DC PUBLIC SCHOOLS

Preparing the Next Generation of Scientists and Engineers in DCPS

Access to science education is an equity issue

- According to the National Center for Education Statistics (NCES), two-thirds of 4th graders (68% of 4th grade boys and 66% of 4th grade girls) self-report that they "like" science.
- But then, by grade 5, both boys and girls begin to turn away from science, with minorities and girls disproportionately effected.
- Too few high school students express interest in science and too few college students pursue science or engineering, with numbers of women still lagging behind men.
- All of this leads to adults who don't know science, and this decline starts at the elementary grades!

"The problem in society is not kids not knowing science. The problem is adults not knowing science. They outnumber kids 5 to 1, they wield power, they write legislation. When you have scientifically illiterate adults you have undermined the very fabric of what makes a nation wealthy and strong."

Neil DeGrasse Tyson (Astrophysicist)

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Encouraging Interest in Science is Increasingly Important

1. We need to inspire the next generation of scientists and engineers.
2. We need to create scientifically literate citizens who understand important issues.
3. We need to prepare our future workforce because even basic jobs now require technical skills that can be learned in science.
4. We need to ensure that our students have **equitable access** to high-paying STEM jobs (Washington, DC is a hub for these kinds of jobs).

Source:
The Hidden STEM Economy, www.brookings.edu.

"It's suicidal to create a society that depends on science and technology . . . in which no one knows anything about science and technology."

Carl Sagan
(Astronomer)

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Research on how children learn best is clear

1. Students learn best through a combination of first-hand experience and ample opportunities for reflection and rich talk (discourse) about their work.
2. When students apply knowledge, skills, and ideas in new situations, it allows them to make sense of what they are learning and increase the likelihood that they will remember what they are learning.

Specifically, teaching science increases students' content, vocabulary, and background knowledge and establishes a purpose for students to read and write (e.g., to answer questions they have about the world). **Therefore, teaching science explicitly supports literacy development and achievement.**

Source:

- Essential Instructional Practices in Early Literacy (Early Literacy Task Force), Michigan Association of Intermediate School Administrators (MAISA) General Education Leadership Network (GELN), 2016.
- Linking Science & Literacy in the K-8 Classroom (2006).

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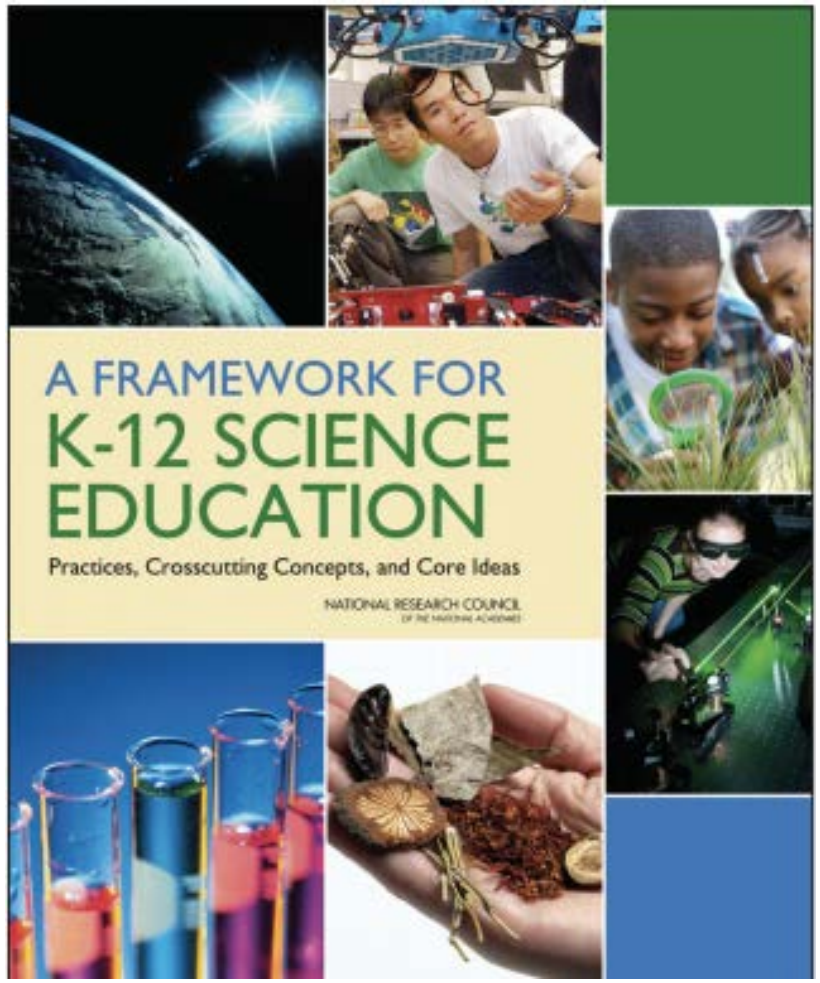
In 2013, the DC State Board of Education voted to adopt the NGSS in full

- The NGSS focus on helping students use science to make sense of phenomena in the natural and designed world and to use engineering to solve problems by developing and applying the Disciplinary Core Ideas and Crosscutting Concepts through the use of the Science and Engineering Practices (Achieve, 2016).
- Both the NGSS and *A Framework for K-12 Science Education* from which the NGSS was developed make it clear that **ALL students** need to have direct opportunities to engage in science and engineering practices to investigate their questions and design solutions to problems they care about.



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Every student feels loved, challenged, and prepared to positively influence society and thrive in life. In science, this means using science to solve complex issues and to be informed, scientifically-literate citizens who will positively influence society and thrive in life.

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Necessary shifts in School Programming and Supports for SY19-20

1. Changes to the Elementary Scheduling Requirements
2. Shift to STEMscopes as primary curricular resource
3. Increased engagement with teachers through professional development and professional learning (through LEAP)

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Necessary shifts in School Programming and Supports for SY19-20

1. Changes to the Elementary Scheduling Requirements

- The Office of Teaching and Learning requires that science be taught (as a standalone subject) at minimum for:
  - 45 minutes/day (for the equivalent of at least one semester) in grades K-2
  - 30 minutes/day (for the entire school year) in grades 3-5
- The Office of Teaching and Learning has provided scheduling models to assist schools in determining how to meet this recommendation.

Reading and writing should work to **support**, **not supplant** knowledge development and inquiry in science. Therefore, science should be taught frequently and consistently. In fact, according to the National Research Council (NRC 2011), science should be taught as frequently and as rigorously as English language arts (ELA) and mathematics.

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Necessary shifts in School Programming and Supports for SY19-20

2. Shift to STEMscopes as primary curricular resource

- In SY2019-20, STEMscopes will become the primary DCPS curricular resource for K-12 science.
- STEMscopes is a 5E model-based digital curriculum that was intentionally designed to address the NGSS.
- Content is organized into 5E lesson sequences called scopes.
  - **Scopes** are grounded in an **anchor phenomenon**.
  - In most cases one scope addresses one **NGSS performance expectation**.
  - The sequence of bundles aligns to the sequence described in the *Framework for K-12 Science Education* and the arrangement of performance expectations by disciplinary core idea.

Why does an animal not look exactly like its mother?

1-LS3-1 Make observations to construct an evidence-based account that young plants and animals are like, but not exactly like, their parents.

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Necessary shifts in School Programming and Supports for SY19-20

2. Shift to STEMscopes as primary curricular resource, cont'd

- NGSS-built, 5E model-based digital curriculum includes:
  - Phenomena infused into all activities
  - Online Simulations and hands-on investigations
  - Multimedia Resources (video, audio, and text)
  - STEM careers and applications
  - Assessment: CER, multiple-choice, free-response, etc. for each scope
  - Read-aloud feature
  - Highlighting and note taking feature
  - Lesson Planning Documents and Materials Lists
  - Literacy Strategies and Resources to Support Explanations
  - Language Acquisition Strategies
  - Intervention and Acceleration Resources
  - Student- and Teacher-facing Materials available in Spanish (K-8)
  - Print materials available for additional purchase

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Necessary shifts in School Programming and Supports for SY19-20

3. Increased engagement with teachers through professional development and professional learning (through LEAP)

a. Basics on navigating STEMscopes: **STEMscopes Navigation Webinar** Recording: **https://bit.ly/2KnVbQE**

b. January 28: **STEMscopes Implementation Training** for grade K-2 teachers (at Wilson HS) and grade 3-5 teachers (at CHEC) during Districtwide PD Day, with additional opportunities to connect with district partners in support of STEM education (e.g., museums, supplementary curricula, etc.)

c. New **Elementary Science LEAP Modules** available for the first time on the following topics:

1. What is three-dimensional learning?
2. The NGSS Science and Engineering Practices
3. Planning with the NGSS Science and Engineering Practices
4. What is the 5E instructional model?
5. 5E Learning Cycles with STEMscopes
6. Practicing a 5E lesson using the lesson plan practice protocol
7. Analyzing student work using the student work analysis protocol

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