

FACT SHEET

LOS ALAMOS NATIONAL LABORATORY (LANL) NORTHERN NEW MEXICO INQUIRY SCIENCE EDUCATION CONSORTIUM (ISEC)

Though the United States has historically been a leader in science, technology, engineering and math (STEM)-related fields, fewer students have been focusing on these topics recently. According to the US Department of Education (USDE), only 16 percent of American high school seniors that are interested in a STEM career have achieved a proficiency in mathematics. Nearly 28 percent of high school freshmen declare an interest in a STEM-related field, but 57 percent of these students will lose interest by the time they graduate from high school.

STEM education creates critical thinkers, increases science literacy, and enables the next generation of innovators. Innovation leads to new products and processes that sustain our economy. This innovation and science literacy depends on a solid knowledge base in STEM fields. It is clear that most jobs of the future will require a basic understanding of math and science. Ten-year employment projections by the US Department of Labor show that of the 20 fastest growing occupations projected for 2015, 15 of them require significant mathematics or science knowledge. A strong foundation in these subjects in both elementary and secondary levels is very important in pursuing careers in STEM. One of the problems is the difficulty to draw and retain teachers who are trained in STEM because opportunities elsewhere are much more attractive. Also, there are not enough math and science teachers who have adequate educational background or that have hands-on experience in STEM. A study by the National Science Foundation shows that over one-third of science teachers and 30 percent of math teachers in middle school still need more in-field training.

“Inquiry-centered” science allows students to conceptualize a question and then seek a possible explanation that responds to that question. Encompassing much more than “hands-on” or open-ended science teaching, comprehensive inquiry-centered science instruction:

- teaches students how to think—not just what to think;
- assesses students’ current knowledge and skills, then builds upon them;
- encourages students to conceptualize a question and then seek a possible explanation;
- actively engages children;
- promotes teamwork and collaboration;
- accommodates different learning styles; and
- enhances learning in other content areas, especially reading, mathematics, and social studies.

Background

The Northern New Mexico Inquiry Science Education Consortium (ISEC) is a collective of public schools in northern New Mexico that is organized by the Los Alamos National Laboratory (LANL) Foundation to improve STEM education for elementary students.

Inquiry-based science programs across the nation have proven highly successful for closing student achievement gaps, particularly because they integrate the teaching of literacy and mathematics.

In the fall of 2010, the LANL Foundation launched ISEC as a regional program designed to improve performance of high-need students in kindergarten through sixth grade. Initially, four school districts (Española, Mesa Vista, Peñasco, and Santa Fe) joined the consortium during school year 2010-2011, each making a five-year commitment to bring inquiry science instruction to all kindergarten through sixth grade classrooms in their districts.

Since then, ISEC has grown to include 29 schools across six school districts: Española, Dulce, Pojoaque, Mesa Vista, Peñasco, and Santa Fe. ISEC uses a student-centered, multi-dimensional approach to STEM instruction and learning that is experiential, involves problem-solving, research, reasoning, writing, drawing, and data collection and emphasizes “meaning making,” a process of critical thinking and discussion that allows for deeper comprehension of scientific concepts.

In addition to funding from the LANL Foundation, ISEC has received funding from Los Alamos National Security (LANS), the USDE and the Public Education Department in FY 16. The ISEC collaboration leveraged money and resources to bolster science education for elementary students, strengthened teacher practice in science—a traditionally underserved subject area, and built on the positive impact inquiry science demonstrates with students in the “achievement gap” (English language learners, students who qualify for free or reduced-fee lunch, and Hispanic and Native American students).

Northern New Mexico Inquiry Science Education Consortium (ISEC) Program

ISEC addresses challenges in science education with a research-based program dependent upon curriculum, professional development, and materials management. The program focuses on an earth, physical, and life science curriculum that is aligned with New Mexico content standards. Lessons guide teachers on not only what to teach but also how to teach science. There are three kits per classroom at each grade level per year. Science kits with all materials for hands-on experiments are delivered and picked up from each school, then refurbished after each 12-week cycle. The Science Resource Center handles all ordering, scheduling, and oversight of a warehouse and complex materials management system. Local resources and vendors are used whenever possible.

Professional development is provided for teachers on each grade-specific kit during summer institutes and condensed kit trainings are offered throughout the school year. Science literacy coaches hired by the districts provide ongoing classroom support. Guidance with effective teaching techniques addresses topics such as advanced content and pedagogy, visual literacy, formative assessment, note-taking and argumentation. Principals, assistant principals, and superintendents are also trained for program understanding and teacher support. Additionally the Foundation’s Conference on Education brings in speakers to present on trends and best practices.

In FY 15, ISEC served 11,224 students and 443 teachers at 37 elementary and middle schools in seven New Mexico school districts (Dulce, Española, Mesa Vista, Peñasco, Pojoaque, Santa Fe, and Springer). The 2014-2015 operating budget was \$1.9 million and \$10 million has been invested in the program over five years. The program has seven full-time staff, and additional part-time administrative support and assistance during the refurbishment process.

Program Evaluation

Program results and effectiveness are measured using both student and teacher outcomes through an independent evaluator. To verify that ISEC is improving performance of high-need students in science, closing student achievement gaps, influencing literacy and math, and improving teacher practice, LANL Foundation contracted with Research Educational Laboratory of Edvance Research, Inc. in San Antonio to design and implement a five-year evaluation at a cost of nearly \$1 million. The evaluation consists of three components. First, pre- and post-test data measures student knowledge and learning before and after each science module is taught in third through sixth grade. These tests demonstrate improvements exist in student content knowledge each year. Information is used to inform teacher professional development. Data revealed that third grade typically shows the highest gains in test scores and the longer a teacher has been in ISEC, the more gains students make in that classroom. Second, observations of fourth grade teachers are conducted twice a year by the ISEC Director of Professional Development. To ensure program fidelity and results are used to inform and expand professional development. Lastly, ISEC students were compared with non-ISEC students or like demographics and characteristics to evaluate the effectiveness of the program.

A propensity match analysis is a statistical evaluation technique to observe data that compares individual ISEC students in contrast with nonparticipants of like demographics and characteristics such as race, gender, poverty index, English language learner status, special education status, and rural school location. From the propensity match analysis of standard based assessment test scores, Edvance found “statistically significant” positive results were seen in fourth through sixth grade in math, reading, writing, and science.

- ISEC students average 4 to 7 points higher on standards-based assessment tests than students not in the program.
- Improvements are typically better for at-risk students.

ISEC is the only evaluation in science meeting WWC standards with “statistically significant” positive results. Edvance reports that the What Works Clearinghouse (WWC), an initiative of the USDE’s Institute of Education Sciences, reviewed impacts of math professional development on student achievement and found sparse positive evidence. Of the 910 studies reviewed, five met WWC standards, and only two showed positive effects on student math proficiency. This comparison further spotlights the impressive outcomes ISEC has displayed. ISEC is the only evaluation in science meeting WWC standards with “statistically significant” positive results.

ISEC District & Elementary School Partners

Dulce Independent Schools:

- Dulce Elementary

Española Public Schools:

- Abiquiu Elementary
- Alcalde Elementary
- Chimayo Elementary
- Dixon Elementary
- Eutimio “Tim” Salazar III (Fairview) Elementary
- Hernandez Elementary
- James H. Rodriguez Elementary
- Los Niños Kindergarten Center
- San Juan Elementary
- Tony E. Quintana (Sombrillo) Elementary
- Velarde Elementary

Mesa Vista Consolidated Schools:

- El Rito Elementary
- Ojo Caliente Elementary

Peñasco Independent Schools:

- Peñasco Elementary

Pojoaque Valley Schools:

- Pablo Roybal Elementary (grades K-3)
- Pojoaque Valley Intermediate School (grades 4 and 5)
- Pojoaque Valley Sixth Grade Academy

Santa Fe Public Schools:

- El Camino Real Academy (formerly Agua Fria Elementary)
- Amy Biehl Community School at Rancho Viejo
- Aspen Community Magnet School
- El Dorado Community School
- Kearny Elementary
- Nava Elementary
- Nina Otero Community School
- Piñon Elementary
- Ramirez Thomas Elementary
- Salazar Elementary
- Sweeney Elementary