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The Smithsonian Science Education Center

Lessons from our shared history, and the path forward

Katherine Pedersen Blanchard

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Who are we and what do we do?

Smithsonian Institution

The Smithsonian is the world's largest museum, education, and research complex.

- 19 museums
- 5 education centers
- 9 research centers
- 1 zoo

Collection of over 154 million objects, works of art, and specimens.

The Smithsonian Institution

- Believes in lifelong, experiential learning
- Seek to drive large, visionary interdisciplinary and scholarly
- Catalyze critical conversations and address complex challenges (and support others in this work!)

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Smithsonian Science Education Center

We are the only formal education unit within the Smithsonian and has been a leader in science education for over 30 years.

Founded in 1985

National Science Resources Center
THE NATIONAL ACADEMIES Smithsonian Institution

Renamed in 2013

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Our Mission

Transform science education for all students in the United States and throughout the world.

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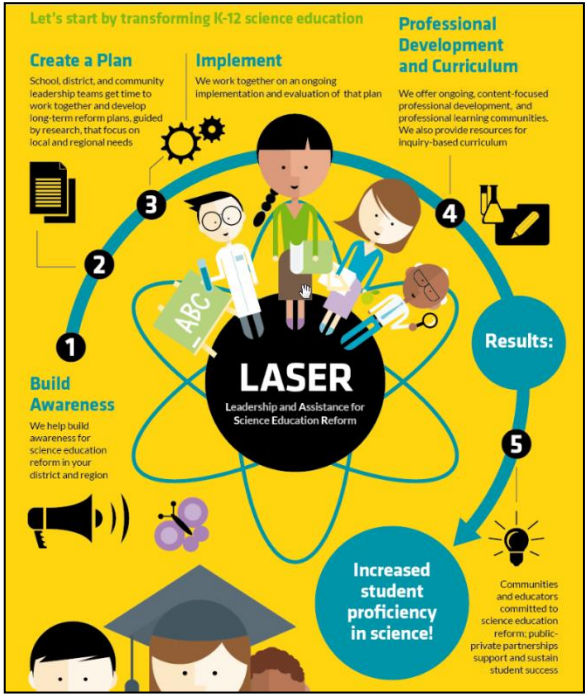
Shifting the Culture toward IBSE

- In partnership with local schools, school districts, and ministries of education, we work on a long-term basis to improve science or STEM education programs through our Leadership and Assistance for Science Education Reform (LASER) model. This model provides the infrastructure to build local capacity, local ownership, and sustainability.



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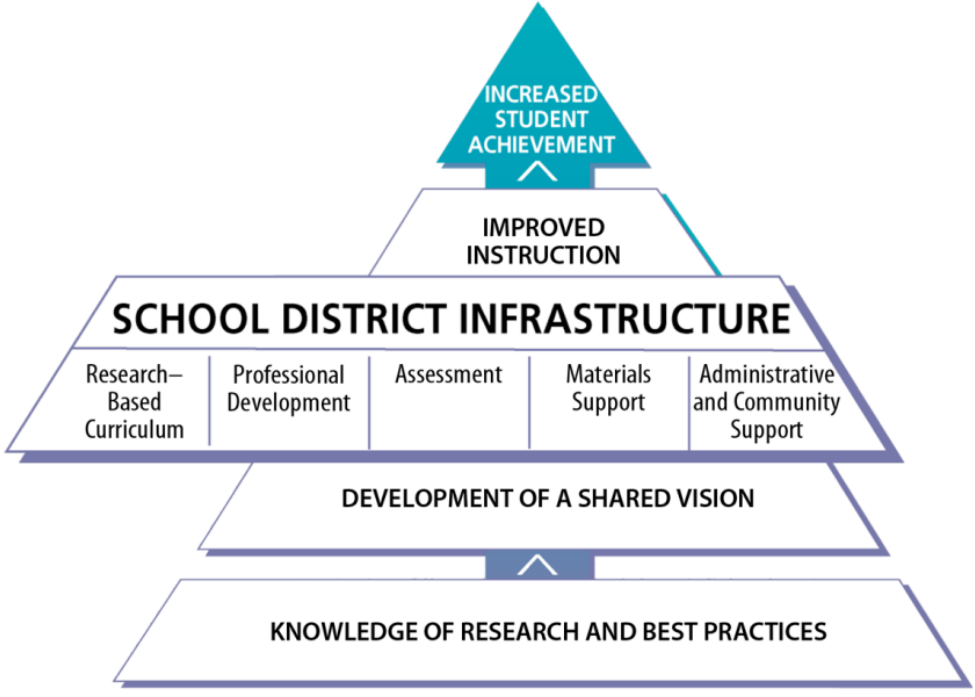
Leadership and Assistance for Science Education Reform (LASER)



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The LASER Model

76 Strategic Planning Institutes (SPIs) in the U.S. with over 1000 leadership teams from 47 states and 25 countries

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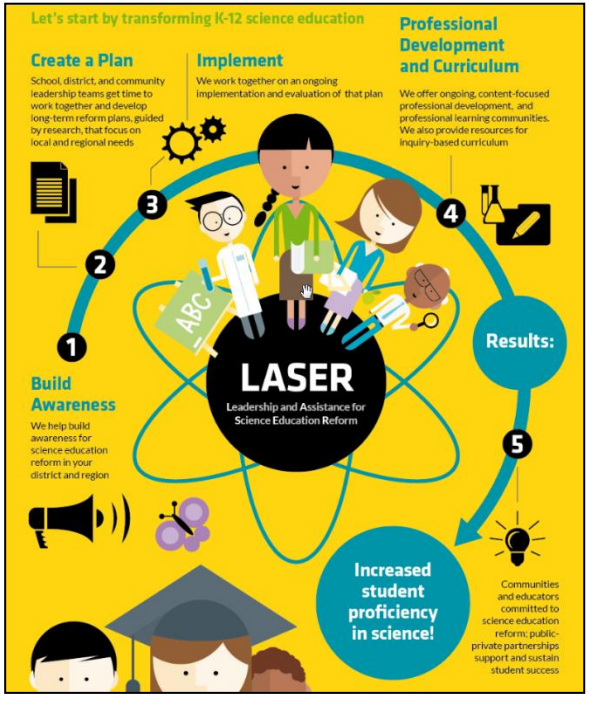
Leadership Development

We support schools, districts, and communities as they implement the LASER model through a series of scaffolded programs:

1. Building Awareness for STEM Education (BASE)
2. Strategic Planning Institute (SPI)
3. Implementation Institutes



K-8 Science Curriculum (STC™)

	Life Sciences	Earth Sciences	Physical Sciences	
	Life on Earth	Earth's Dynamic Systems	Chemistry	Physics
Grade K	Exploring Plants and Animals	Exploring My Weather		Exploring Forces and Motion
Grades 1-5	Organisms	Weather	Solids and Liquids	Comparing and Measuring
	The Life Cycle of Butterflies	Soils	Changes	Balancing and Weighing
	Plant Growth and Development	Rocks and Minerals	Chemical Tests	Sound
	Animal Studies	Land and Water	Food Chemistry	Electric Circuits
	Microworlds	Ecosystems	Floating and Sinking	Motion and Design
Grades 6-8	Investigating Digestion and Motion	Understanding Weather and Climate	Exploring the Properties of Matter	Experimenting with Forces and Motion
	Exploring Respiration and Circulation	Researching the Sun-Earth-Moon System	Experimenting with Mixtures, Compounds, and Elements	Working with Motors and Simple Machines
	Investigating Biodiversity and Interdependence	Exploring Planetary Systems		Investigating Circuit Design
	Studying the Development and Reproduction of Organisms	Exploring Plate Tectonics		Exploring the Nature of Light
				Discovering Electrical Systems
				Researching Optical Systems

Science and Technology Concepts (STC™)

Materials from our Electricity, Waves, and Information Transfer middle school STC™ *unit.*

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Professional Development

- **Introductory Level**

  Occurs prior to a teacher using a Smithsonian-developed curricular unit; **curriculum-focused to provide teachers with experience using the materials.**

- **Intermediate Level**

  Occurs after a teacher has taught a unit; **content- and pedagogy-focused** but based on teachers' classroom experiences.

- **Expert Level**

  Select teachers were invited to a **train-the-facilitator** training to create a sustainable model of PD at the local level.

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How do we know it works?

The LASER i3 Study

- The "LASER i3" study refers to the 5-year longitudinal study of LASER + STC™ model.
  - Funded by the U.S. Department of Education (ED)
  - Externally evaluated by the Center for Research in Educational Policy (CREP) at the University of Memphis
  - Cohort: 2010-2015
  - 3 U.S. States (NM, TX, NC)
  - 16 school districts, 125 schools, and 60,000 students
  - Randomized Controlled Trial
  - Pre- vs. post-tests assessing science, math, and reading skills

Funded by the U.S. Department of Education's Investing in Innovation (i3) program Grant # (U396B100097)

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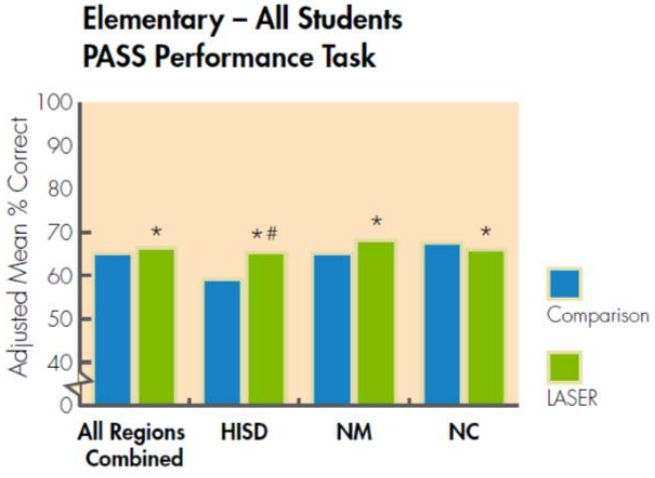
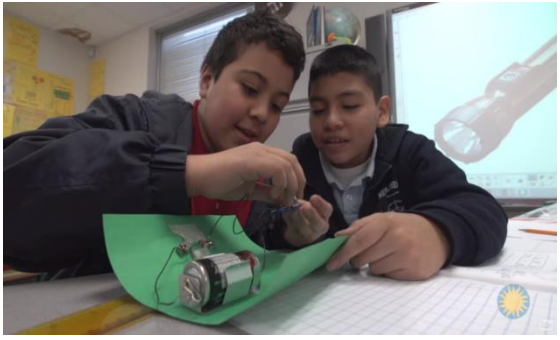
Students were able to apply what they learned to solve real science problems



"*" indicates statistically significant results. "#" indicates educationally meaningful results. Comparison group sample size (n) is 1,172 students and LASER sample size (n) is 1,429 students for all regions combined. HISD indicates Houston Independent School District. HISD comparison (n= 273) and LASER (n=427). NM indicates New Mexico. NM comparison (n=197) and LASER (n=376). NC indicates North Carolina. NC comparison (n=702) and LASER (n=626). Adapted from CREP, "The LASER Model: A Systemic and Sustainable Approach for Achieving High Standards in Science Education, Summative Report, Section 4" (Memphis: CREP / University of Memphis, July 15, 2015).



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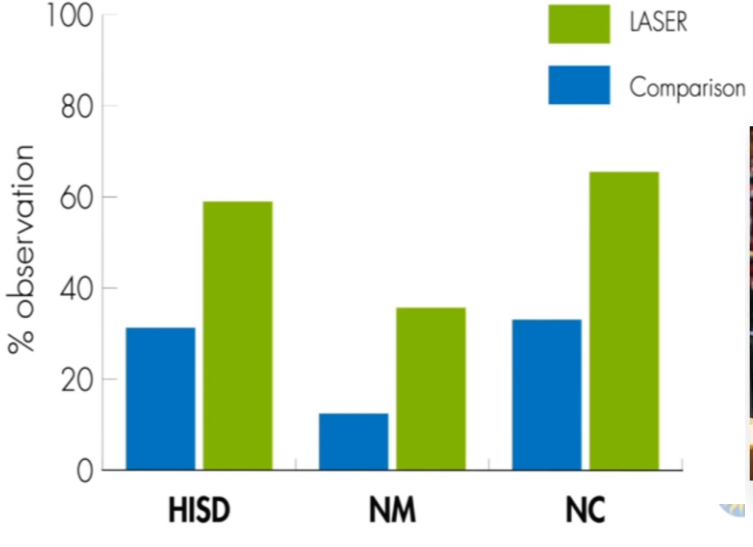
Classroom observations showed students in LASER schools demonstrated more collaboration and worked in teams to solve problems

Collaborative Learning



Observational data presented was collected during the 2013-13 school year. Adapted from CREP, "The LASER Model, Summative Report, Section 2" (Memphis: CREP / University of Memphis, July 15, 2015).

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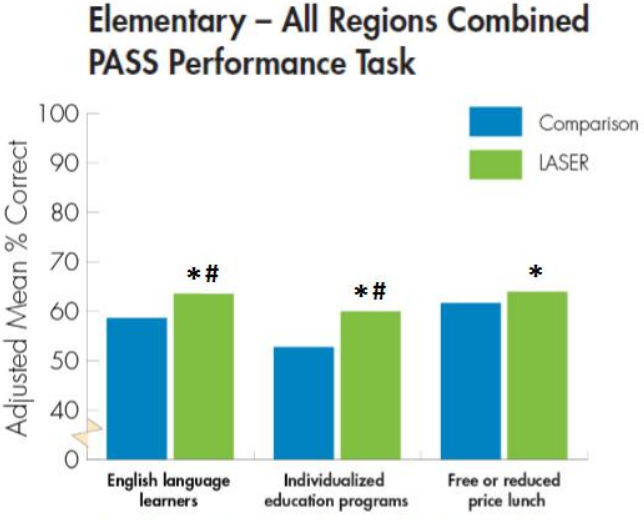
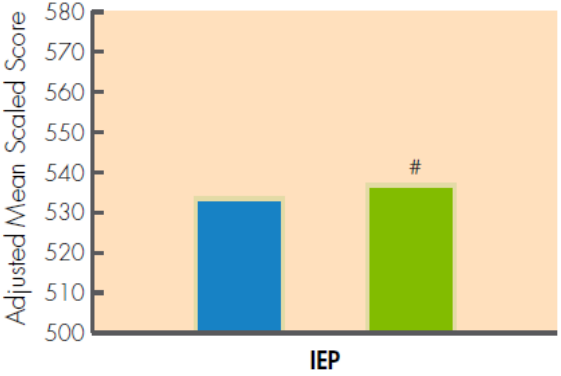
Underserved students scored higher on the PASS PT compared to their peers



"*" indicates statistically significant results. "#" indicates educationally meaningful results. ELL students are English Language Learners. ELL comparison (n= 238) and LASER (n=371). IEP students possess individualized education programs. IEP comparison (n=94) and LASER (n=132). FRL students participate in free or reduced price lunch. FRL comparison (n=654) and LASER (n=895). Adapted from CREP, "The LASER Model, Summative Report, Section 4" (Memphis: CREP / University of Memphis, July 15, 2015).

Our interdisciplinary approach to teaching science led to higher reading scores

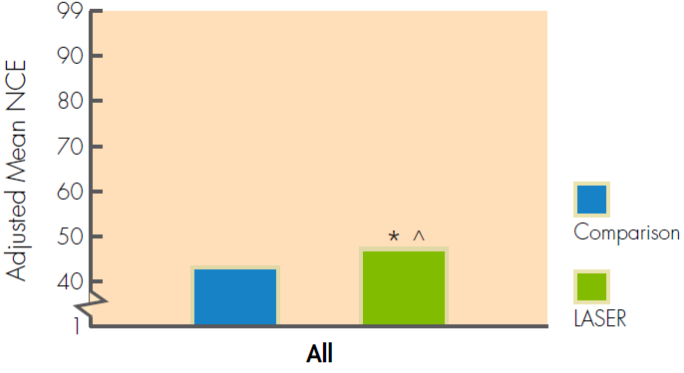
NM Elementary – Standards-Based Assessment in Reading



"#" indicates educationally meaningful results. Comparison group (n=44) and LASER (n=64). Adapted from CREP, "The LASER Model, Summative Report, Section 6" (Memphis: CREP / University of Memphis, July 15, 2015).

IEP = Individualized education programs

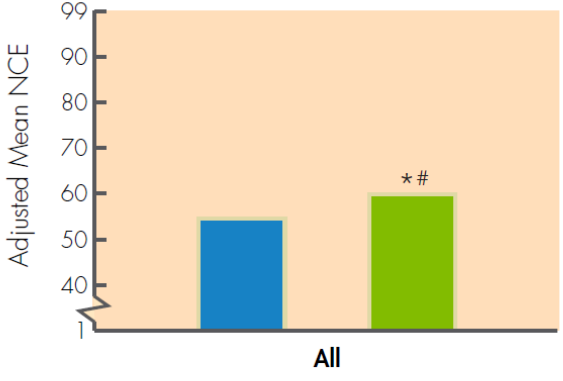
HISD Middle School – Stanford Reading Test



"*" indicates statistically significant results. "^" indicates nearly educationally meaningful results as defined by Hedge's g=0.24. NCE is the Normal Curve Equivalent score. Comparison group (n=143) and LASER (n=148). Adapted from CREP, "The LASER Model, Summative Report, Section 6" (Memphis: CREP / University of Memphis, July 15, 2015).

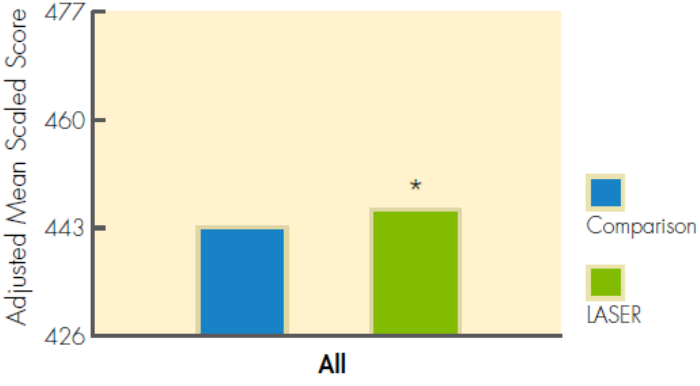
Our interdisciplinary approach to teaching science led to higher math scores

HISD Middle School – Stanford Mathematics Test



"*" indicates statistically significant results. "#" indicates educationally meaningful results. NCE is the Normal Curve Equivalent score. Comparison group (n=113) and LASER (n=131). Adapted from CREP, "The LASER Model, Summative Report, Section 6" (Memphis: CREP / University of Memphis, July 15, 2015).

NC Middle School – End-of-Grade Test, Mathematics



"*" indicates statistically significant results. Comparison group (n=888) and LASER (n=522). Adapted from CREP, "The LASER Model, Summative Report, Section 6" (Memphis: CREP / University of Memphis, July 15, 2015).

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Summary: LASER Promotes Inquiry and Problem Solving Skills for *All* Students

We now have rigorous evidence that LASER improves achievement not only in ***science*** but in ***reading*** and ***math*** for ***all students*** including English language learners, students with special needs, and those qualifying for free or reduced price lunch.

Learning by doing –

the great equalizer.

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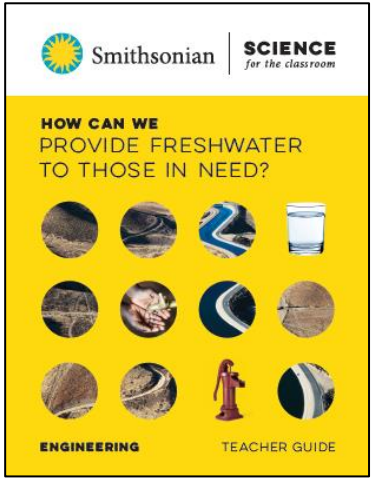
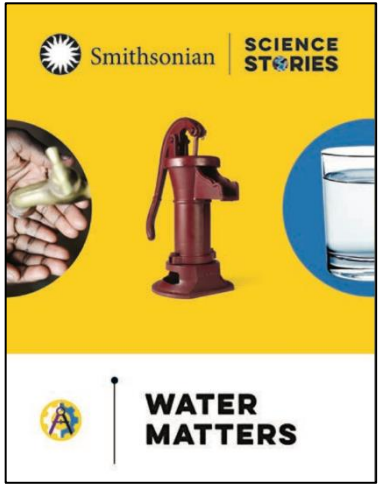
Where do we go from here?

Curriculum for the Next Generation

- New Elementary (Primary) curriculum aligned to the Next Generation Science Standards.
- Built on Smithsonian resources and driven by questions.
- STCMS has Also been updated.





Curriculum for Sustainable Development

- Hands-on, inquiry-driven curriculum based on the UN SDGs
- Accessible to educators across the globe free of charge.
- Conceived of by the Inter-Academy Partnership
- Funded by the Gordon & Betty Moore Foundation

Globalizing AND Localizing PD

- Bringing together scientists and educators
- Consider how local work can have a global impact
- Reaching teachers that have not traditionally had access to professional development.

Focus on Sustainability

- Education plays the long game.
  - issues facing our world can not be solved in a single day or with a single intervention.
  - Success, requires buy-in from stakeholders at every level within an educational ecosystem.

- We need to construct a shared vision for ***Global Science Education*** that supports a scientifically literate, career-ready citizenry.
  - Our Shared Vision must be global.
  - Our Shared Vision must serve tomorrow's populations.
  - We must close the scholar-practitioner gap

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Thank you!

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