Smithsonian Institution

Smithsonian Science Education Center (SSEC) Leadership Assistance in Science Education Reform (LASER)

DID STUDENTS IN SCHOOLS THAT RECEIVED THE LASER MODEL ATTAIN HIGHER LEVELS OF SCIENCE ACHIEVEMENT?

Project Overview

THE PROBLEM: What Challenge Did the Program Try to Address?

In 1985, the Smithsonian Institution and the National Academies took a bold step and established the National Science Resources Center (NSRC) to assume a leadership role in transforming K-12 science. In 2012, the NSRC's name changed to the Smithsonian Science Education Center (SSEC). The SSEC has a systemic reform model now referred to as Leadership and Assistance for Science Education Reform: The LASER Model. The purpose of the model was to help district and school-based leadership teams create the infrastructures that are required to support and promote high-quality, inquiry-oriented science instruction in every classroom. The LASER Model is being successfully implemented in hundreds of districts in numerous states.

THE PROJECT: What Strategies Did the Program Employ?

In 2010, the SSEC[1] was awarded a five-year i3 validation grant (2010–2015) to evaluate the LASER model's efficacy in systemically transforming science education in New Mexico, North Carolina, and Texas. The Center for Research in Education Policy (CREP) at the University of Memphis evaluated the impact of the LASER model utilizing randomized control trials (RCT) with 4,123 grade 3–8 students.

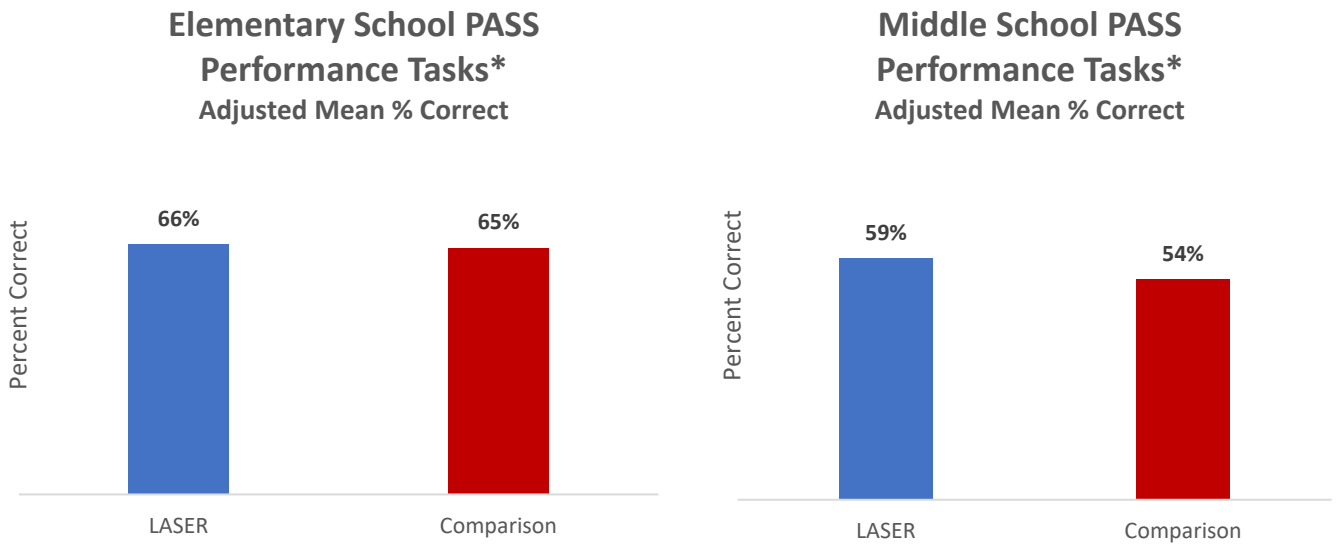
[1] Smithsonian Institute received an i3 validation grant supported by the U.S. Department of Education's Investing in Innovation program through Grant Number U396B100097. Validation grants provide funding to support the expansion of projects that address persistent education challenges at the regional or national level. All i3 grantees are required to conduct rigorous evaluations of their projects. The quality of evidence required to demonstrate a project's effectiveness depends on a project's level of scale or grant type.

THE LASER MODEL

- **A research-based, inquiry-driven science curriculum.** Emphasis on curriculum selection that best suits the pedagogical needs of school administrators and teachers as well as state and local standards. This concept applies not only to the materials teachers use, but also to their presentation and augmentation with available resources.
- **Differentiated Professional Development.** The second pillar promotes differentiated professional development that moves instructors of inquiry science from novice to competent and from competent to expert. Professional development can come in multiple forms: multi-day trainings, one-on-one instruction, or professional learning communities supporting teacher communication.
- **Administrative and Community Support.** Without the support of administrators, change in curriculum is impossible. Strong leadership is essential in promoting an inquiry-based approach, or any new approach, to science instruction.
- **Materials Support.** Commitment to supporting science instruction by making certain the necessary environment and materials are available to students and teachers. Materials support can come from a number of sources, but all share a single objective: To ensure students have all the physical materials necessary for hands-on learning.
- **Assessments.** It is important to know where students begin their journey, how they are learning, if they are retaining information, and what they have learned after instruction. Assessment is important for gauging student progress and adapting instruction to fit student needs.

Summary of Results

DID STUDENTS IN SCHOOLS THAT RECEIVED THE LASER MODEL ATTAIN HIGHER LEVELS OF SCIENCE ACHIEVEMENT?



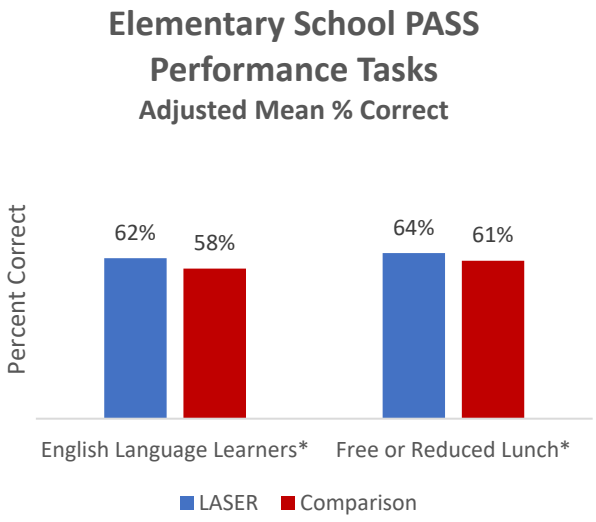
~CRI is a 17-item index that quantifies the respondent's self-reported college readiness. The index includes items that measure three latent variables – academic preparedness, college knowledge, and college admissions preparedness – that have been identified as predictive of being prepared for college. The CRI operationalizes the domain of college readiness, which is the degree to which an individual is prepared for and able to attend college.

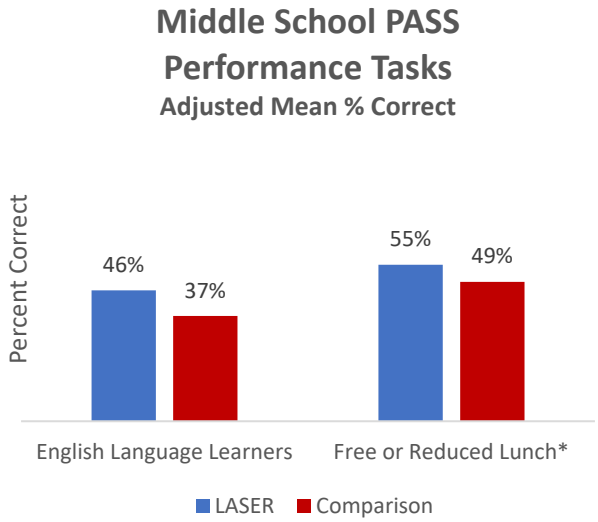
LASER STUDENTS OUTPERFORMED students who were not exposed to the Laser Model on sections of the Partnership for Standards-based Science Assessment (PASS) and certain state tests in reading, math, and science. The program made a positive impact in the following areas.

- **SCIENCE ACHIEVEMENT – ELEMENTARY SCHOOL.** The LASER model had a statistically significant positive impact on science achievement on students overall. Compared to students who did not participate in the program, LASER students scored significantly higher on the PASS Open Ended and Performance Task tests at the elementary level.
- **SCIENCE ACHIEVEMENT – MIDDLE SCHOOL.** Compared to students who did not participate in the program, LASER students overall scored significantly higher on the PASS Performance Task test at the middle school level.

Please see Appendices B and C for information about the evaluation's design and the quality of the evidence, respectively.

SECONDARY FINDINGS





*Differences are statistically significant

- **ELEMENTARY SCHOOL.** Students in the Free and Reduced Lunch program, and English Language Learners who participated in the LASER program, scored significantly higher on the PASS Performance Task test than their peers who did not participate in LASER. These differences were statistically significant.
- **MIDDLE SCHOOL.** English Language Learners in the LASER program had significantly more performance tasks correct than those who did not participate in LASER. This difference was statistically significant.

OTHER CONSIDERATIONS

A few key considerations related to the LASER model's efficacy are discussed below:

- **UNDERSERVED POPULATIONS.** Underserved populations of economically disadvantaged and special needs students, as well as those for whom English is a second language, seem to have benefited from their experiences with LASER, as reflected in scores on the PASS and state standardized tests.
- **STAFF TURNOVER.** Many district and school leaders who were committed to the work in 2010 were no longer in place by the end of the grant funded period.
- **PROFESSIONAL DEVELOPMENT FOR TEACHERS:** Feedback on professional development sessions for teachers, a key component of the LASER model, was universally positive. However, attending three sessions during the summer was a hardship for many teachers. As a result, LASER may incorporate online professional development sessions in the future.

For More Information

Evaluation Reports	Additional Reports
Final Evaluation Report: Executive Summary (The University of Memphis, Center for Research in Education Policy, July 2015)[2]	**Final Evaluation Report: Overview (PDF)** (University of Memphis, Center for Research in Education Policy, July 2015) **Final Evaluation Report: PASS Multiple Choice (PDF)** (University of Memphis, Center for Research in Education Policy, July 2015) **Final Evaluation Report: PASS Open-Ended (PDF)** (University of Memphis, Center for Research in Education Policy, July 2015) **Final Evaluation Report: Student Attitudes (PDF)** (University of Memphis, Center for Research in Education Policy, July 2015) **Final Evaluation Report: State Assessments (PDF)** (University of Memphis, Center for Research in Education Policy, July 2015) **Final Evaluation Report: Case Studies (PDF)** (University of Memphis, Center for Research in Education Policy, July 2015) **Final Evaluation Report: Confirmatory and Exploratory Analyses (PDF)** (University of Memphis, Center for Research in Education Policy, January 2017)

[2] The information and data for this result summary was collected from the most recent reports as of 01/23/2020: "The LASER Model: A Systemic and Sustainable Approach for Achieving High Standards in Science Education, Summative Report," The University of Memphis, Center for Research in Education Policy, 2015.

Appendix A: Students Served by the Project[3]

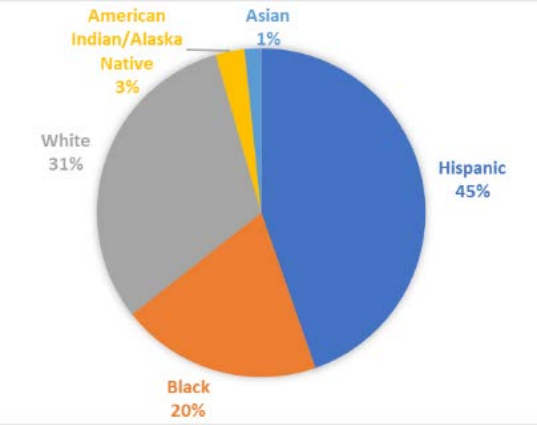
GRADE(S)

PK	K	1	2	3	4	5	6	7	8	9	10	11	12

GENDER

Not Applicable/Not Reported

RACE/ETHNICITY



COMMUNITY

Not Applicable/Not Reported

HIGH-NEED STUDENTS[i]

Economically Disadvantaged	English Learners	Students with Disabilities
73%	18%	8%

[3]These data reflect the entire student population served by the intervention, not just the evaluation sample used in the impact study.

Appendix B: Impact Evaluation Methodology[4]

RESEARCH DESIGN:

Design:	Matched-Pair Randomized Controlled Trial (RCT)
Approach:	▪ Students in the three regions with intact elementary (grades 3–5) and middle school (grades 6–8) cohorts were paired and randomly assigned to Phase 1 (immediate implementation) or Phase 2 (delayed implementation) ▪ The matched pair design was used to ensure equivalency between groups ▪ The evaluation team utilized the Partnership for Standards-based Science Assessment (PASS) test as the primary measure of student learning and state-specific achievement test scores were also analyzed.
Study Length:	Five years (2010–2015)

DATA COLLECTION AND ANALYSIS: SECOND COHORT

Study Setting	Elementary and middle schools in three regions (Houston Independent School District; central and western North Carolina; and northern New Mexico)
Final Sample Sizes	▪ 125 study schools within the 16 districts
Sample Group Characteristics[5]	▪ African American: 19.4%, Hispanic: 43.9%, Caucasian: 30.6%, American Indian/Alaskan Native: 2.8%, Asian: 1.6%, Free and Reduced-Price Lunch: 73%, English language learners: 18%, IEPs: 8%
Data Sources	▪ Student assessments ▪ Questionnaire ▪ Teacher focus groups ▪ Administrator interviews ▪ Case studies
Key Measures	▪ Science achievement (PASS performance test and open-ended scores; STAAR state standardized test; end-of-grade state standardized test; Stanford achievement test)

[4] These data reflect only the evaluation sample in the impact study, not the entire population served.
[5] Schools in the intervention and control groups were chosen to be equivalent, according to the evaluation. The evaluation did not differentiate characteristics by group; rather the overall ones, provided above, were used.

Appendix C: Quality of the Evidence

WHAT WORKS CLEARINGHOUSE REVIEW[6]

STUDY	RATING
▪ **The LASER model: A systematic and sustainable approach for achieving high standards in science education: SSEC i3 Validation Final Report of Confirmatory and Exploratory Analyses [Elementary Schools]** https://ies.ed.gov/ncee/wwc/Study/163	▪ Study meets WWC standards without reservations ▪ No statistically significant positive findings
▪ **The LASER model: A systematic and sustainable approach for achieving high standards in science education: SSEC i3 Validation Final Report of Confirmatory and Exploratory Analyses [Middle Schools].** https://ies.ed.gov/ncee/wwc/Study/500	▪ Study meets WWC standards without reservations ▪ No statistically significant positive findings

EVIDENCE FOR ESSA REVIEW[7]

STUDY	RATING
Not reviewed as of 01/23/2020	N/A

NATIONAL CENTER ON INTENSIVE INTERVENTIONS REVIEW[8]

STUDY	RATING
Not reviewed as of 01/23/2020	N/A

[6] https://ies.ed.gov/ncee/wwc/FWW
[7] https://www.evidenceforessa.org/
[8] https://intensiveintervention.org/

*The **Investing in Innovation Fund (i3)**, established under section 14007 of the American Recovery and Reinvestment Act of 2009, is a Federal discretionary grant program at the U.S. Department of Education within the Office of Innovation and Improvement. i3 grants help schools and local education agencies work in partnership with the private sector and the philanthropic community to develop and expand innovative practices that improve student achievement or student growth, close achievement gaps, decrease dropout rates, increase high school graduation rates, and/or increase college enrollment and completion rates for high-need students.*

This summary was prepared by the Education Innovation and Research (EIR) Program Dissemination Project. The project is conducted by the Manhattan Strategy Group, in partnership with Westat and EdScale, with funding from the U.S. Department of Education, Office of Innovation and Improvement, under Contract No. ED-ESE-15-A-0012/0004. The evaluation results presented herein do not necessarily represent the positions or policies of the U.S. Department of Education, and no official endorsement by the U.S. Department of Education should be inferred.

[i] "High-need student" refers to a student at risk of academic failure or otherwise in need of special assistance and support, such as students who are living in poverty, attend high-minority schools, are far below grade level, who have left school before receiving a regular high school diploma, at risk of not graduating with a diploma on time, who are homeless, in foster care, have been incarcerated, have disabilities, or who are English learners. For more information see: Applications for New Awards; Investing in Innovation Fund-Development Grants, 81 FR 24070 (April 25, 2016).