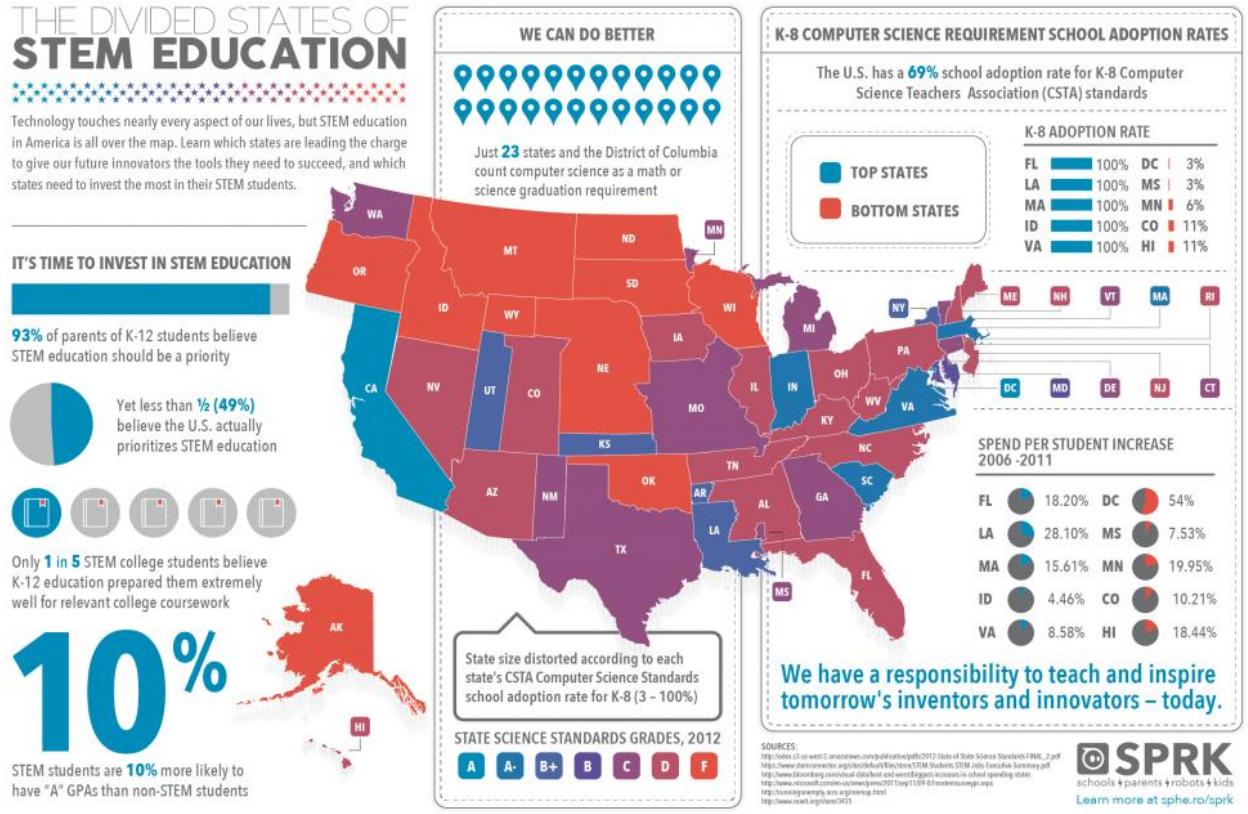
[18] (President's Council of Advisors on Science, September 2010)
[19] (Committee, January 2014)
[20] (John Thomasian, Black Point Policy Solutions, LLC, December 2011)
[21] (John Thomasian, Black Point Policy Solutions, LLC, December 2011)
[22] (John Thomasian, Black Point Policy Solutions, LLC, December 2011)
[23] (Committee, January 2014)
[24] (John Thomasian of Black Point Policy Solutions, LLC.)
[25] (John Thomasian of Black Point Policy Solutions, LLC.)
[26] (President's Council of Advisors on Science, September 2010)
[27] (Andrew Volmert, 2013)
[28] (President's Council of Advisors on Science, September 2010)
[29] (STEMconnector, 2012)
[30] (John Thomasian of Black Point Policy Solutions, LLC.)
[31] (John Thomasian, Black Point Policy Solutions, LLC, December 2011)

altogether because they fail to see (a) the linkages between what they learn in the classroom, (b) how it can be applied in the real world, (c) and (d) consequent conversion into a future career.

The U.S. cannot remain at the forefront of science and technology if students do not acquire the level of STEM proficiency needed to compete in the highly competitive global economy.[32] Without reform, the U.S. education system will be unable to produce the talent needed to fill the volume of projected STEM roles. Currently, STEM occupations are projected to more than double the rate to 20.8 percent of the overall U.S. labor force through 2018.[33]

Figure 1: STEM Education Across the U.S.



[32] (President's Council of Advisors on Science, September 2010)
[33] (STEMconnector, 2012)

II. Addressing Needs and Ensuring Success: DC's STEM Plan at a Glance

The District of Columbia's STEM Plan will be implemented in three distinct phases: (1) Awareness, (2) Readiness and Transition, and (3) Sustainability and Monitoring. Currently in Phase two, the focus is ensuring identified goals are met successfully. Feedback from stakeholders will be collected continually to ensure we are meeting the needs of STEM educators and community members.

a. Overarching Goals and Metrics of Success

Many well-developed partnerships and a commitment to STEM have resulted in pockets of excellence in STEM education in DC, as demonstrated by the consistent gains in student achievement in math and science over the past 5 years and momentum around the adoption and implementation of college- and career aligned standards for both Mathematics (2010) and Science (2013). Continuing the development of college- and career ready pathways has remained a priority, with strategic initiatives in both Early Childhood and Career and Technical Education (CTE). In 2012, DC established its commitment to college and career readiness, releasing a strategic plan for CTE.

In 2013, $2.8 million was allotted to nine National Academy Foundation (NAF) career academies at traditional public and public charter school campuses in the District, with the goal of preparing students in three of the District's most vital and fast-growing career sectors: information technology, engineering, and hospitality.[34] This initiative is inclusive of outreach to middle school students to design direct pathways to college and careers. With an investment in establishing pathways to support careers and industry certification in engineering, information, technology and construction at the secondary level, it is essential to have a strong foundation for STEM in the early grades and to continue to attract, support and retention of effective STEM educators.

The District is also home to a wide variety of (a) community based organizations, (b) STEM businesses, (c) STEM professional societies, (d) colleges and universities, (e) federal government and research institutions, (f) world class museums, and (g) zoos and nature centers. There is a need to develop more collaborative and strategic partnerships between public schools and our community resources in an effort to (a) supplement classroom enrichment, (b) engage in opportunities to integrate classroom resources, (c) support sustained student and teacher learning communities, and (d) coordinate to address infrastructural challenges and develop LEA capacity in support of STEM pathways. With its robust reform efforts, a multitude of innovative Local Education Agencies (LEAs), and its central geographic location, the District of Columbia is well-positioned to be a model for STEM education.

In an effort to strengthen its STEM pipeline and improve opportunities for all students, the District has established two overarching goals[35], with aligned targets, to drive its STEM reform agenda:

1. To prepare all students in DC to graduate high school with a college and career ready mastery of math, science, engineering and technology
2. To increase the number of DC students who major in STEM fields in college and enter STEM careers

[34] (OSSE, Mayoral press release, 2012)
[35] (DC Race to The Top (RTTT) Application, 2010)

The table below indicates targets set for each of the goals identified for STEM reform. Data collected on targets will be derived from the State-wide Longitudinal Education Data System (SLED), overseen by OSSE's Division of Data, Assessment, and Research. The SLED tool is a single, comprehensive repository of student and education related data needed to improve education planning, management, reporting, instruction, and evaluation. In addition, SLED provides District stakeholders with a system for accessing standardized information about students' academic development (e.g., state-wide assessment data, SAT/ACT, AP performance and participation) over multiple years and across the District's education institutions.

Table 1: Overarching Goals and Targets to Drive STEM Reform

	Targets
<u>Goal 1</u> To prepare all students in DC to graduate high school with a college and career ready mastery of math, science, engineering and technology	• Reduce non-proficiency, as measured by DC standardized assessment in math, by 50% over ten years in equal annual increments from the 2014-15 school year baseline • Reduce non-proficiency, as measured by DC standardized assessment in science, by 50% over ten years in equal annual increments from the 2014-15 school year baseline • Increase the percentage of Pre-K – Grade 5 students who receive at least 3 hours of science per week • Increase student participation in advanced STEM courses in grades 9-12 across all LEAs
<u>Goal 2</u> To increase the number of DC students who major in STEM fields in college and enter STEM careers	• By 2017, 80 percent of District students concentrating on STEM CTE programs will complete programs of study that lead to a certification, credential, or diploma associated with one of the District's most promising occupations; • Increase college majors in math and science by 50% over 5 years

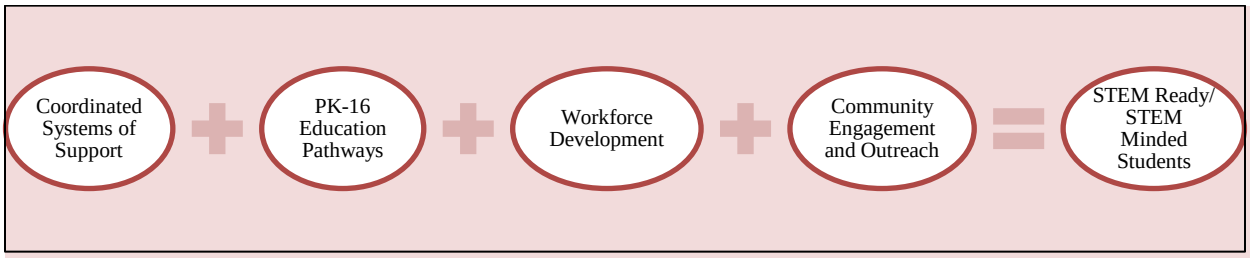
b. DC's Theory of Action

The District of Columbia's goal is for all students to be STEM ready – whether they enter into STEM careers, or other career fields. To achieve breakthrough results in the preparation of all DC students to be fluent in STEM subjects and to engage and prepare a significantly larger and more broadly representative population of students for STEM professional careers requires a commitment to a cohesive, whole-system transformation.

This includes a systemic commitment and equitable access to regular and authentic STEM learning opportunities supported by (a) practicing STEM professionals, (b) institutions of higher education, and (c) community-based programs. Coordination resulting from a combination of locally responsive initiatives and a system of community support that (a) inspires students, (b) motivates educators, and (c) engages community partners will ensure access to high quality STEM education and potential STEM career options for DC's students. In order to engage all students in STEM subjects, it is necessary to raise student awareness of how STEM affects their everyday lives through strong community engagement

and academic coherence. Increased awareness of the relevance of STEM in students' daily lives, coupled with high quality STEM connections through in- and out of school learning experiences, can spur students to become more "STEM minded;" a necessity for students pursuing STEM focused coursework and careers.

Figure 2: Components for STEM Readiness



c. DC's Four Key Priorities

In order to ensure students are prepared to be STEM ready for college- and careers, the District has identified four priority areas: (a) PK-16 STEM Education Pathways, (b) STEM Workforce Development, (c) Systems of Support, and (d) STEM Community Engagement and Outreach, with a comprehensive focus on broadening access and equity. The education pathway priority will focus on ensuring pathways are developed for students from the time they enter school through their postsecondary education career. The workforce priority will focus on connecting with business and community partners to engage students in opportunities that will prepare them for STEM careers. The systems of support priority will focus on establishing a STEM Network and identifying and disseminating evidence-based practices in STEM. Finally, the community engagement and outreach priority will focus on increasing awareness of STEM education throughout the District.

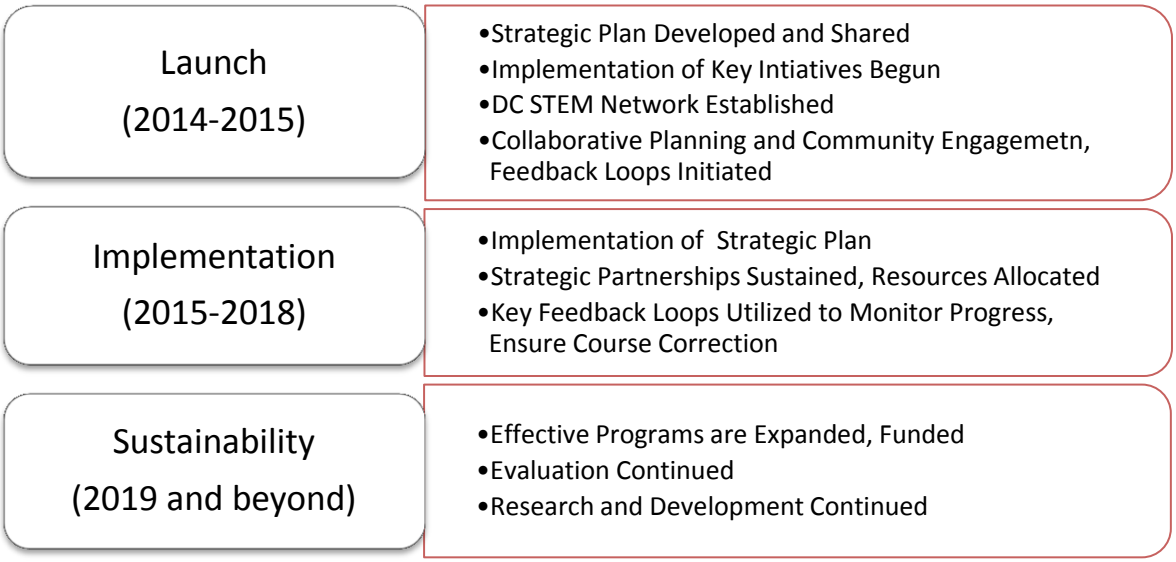
Table 2: STEM Priorities

PK-16 STEM Education Pathways	**STEM Workforce Development**
Developing equitable pathways to support STEM awareness, interest, engagement, and achievement from Pre-K through Postsecondary study	**Strategies aligned to address the demand for a highly skilled STEM workforce and create equitable opportunities for students to engage in career pathways**
Systems of Support	**STEM Community Engagement and Outreach**
Developing a coordinated system of support to actualize a cohesive vision for PK-16 STEM education that promotes equitable access to STEM rich opportunities for DC students and families	**Coordinated systems of support to promote city-wide engagement and awareness of STEM education initiatives and opportunities**

These priority areas outline the key themes addressed in the STEM Strategic Plan. These priorities support the initiatives and strategies called for in the two overarching RTTT goals. To that end, currently and moving forward, all goals focus on (a) leveraging existing systems of support, (b) supporting STEM community engagement and outreach initiatives, (c) supporting pathways in STEM for PK–16, (d) cultivating support for STEM educators, and (e) promoting and measuring workforce development.

Fundamental aspects of the DC Strategic STEM Plan include implementation and sustainability. Accordingly, OSSE will work collaboratively with key stakeholders, including the DC STEM Network and the DC STEM Advisory Board, to facilitate the implementation of the Strategic Plan in three distinct phases: Launch, Implementation, and Sustainability.

Figure 3: Phases of STEM Implementation



III. DC's STEM Implementation Plan: Benchmarking for Success

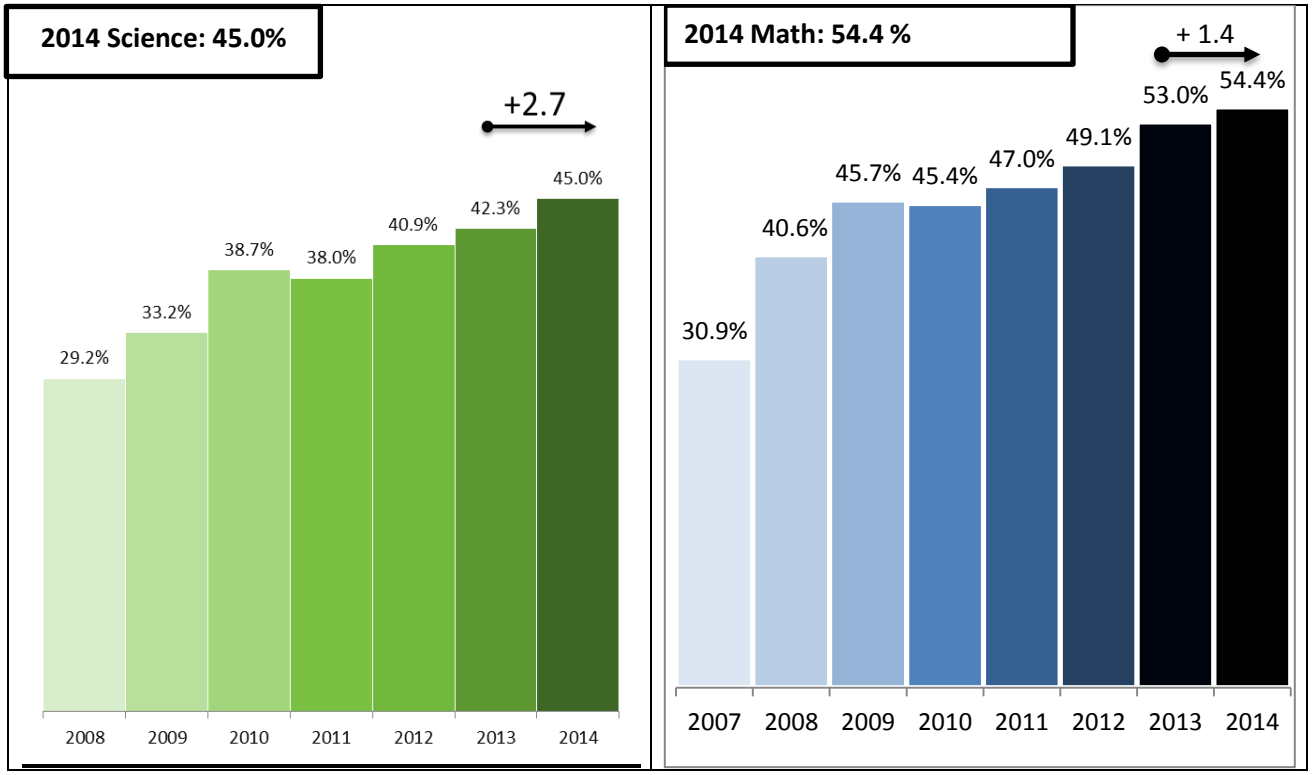
Benchmarks have been set to monitor successful implementation of DC's STEM Plan. These benchmarks are based on the targets set by OSSE in math and science and are identified in each priority area.

a. Priority One: Develop PK-16 STEM Education Pathways

There are many assumptions that students must naturally have an aptitude for STEM fields, while others argue that the lack of available talent is a direct result of lack of preparation. Exposing students to STEM skills and knowledge, while preparing them for STEM degrees, can help students to develop (a) logic, (b) problem solving, and (c) critical thinking skills. These skills can be utilized in every discipline, enabling students to compete in the continually growing high-tech job sector.

While the District has made gains in both math and science (see Figure 4), a persistent achievement gap is still prevalent. Latino and African-American students, who represent fast-growing segments of DC's population, earn less proficiency than their White and Asian peers on key academic assessments and in their rate of participation in STEM career fields. Nationally, female students, while often demonstrating strong achievement levels in STEM subjects, too often express lower levels of interest in these STEM careers. This is one example of an improving, but still present, interest gap that can be addressed via targeted intervention.

Figure 4 State Math and Science Proficiency



Current data on school readiness and early math and science achievement indicate we are not giving young children the support they need to be "STEM Smart." Early exposure (i.e., grades

pre-K to 5) to STEM subjects and skills is essential to broaden access and allow for opportunities in later grades towards college coursework and career pathways in related fields. Approximately 40 percent of U.S children are not ready for kindergarten, and too many children reach grade 4 lacking key science and math skills and knowledge, as evidenced by both local and national performance metrics[36]. Middle school is too late for students to begin developing these essential skills. Increased awareness of the relevance of STEM in students' daily lives, coupled with high quality STEM connections through in- and out of school learning experiences, is an effective way to increase the number of students pursuing STEM focused coursework and careers.

The District of Columbia must develop cohesive pathways from Early Childhood to postsecondary study to address these gaps. In response to this the District of Columbia has established the following key strategies:

[36] Council of Chief State School Officers. (2009).

Table 3 DC STEM PLAN: **Priority One: Develop PK-16 Education Pathways**

Item Number	Strategies/Action Items	Timeline	Responsible Party	Current Progress			Evidence of Completion
				Planning	Developing	Implementing	
1	Identify and evaluate existing STEM teacher certification pathways	Summer, 2015	OSSE , State Science Leadership Team		X		• Local STEM teacher preparation and induction programs produce skilled STEM educators. • Increase the number and percentage of STEM certified or credentialed Pre-K -5 educators.
2	Establish community-based partnerships to support STEM learning	Summer, 2015	OSSE		X		• A network of STEM volunteers, mentors, and tutors is accessible to all students in all wards of the city • Increased participation and LEA representation at local and national STEM contests and Competitions
3	Facilitate STEM career exploration from PK through postsecondary study	Summer, 2015, Ongoing	OSSE, DC STEM Network,			X	• Increased interest in STEM college and career pathways in high school. • Increase the number of DC students entering STEM post-secondary study

Item Number	Strategies/Action Items	Timeline	Responsible Party	Current Progress			Evidence of Completion
				Planning	Developing	Implementing	
4	Provide access to high-quality STEM curricula aligned to college- and career ready standards accessible via Out of School Time STEM learning experiences	Fall, 2016	OSSE, DC STEM Network	X			• Increased participation and LEA representation at local and national STEM contests and Competitions • All OST STEM programs focus on the application of STEM skills in the local community. • DC OST STEM programs utilize a high-quality college and career aligned STEM curricula.
5	Support implementation of evidence-based practices STEM teacher effectiveness	Fall, 2016	OSSE, DC STEM Network	X			• Increase the retention rate of effective and highly effective STEM educators. • All DC schools have access to highly-qualified and effective STEM teachers.

Item Number	Strategies/Action Items	Timeline	Responsible Party	Current Progress			Evidence of Completion
				Planning	Developing	Implementing	
6	Increase proficiency in math and science	Annual, based on 2014-2015 baseline	OSSE, DC STEM Network		X		• State standardized assessment proficiency targets met. • Increase in the percentage of 5th, 8th and HS students scoring proficient or advanced on math and science assessments. • Percentage of DC graduates who require remedial or development mathematics courses at community colleges reduced.
7	Expand access to high-quality STEM professional development	Fall, 2016	OSSE	X			• All DC schools have access to highly-qualified and effective STEM teachers. • Increase in the number of DC STEM teachers rated effective and highly effective across all LEA's. • DC STEM teachers receive sustained STEM-specific training, including content, evidence based best practices. • Professional development training calendar, participant evaluations

Item Number	Strategies/Action Items	Timeline	Responsible Party	Current Progress			Evidence of Completion
				Planning	Developing	Implementing	
8	Cultivate a thriving professional learning community	Ongoing	OSSE, DC STEM Network		X		• STEM communities of practice established to support collaboration within and across LEA's. • Increase in the number of DC STEM teachers rated effective and highly effective across all LEA's.
9	Ensure full and ready access to college and career standards and assessment across PK-12.	Fall, 2014	OSSE			X	• Full implementation college and career standards across all LEA's as evidenced by performance on Next Generation Assessments.

b. Priority Two: STEM Workforce Development

In the District of Columbia, STEM skills remain in demand despite the economic downturn and represent over half of the priority career sectors predicted for growth in the next few years. Across the U.S., only 6 percent of graduating high school students chooses a science and engineering discipline with even fewer students represented from underserved populations. Career and Technical Education is a proven strategy for (a) engaging students, (b) effectively connecting them to college and careers, (c) increasing high school graduation rates, and (d) improving labor market outcomes for high school graduates.[37]

On July 10th, 2012, the Council of the District of Columbia passed the Career and Technical Education Plan Establishment Act. The Act called for a Task Force comprised of key education and workforce development stakeholders to develop a city-wide Strategic Plan to improve the quality, structure, and student outcomes of CTE programs administered by (a) DC Public Schools, (b) public charter schools, (c) the University of the District of Columbia Community College, and (d) other institutions receiving local or federal funding for CTE programming.

The Task force identified nearly 70 Priority Occupations within the following 12 Career Sectors, noting that the majority require STEM skills in order to achieve industry certification and to enter the workforce.

The Task Force agreed that the District must increase the number and percentage of CTE-focused students, such that by 2017, 80 percent of District students concentrating in CTE Programs will complete Programs of Study that lead to a certification, credential, or diploma associated with one of the District's most promising occupations. Increasing collaboration among organizations and schools is key to this economic and education reform effort. The DC STEM Network would work collaboratively to support STEM CTE and workforce development as part of this initiative. Example initiatives in support of STEM CTE pathways include:

- Adoption and implementation of Common Career Technical Core standards
- Establishment of 7 STEM focused NAF Career Academies (Engineering, Information Technology, and Construction)
- Establishment of Microsoft IT Academies at 18 schools

[37] Center for Advanced Human Resources Studies. (2003)

- Annual Young Men and Women's conference on College and Careers
- PIPESTEM Professional Development initiative
- Champions for Change for Women and Girls in STEM and Deloitte Day, of Impact-Women in Technology

Developing pathways that are responsive to the needs of our students and our community must remain a priority – ensuring connections for our students to opportunities in the classroom and beyond.

Table 4 DC STEM PLAN: Priority Two: STEM Workforce Development

Item Number	Strategies/Action Items	Timeline	Who Is Responsible?	Status			Evidence of Completion
				Planning	Developing	Implementing	
10	Establish and support STEM Career Tech Education (CTE) programs of study aligned with the District's most promising occupations.	Fall, 2014	OSSE			X	• STEM Priority Programs of Study are supported with funding, professional development, partnerships with networks and Industry Councils or District trade associations, and connections to postsecondary institutions and articulation/dual enrollment opportunities.
11	Establish and implement rigorous standards of program quality for STEM CTE pathways	Spring, 2018	OSSE, CTE Interagency Team, DC STEM Network		X		• All CTE STEM Priority Programs of Study offered in the District adhere to rigorous standards of program quality.

12	Engage the business and community to strengthen STEM CTE program curricula and partnerships to support classroom instruction	Fall,2014	OSSE, CTE Interagency Team, DC STEM Network		X		• DC CTE Strategic Taskforce Meetings • STEM Community Partner Directory
13	Reengage the District's disconnected youth through STEM-CTE programs that can prepare them for successful careers	Summer 2015, Ongoing	CTE Interagency Team, DC STEM Network, OSSE		X		• Increased access to STEM educational placements at district youth reengagement centers. • Increased number of connected employment opportunities in STEM CTE pathways.
14	Expand access to and streamline STEM resources	Fall 2014, Ongoing	CTE Interagency Team, DC STEM Network, OSSE	X			• Increased STEM CTE Student Concentration & Completion Rates • Coordinated system for evaluation and sharing of STEM CTE instructional resources and best practices developed.

c. Priority Three: Developing Coordinated Systems of Support

The District of Columbia will need to fill 94,000 STEM-related jobs by 2018.[38] High-quality STEM learning experiences should be accessible to all students in the District. Though many well-developed partnerships exist, they have resulted in pockets of excellence in STEM education in DC, signaling the need for a networked approach. STEM must be expanded to include the larger community, supporting a cohesive vision.

State-level STEM networks are leading these efforts in many states and cities around the country. These STEM networks are working on the ground-level to facilitate connections between (a) businesses, (b) industries, (c) institutions of higher education, and (d) PK-12 partnerships to design and launch transformative STEM education initiatives in support of college- and career readiness in STEM. To this end, DC plans to partner with the Carnegie Academy for Science Education (CASE), part of the Carnegie Institution of Washington (CIW), to develop a DC STEM Network, and a STEM Advisory Council made up of (a) representatives from local and federal government, (b) local education agencies, (c) institutes of higher education, professional societies, (d) community-based organizations, (e) parents and families, and (f) industry partners. The CIW, headquartered in the heart of Washington, DC, is a private, non-profit, basic-science research organization of world prominence. CASE is the institution's, K-12 education arm, and is housed at the Carnegie Academy's headquarters. Its primary mission is to enhance the education of DC's children in science, technology, engineering, and mathematics. With an established history of (a) STEM advocacy, (b) professional development for educators, (c) collaboration with professional societies, and (d) a focus on working with underserved and underrepresented students, CASE has a proven, long-term commitment to improving opportunities for DC students and educators to succeed in STEM.

The STEM Network will serve to unite stakeholders in the STEM system. DC Plans to partner with CASE to (a) map current programs, (b) identify and provide professional development opportunities, and (c) to promote and build upon partnerships to better understand and serve the community. The Network will also provide a space for collaboration, direction, and support for the development of policy and current and future partnerships. The DC STEM advisory group will be tasked with creating positive conditions for the STEM Network to be successful over time, including recommendations and guidance on investing public and private dollars effectively to advance STEM education across the District, as well as policy and regulatory proposals. This approach will serve to create an integrated system of STEM education and workforce development in the local community—fostering partnerships to eliminate the duplication of work and ensuring forward momentum for all DC students.

[38] (STEM Connector, 2013)

Table 5 DC STEM Plan Priority Three: Developing Coordinated Systems of Support

Item Number	Strategies/Action Items	Timeline	Who Is Responsible?	Status			Evidence of Completion
				Planning	Developing	Implementing	
15	Recruit a partner organization to manage and support the expansion and development of the DC STEM Network	Fall, 2014	OSSE			X	Network partner identified and agreement established.
16	Identify and cultivate strategic partnerships with industry partners, community-based organizations, STEM rich institutions, STEM professional societies, and business and industry partners	Ongoing	DC STEM Network		X		Broad representation from STEM stakeholder groups participating in the DC STEM Network working to implement strategic initiatives. Standardized meeting schedule and full meeting attendance

Item Number	Strategies/Action Items	Timeline	Who Is Responsible?	Status			Evidence of Completion
				Planning	Developing	Implementing	
17	Design and establish effective systems of communication about STEM Resources (e.g. website, list-serve, social media, database)	Spring, 2016	DC STEM Network	X			• DC STEM Network Technology Platform Established. • Regular convening's and communication established. • Multimember projects incubate, emerge and earn funding for implementation.

d. Priority Four: STEM Community Engagement and Outreach

Recent data suggests that American students are not prepared to compete for careers or jobs in a 21st century, knowledge-based economy. Across the U.S., and more specifically in DC, growth in traditional STEM fields is expected to be the fastest-growing employment sectors. STEM skills are critical to DC's present and future prosperity.[39] Students not pursuing STEM-related careers will recognize that responsible citizenship today requires a foundation of solid STEM education. Whether it is engaging in healthcare, understanding environmental stewardship, understanding current geopolitics, or explaining global opportunities and crises knowledge and skills in STEM are essential for everyday life. This change begins in our communities.

Communities play a unique and vital role in the development of equitable and sustainable innovation. Engaging a community and its members in its own future provides fertile ground for new ideas and the opportunity for broad ownership of the ideas and plans that are adopted. Helping District residents understand the urgent need associated with STEM education and building a sustained commitment to support STEM education will require that all stakeholders understand how to get involved and appreciate the consequences of failing to act for themselves, their children, and their communities. Most importantly, it will require a shared vision of the future that is regularly communicated and discussed by leaders in every sector, of every background, and across all Wards in the District. This initiative will require sharing information in an open, consistent, and straightforward manner. It will require engaging all stakeholders in meaningful ways and inspiring them to action that produces results in both the short and long term. Broad, diverse community engagement such as (a) family STEM events, (b) social media campaigns, and (c) STEM fairs increase the ability to (a) influence policy, (b) connect with valuable expertise, and (c) access resources and assets to coordinate STEM education initiatives and further economic development. DC plans to engage a diverse sampling of key stakeholders, to support and engage in the STEM implementation process via the DC STEM Network.

[39] Executive Office of the Mayor. (2012).

Table 6 DC STEM Plan: Priority Four: STEM Community Engagement and Outreach

Item Number	Strategies/Action Items	Timeline	Who Is Responsible?	Status			Evidence of Completion
				Planning	Developing	Implementing	
18	Disseminate and share best practices, research, and data across systems	Fall, 2016	DC STEM Network	X			• Multimember projects incubate, emerge and earn funding for implementation. • Coordinated system for evaluation and sharing of STEM instructional resources and best practices developed. DC STEM Network Technology Platform established.

19	Coordinate a public awareness campaign to increase community understanding, awareness and support of STEM	Fall, 2015	DC STEM Network, OSSE	X			• Public Awareness materials developed, produced for key audiences (educators, parents, students, community members) • Websites, social media, public forums are being leveraged to recognize DC STEM successes. • Increased community support across all sectors for STEM initiatives and programs. • Students, parents, and guardians across DC have ready access to guidance and information about STEM college and career pathways.

Item Number	Strategies/Action Items	Timeline	Who Is Responsible?	Status			Evidence of Completion
				Planning	Developing	Implementing	
20	Establish and leverage Community partnerships	Ongoing	DC STEM Network, OSSE	X			• Sustained support for network of annual school based STEM-events established across all Wards. • A network of STEM volunteers, mentors, and tutors is accessible to all Wards in the city. Network is accessible. • Multimember projects incubate, emerge and earn funding for implementation.

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