

# State Education & Environment Roundtable



## California Student Assessment Project

The Effects of  
Environment-based  
Education  
on Student  
Achievement

March 2000

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### **State Education and Environment Roundtable (SEER)**

SEER is a cooperative endeavor of education agencies from 12 states working to improve student learning by integrating the environment into K-12 curricula and school reform efforts. SEER provides opportunities for its member agencies to exchange skills, experience, and resources that will help them enhance their respective programs. It also collects and disseminates information on existing school improvement programs to enable state agencies to build from a foundation of practical experience and knowledge.

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- Colorado Department of Education
- Florida Office of Environmental Education
- Iowa Department of Education
- Kentucky Environmental Education Council
- Maryland State Department of Education
- Minnesota Department of Families, Children and Learning
- Minnesota GreenPrint Council
- New Jersey Department of Education
- Ohio Department of Education
- Pennsylvania Department of Education
- Texas Education Agency
- Washington Office of the Superintendent of Public Instruction

The Pew Charitable Trusts sponsor the Roundtable. The Council of Chief State School Officers administers project funding.

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### **Disclaimer**

The opinions expressed in this report are those of the authors and do not necessarily reflect the views of the California Department of Education, The Pew Charitable Trusts, the Council of Chief State School Officers, The Environmental Trust or SEER's member agencies.

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## PREFACE

Several years ago, representatives of the state education agencies that comprise the State Education and Environment Roundtable (SEER) became interested in the potential of environment-based education programs to improve student learning, change long-standing pedagogical paradigms, and influence the way young people learn to live successfully in the world that surrounds them. In the face of limited research on the efficacy of environment-based education programs, SEER members designed a study to identify some of the most innovative and successful programs; describe their effectiveness; and, analyze their commonalities and differences. They also sought to identify the factors that contributed to the success of these programs and any challenges they encountered during implementation.

This report provides evidence that further substantiates the research presented in SEER's previous report, *Closing the Achievement Gap: Using the Environment as an Integrating Context for Learning*<sup>1</sup>.

### **Using the Environment as an Integrating Context for learning (EIC)**

Using the Environment as an Integrating Context for learning (EIC), defines a framework for education—a framework for interdisciplinary, collaborative, student-centered, hands-on, and engaged learning. EIC, a term coined by SEER, encompasses the educational practices that the group believes should form the foundation of environment-based education in America's schools. This framework has begun to transform curricula in a growing number of schools across the United States and has the potential to significantly improve K-12 education.

EIC-based learning is not primarily focused on learning about the environment, nor is it limited to developing environmental awareness. It is about using a school's surroundings and

community as a framework within which students can construct their own learning, guided by teachers and administrators using proven educational practices. EIC-based programs typically employ the environment as a comprehensive focus for learning in all areas: general and disciplinary knowledge; thinking and problem-solving skills; basic life skills, such as cooperation and interpersonal communications; as well as, understanding of one's relationship to the environment—community and natural surroundings.

Evidence gathered from the study of over 60 schools, indicates that students learn more effectively within an environment-based context than within a traditional educational framework. This evidence comes from site visits, interviews, survey results, and gains on both standardized test scores and GPAs.

The observed benefits of EIC-based programs are both broad ranging and encouraging. They include:

- better performance on standardized measures of academic achievement in reading, writing, math, science and social studies;
- reduced discipline and classroom management problems;
- increased engagement and enthusiasm for learning; and,
- greater pride and ownership in accomplishments.

EIC—by providing a comprehensive educational framework instead of traditional compartmentalized approaches—significantly improves student performance throughout the curriculum and enriches the overall school experience.

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<sup>1</sup> *Closing the Achievement Gap* presents EIC's conceptual framework. For further information contact:

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## INTRODUCTION

Environmental education (EE) represents a tool with powerful potential to change both long-standing pedagogical paradigms and influence the way young people learn to live successfully in the world that surrounds them. Yet despite these possible benefits, after almost three decades, the history of EE represents an unfulfilled promise, yet to achieve its full potential for desperately needed educational changes.

The purpose of this project was to study the educational efficacy of using the environment as an integrating context for learning (EIC) when compared to traditional educational methods. This project was designed to determine if there are measurable changes in academic achievement, as indicated by standardized tests, for students who have the opportunity to learn in programs that use the EIC approach (treatment) when compared to students in traditional programs (non-treatment). In addition, the study sought to examine behavioral effects, indicated by attendance records.

The research team from the State Education and Environment Roundtable (SEER) gathered comparative standardized data from 11 paired populations of treatment and control students.

Ultimately, only eight of the 11 paired comparisons had sufficient data to be included in the study. The collected student achievement and attendance data represents the 1996-97, 1997-98 and 1998-99 school years.

In some cases, it was possible to compare treatment and control groups within a school. In several instances, it was necessary to compare treatment and non-treatment groups from different, neighboring populations matched by demographics and socio-economic descriptors.

This is a summary report of a research project that was conducted by SEER over a seven-month period in 1999. This document is not meant to provide a detailed reporting of that project, but instead is intended to summarize the key points of the research. This report presents the study methods, school descriptions, data analysis and research results.

## METHODOLOGY

Treatment and control programs were identified through a rigorous selection process. The study schools represented diverse student populations: urban, rural and suburban settings; a range of socio-economic backgrounds; and, large to small school populations.

After an extensive search throughout California, 11 schools that appeared to have characteristics of EIC programs were selected as treatment schools. Students participating in the EIC programs were then matched with analogous students from a traditional program.

Upon reviewing the data and student population samples from the study schools, two sets of paired schools were found to have unsatisfactory comparative data and insufficient sample sizes to be included in the study. In another case, the school population was too transient to provide reliable data. Therefore, this

report reflects analysis of eight comparison pairs, instead of the original 11 pairs.

In two of the treatment schools, EIC programs and traditional programs operate simultaneously on campus, thus allowing a "within-school" comparison of treatment and control groups. Six of the study schools, however, used EIC on a school-wide basis, making it necessary to identify control populations from neighboring schools. The control populations were chosen on the basis of comparable school demographics<sup>2</sup> and proximity to the treatment school.

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<sup>2</sup> Demographic comparisons were based on: attendance area; number of students enrolled; percentage of student body receiving free- or reduced- price meals; percentage of student body classified as Limited-English-Proficient (LEP) students; ethnic composition; and, average school-wide class size.

### Quantitative Data

Quantitative data regarding academic achievement and attendance were collected from all of the treatment and control programs. Achievement was evaluated based on the results of standardized tests and, in one case, grade-point averages. Attendance was assessed on the basis of annual actual attendance rates.

In several cases, however, there were significant differences in data management and reporting between treatment and control programs. Due to the relatively small sample sizes, it was not possible to calculate the standard deviations required for standard statistical approaches.

The results reported here include all available data for measures of student achievement and attendance rates for the 1996-97, 1997-98 and 1998-99 school years. To avoid the confounding effects of program initiation, the researchers did not collect student achievement data from the first two years of program implementation.

The quantitative information included in this report was gathered with the full cooperation of the study schools and their school districts.

Standardized test results were collected from the Stanford Achievement Test (SAT), the California Test of Basic Skills (CTBS) and the California Achievement Test (CAT). Data from these three norm-referenced achievement tests allow a more or less summative comparison of K-12 students' abilities in basic skill areas.

Attendance rates were compared using annual percentages of actual attendance. The comparison of actual attendance rates was chosen over apportioned attendance rates due to the enactment of new state policy regarding apportionment. Actual attendance rates were tracked uniformly by all study schools.

Grade-point averages were included in the analysis of Lincoln High School's treatment and comparison populations. Students involved in the treatment program were compared to a random sample of analogous students in the school's traditional program.

### Qualitative Program Comparisons

Over the past two years, SEER has developed instruments consisting of 23 rubrics that can be used to assess the current status of school

programs in relation to EIC's principal characteristics. These rubrics are based on SEER's research into the pedagogies common to schools that are successfully implementing EIC.

The rubrics are organized into six principal pedagogies that evaluate a school's use of:

- natural and community settings, the local environment, as a context for learning;
- integrated, interdisciplinary instruction;
- problem-, issue-based instruction;
- collaborative instruction;
- learner-centered, constructivist methods; and,
- independent and cooperative learning.

SEER's rubrics were used to collect uniform data from the treatment and control schools regarding the instructional practices utilized by their teachers. The rubric survey forms required respondents to identify statements that reflected their personal instructional practices and to provide a narrative describing their rubric selection. The instructional practices highlighted in the rubric survey were those used as selection criteria in telephone interviews to identify participation as a treatment school.

Teachers in both treatment and control programs completed rubric survey forms. The school principal or a lead teacher within the school chose the teachers who were asked to complete rubric survey forms. Teachers were selected to reflect the grade levels and discipline areas included in the treatment programs. Measures were taken to insure that the characteristics of the teachers from control programs corresponded, to the greatest extent possible, with the treatment program teachers. The teachers were matched on the basis of years of teaching experience, grade level(s) and subject area(s) taught.

Scoring of the rubric survey forms was completed based on a four-point scale, with four representing the best practice. The rubric survey forms were scored anonymously by a panel of four educators.

The rubrics are generally used in conjunction with SEER's EIC Professional Development Seminars. The rubrics are incorporated into training sessions where participants learn the definition of terms associated with the selections. It became evident in reviewing the forms completed by educators during the course

of this study, that many teachers misinterpreted key terminology. Thus, the EIC scores for the schools are not included in this report. The school overviews, however, are based almost entirely on the written narratives the teachers provided on their surveys.

#### Paired-School Comparisons

This section consists of eight sets of paired-program or paired-school overviews and their accompanying standardized data comparisons. Each overview begins with a set of summary bullets. The overviews provide descriptions of the study schools in reference to three primary components of EIC: environment as a learning context; integrated, interdisciplinary instruction; and, problem-, issue-based instruction.

The standardized data comparisons begin with bullets summarizing the assessment tables. Each table outlines the academic areas and attendance data that were analyzed. The type of assessment (standardized test, proficiency test or portfolio assessment) is also indicated, in parenthesis, following the subject area title and

grade level. The table displays the percentage difference in scores between the two student groups and indicates the program (EIC or control) that scored higher in each assessment.

The pairs of schools included in the final comparisons are as follows:

1. Drake High: DISC Program (EIC) and Drake High traditional program (control)
2. Lincoln High: ISIS Program (EIC) and Lincoln High's traditional program (control)
3. Yreka High (EIC) and Del Norte High (control)
4. Pinecrest Intermediate (EIC) and Bridgeport Intermediate (control)
5. Brookside Elementary (EIC) and Cummins Elementary (control)
6. Maguire Elementary (EIC) and Cummins Elementary (control)<sup>3</sup>
7. Open Charter Elementary (EIC) and Community Elementary (control)
8. Thomas Elementary (EIC) and Bel Aire Elementary (control)

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<sup>3</sup> Cummins Elementary provided the control population for comparisons with EIC groups at both Brookside and Maguire Elementary Schools.

## Paired-program Overview

### Francis Drake High School's Drake Integrated Studies Curricula (DISC) and Traditional Program

- In the DISC Program, community settings provide a focus for study more consistently than in Drake's traditional classrooms.
- DISC's teaching teams routinely develop interdisciplinary units of study, whereas the traditional Drake teachers focus on their individual subject areas.
- Community-based investigations are the focus of study for DISC students on a more regular basis than for their traditional Drake peers.

#### Environment as the Context

DISC programs are solidly based in the school's surrounding community. A variety of community settings provide the context for student learning. In the traditional program at Drake, the classroom is the primary learning setting. Experiences outside the classroom are somewhat limited.

#### Integrated, Interdisciplinary Instruction

DISC programs, taught by teams of teachers representing multiple academic disciplines, focus on specific topics rather than individual subject areas. The integrated, project-based programs are centered on a theme or essential question, which provides the foundation for interdisciplinary exploration.

Routinely, Drake's traditional students move from one class to another throughout the day, each focusing on a given subject area. Teachers in the traditional program at Drake primarily plan and instruct alone.

#### Problem-, Issue-based Instruction

DISC students utilize community resources to investigate complex issues through field studies, laboratory experiments, research and mentorships. Students' projects are drawn from the community context and emphasize developing work place skills, conducting community service and pursuing internships within their area of interest.

Primarily, Drake's traditional teachers generate their study topics from textbooks and activities that provide simulated problems and issues. Based on their personal needs and interests, Drake's traditional students are given some opportunities to choose the focus of their projects and set up inquiries based on their own questions.

#### Key Results

- DISC students (EIC treatment) scored higher than Drake's traditional students (control) in 20 of the 26 academic and attendance assessments analyzed.
- Notably, eight of the 11 language arts scores for DISC students were at least 9% higher than the traditional students' scores.
- Two of the three science scores for DISC students were at least 12% higher than their traditional peers.

**EIC — Drake High School (DISC)**  
**Control — Drake High School (traditional)**

		EIC	Control
<b>Language Arts</b>			
Reading 9 <sup>th</sup> (ST)	16.0% higher	↑	
Reading 10 <sup>th</sup> (ST)	14.5% higher	↑	
Reading 11 <sup>th</sup> (ST)	4.5% higher		↑
Reading 12 <sup>th</sup> (PT)	10.4% higher	↑	
Language 9 <sup>th</sup> (ST)	14.0% higher	↑	
Language 10 <sup>th</sup> (ST)	14.5% higher	↑	
Language 11 <sup>th</sup> (ST)	3.0% higher		↑
Literacy 10 <sup>th</sup> (PA)	22.2% higher	↑	
Writing 9 <sup>th</sup> (PA)	9.2% higher	↑	
Writing 9 <sup>th</sup> (PT)	18.9% higher	↑	
Writing 12 <sup>th</sup> (PT)	5.6% higher	↑	
<b>Mathematics</b>			
Mathematics 9 <sup>th</sup> (ST)	7.5% higher	↑	
Mathematics 10 <sup>th</sup> (ST)	7.0% higher	↑	
Mathematics 11 <sup>th</sup> (ST)	6.5% higher		↑
Mathematics 9 <sup>th</sup> (PA)	0.1% higher		↑
Mathematics 9 <sup>th</sup> (PT)	4.9% higher	↑	
<b>Other Areas</b>			
Science 9 <sup>th</sup> (ST)	12.0% higher	↑	
Science 10 <sup>th</sup> (ST)	13.5% higher	↑	
Science 11 <sup>th</sup> (ST)	3.0% higher		↑
Social studies 9 <sup>th</sup> (ST)	20.5% higher	↑	
Social studies 10 <sup>th</sup> (ST)	9.5% higher	↑	
Social studies 11 <sup>th</sup> (ST)	0.5% higher		↑
<b>Attendance</b>			
Attendance rates 9 <sup>th</sup>	2.1% higher	↑	
Attendance rates 10 <sup>th</sup>	2.6% higher	↑	
Attendance rates 11 <sup>th</sup>	2.0% higher	↑	
Attendance rates 12 <sup>th</sup>	1.0% higher	↑	

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ST = standardized test

PT = proficiency test passing rate

PA = portfolio assessment

## Paired-program Overview

### Lincoln High School's Integrated Studies in Systems Program (ISIS) and Traditional Program

- ISIS teachers use the community as a learning setting more routinely than Lincoln's traditional teachers.
- The ISIS teaching team emphasizes interdisciplinary connections more readily than do the traditional Lincoln teachers.
- ISIS teachers more commonly utilize inquiry and issue-based instruction than do teachers in Lincoln's traditional classrooms.

#### Environment as the Context

The ISIS program uses a diversity of learning settings outside the classroom. On campus, ISIS students utilize the environmental learning center for assignments and projects. ISIS students also use their community as a learning resource and visit various off-campus sites, such as farms and hospitals.

The majority of instruction in Lincoln's traditional track takes place in the classroom. Occasionally, off-site settings are used to enhance classroom experiences.

#### Integrated, Interdisciplinary Instruction

ISIS teachers have formed an interdisciplinary instructional team representing science, history and English/communications. Units are taught in a manner that crosses traditional disciplinary boundaries to develop an understanding of natural and social systems.

Although teachers in Lincoln's traditional classrooms meet within their discipline areas regularly to discuss, plan and coordinate curricular decisions, they seldom share instructional responsibilities. However, Lincoln's traditional teachers make a concerted effort to help students understand the interdisciplinary connections between subject areas.

#### Problem-, Issue-based Instruction

A major component of the ISIS Program is a student-identified inquiry project, combined with community service. This project requires that students identify an essential question and examine the social, cultural, scientific and technological impacts related to their topic. All inquiry projects are presented to peers, parents, community members and teachers.

In Lincoln's traditional classrooms, instructional practice relies on textbooks and standard literature to develop study topics. As instructional focal points, the teachers occasionally integrate real-world problems and issues.

#### Key Results

- ISIS students (EIC treatment) scored lower than Lincoln's traditional students (control) in six of the 13 academic and attendance assessments analyzed.
- There was little difference overall in the comparative scores of ISIS and Lincoln's traditional students.

**EIC — Lincoln High School (ISIS)**  
**Control — Lincoln High School (traditional)**

		EIC	Control
<b>Language Arts</b>			
Reading 9 <sup>th</sup> (ST)	1.5% higher	▲	
Reading 10 <sup>th</sup> (ST)	1.0% higher	▲	
Language 9 <sup>th</sup> (ST)	2.5% higher		▲
Language 10 <sup>th</sup> (ST)	2.0% higher		▲
<b>Mathematics</b>			
Mathematics 9 <sup>th</sup> (ST)	4.5% higher		▲
Mathematics 10 <sup>th</sup> (ST)	9.5% higher		▲
<b>Other Areas</b>			
Science 9 <sup>th</sup> (ST)	1.5% higher		▲
Science 10 <sup>th</sup> (ST)	3.5% higher		▲
Social studies 9 <sup>th</sup> (ST)	2.5% higher		▲
Social studies 10 <sup>th</sup> (ST)	0.5% higher	▲	
<b>Summative Assessments</b>			
GPA's 9 <sup>th</sup> and 10 <sup>th</sup>	0.15 higher	▲	
<b>Attendance</b>			
Attendance rates 9 <sup>th</sup>	1.4% higher	▲	
Attendance rates 10 <sup>th</sup>	2.5% higher	▲	

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ST = standardized test

## Paired-schools Overview

### Yreka High School<sup>4</sup> and Del Norte High School

- Yreka's teachers utilize real-world learning contexts more consistently than do Del Norte teachers.
- Integrated, interdisciplinary instruction at Yreka is connected to local issues and authentic topics more routinely than at Del Norte.
- Problem-, issue-based learning seems to play a stronger educational role at Yreka than at Del Norte.

#### Environment as the Context

Yreka's educational programs utilize a nearby stream, off-site environment-based education center and various community locations as learning settings. Del Norte teachers use their classrooms as the primary learning setting, although some teachers take students to off-campus learning sites.

#### Integrated, Interdisciplinary Instruction

Yreka's interdisciplinary team of teachers uses natural resources as the integrating theme for curricular planning. Their interdisciplinary units help students connect learning in science and language arts with study of the local economy and history of their community.

At Del Norte, subject area disciplines are routinely taught by individual teachers who specialize in a given subject area. To reinforce learning in their specific subject area, some Del Norte teachers work together to develop themes that connect multiple disciplines.

#### Problem-, Issue-based Instruction

Yreka's school projects are linked to strong partnerships with agencies such as the U.S. Forest Service, Fish and Game and the city of Yreka. Students' field data are used by these agencies in monitoring local issues, such as stream stabilization.

Del Norte teachers primarily use textbooks and classroom-based activities in the delivery of instruction. Real-world and simulated problems and issues are periodically incorporated into their lessons.

#### Key Results

- Yreka's students (EIC treatment) scored higher than Del Norte students (control) in 20 of the 21 academic and attendance assessments analyzed.
- Notably, five of the eight language arts scores for Yreka were at least 8% higher than the Del Norte language arts scores.
- In the three years studied, all science scores for Yreka students were at least 11% higher than the Del Norte students' scores.
- For all grade levels, Yreka's annual actual attendance rates were higher than Del Norte's attendance scores.

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<sup>4</sup> Yreka High School educators did not return their survey forms. Thus, program descriptions of Yreka are based solely on phone and site-visit interviews conducted with teachers and the district superintendent.

**EIC — Yreka High School**  
**Control — Del Norte High School**

		EIC	Control
<b>Language Arts</b>			
Reading 9 <sup>th</sup> (ST)	8.5% higher	▲	
Reading 10 <sup>th</sup> (ST)	12.0% higher	▲	
Reading 11 <sup>th</sup> (ST)	6.0% higher	▲	
Language 9 <sup>th</sup> (ST)	4.0% higher	▲	
Language 10 <sup>th</sup> (ST)	10.5% higher	▲	
Language 11 <sup>th</sup> (ST)	8.5% higher	▲	
Spelling 9 <sup>th</sup> (ST)	8.0% higher	▲	
Spelling 10 <sup>th</sup> (ST)	5.0% higher	▲	
Spelling 11 <sup>th</sup> (ST)	3.0% higher		▲
<b>Mathematics</b>			
Mathematics 9 <sup>th</sup> (ST)	0% difference		
Mathematics 10 <sup>th</sup> (ST)	1.5% higher	▲	
Mathematics 11 <sup>th</sup> (ST)	0.5% higher	▲	
<b>Other Areas</b>			
Science 9 <sup>th</sup> (ST)	13.0% higher	▲	
Science 10 <sup>th</sup> (ST)	11.0% higher	▲	
Science 11 <sup>th</sup> (ST)	16.0% higher	▲	
Social studies 9 <sup>th</sup> (ST)	3.0% higher	▲	
Social studies 10 <sup>th</sup> (ST)	12.0% higher	▲	
Social studies 11 <sup>th</sup> (ST)	7.0% higher	▲	
<b>Attendance</b>			
Attendance rates 9 <sup>th</sup>	3.0% higher	▲	
Attendance rates 10 <sup>th</sup>	4.7% higher	▲	
Attendance rates 11 <sup>th</sup>	5.5% higher	▲	
Attendance rates 12 <sup>th</sup>	3.9% higher	▲	

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ST = standardized test

## Paired-schools Overview

### Pinecrest Intermediate School and Bridgeport Intermediate School (grades 6-8)

- Pinecrest students appear to have opportunities to explore a greater diversity of natural and community settings than do Bridgeport students.
- Authentic issues are used to integrate interdisciplinary learning more consistently at Pinecrest than at Bridgeport.
- Problem- and issue-based learning is more routinely used as an instructional method at Pinecrest than at Bridgeport.

#### Environment as the Context

Learning settings for Pinecrest students are comprised of classroom, community and statewide contexts. The students often visit local ranches, tree farms and a 45-acre forested parcel.

The classroom is the primary learning setting for instruction at Bridgeport. Students have limited opportunities to take walking field trips and have adopted a local forested area.

#### Integrated, Interdisciplinary Instruction

Community-based issues and field studies guide the integrated, interdisciplinary instruction at Pinecrest. Students integrate multiple subject areas as they investigate the many viewpoints of community issues.

Bridgeport teachers make an effort to provide activities that combine various disciplines. These activities are used to strengthen learning of the disciplines as separate subject areas and to examine their connections.

#### Problem-, Issue-based Instruction

Through a partnership with the U.S. Forest Service and local business people, Pinecrest students have developed a strong service learning component in their educational program. These intermediate students also communicate with business representatives and community members as they explore local issues related to the timber industry and ranching.

Bridgeport teachers primarily rely on textbooks as the source of study topics. Supplementary activities involve using the Internet, watching videos and reviewing source books.

#### Key Results

- Pinecrest students (EIC treatment) scored higher than Bridgeport students (control) in 9 of the 15 assessments analyzed.
- Six of the 9 language arts scores for Pinecrest were at least 12% higher than the scores of their Bridgeport counterparts.

**EIC — Pinecrest Intermediate School**  
**Control — Bridgeport Intermediate School**

		EIC	Control
<b>Language Arts</b>			
Reading 6 <sup>th</sup> (ST)	2.0% higher	▲	
Reading 7 <sup>th</sup> (ST)	18.3% higher	▲	
Reading 8 <sup>th</sup> (ST)	15.3% higher	▲	
Language 6 <sup>th</sup> (ST)	0.5% higher	▲	
Language 7 <sup>th</sup> (ST)	15.6% higher	▲	
Language 8 <sup>th</sup> (ST)	21.7% higher	▲	
Spelling 6 <sup>th</sup> (ST)	5.0% higher		▲
Spelling 7 <sup>th</sup> (ST)	19.0% higher	▲	
Spelling 8 <sup>th</sup> (ST)	12.5% higher	▲	
<b>Mathematics</b>			
Mathematics 6 <sup>th</sup> (ST)	22.0% higher		▲
Mathematics 7 <sup>th</sup> (ST)	21.3% higher		▲
Mathematics 8 <sup>th</sup> (ST)	3.0% higher	▲	
<b>Attendance</b>			
Attendance rates 6 <sup>th</sup>	5.0% higher		▲
Attendance rates 7 <sup>th</sup>	3.5% higher		▲
Attendance rates 8 <sup>th</sup>	1.4% higher		▲

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ST = standardized test

## Paired-schools Overview

### Brookside Elementary School and Cummins Elementary School

- Brookside teachers appear to use authentic natural and community settings more consistently than do Cummins' teachers.
- At Brookside, interdisciplinary instruction is tied to real-world learning on a more regular basis than at Cummins.
- Problem-, issue-based learning seems to be a greater educational focus at Brookside than it is at Cummins.

#### Environment as the Context

Teachers at Brookside regularly focus their instructional program on the local hills, ranches, creek and school garden. They work to employ a wide variety of local, authentic settings in their program.

At Cummins, teachers frequently conduct field trips, taking students to off-campus learning sites. Some classes utilize a class garden. All fifth graders also have an outdoor education experience.

#### Integrated, Interdisciplinary Instruction

At Brookside, learning about the natural history of the area is connected to interdisciplinary study of the local community. These real-world settings reinforce subject matter knowledge and development of research, critical thinking and problem-solving skills.

Cummins teachers incorporate cross-disciplinary projects to coordinate learning across multiple subject areas. Units of study, such as a simulated travel project, draw on various disciplinary skills and knowledge.

#### Problem-, Issue-based Instruction

Brookside students are provided opportunities to identify and select problems that guide their learning. Restoration work along local creeks and on the school campus reinforces critical thinking and problem-solving skills. Making presentations to educate the larger community provides Brookside students with authentic feedback from community stakeholders.

Primarily, instruction at Cummins is teacher-directed. Some teachers supplement the curriculum with community service projects. Student projects generally act as culminating activities at the end of a study unit or end of the school year.

#### Key Results

- Brookside students (EIC treatment) scored higher than Cummins students (control) in 18 of the 20 academic and attendance assessments analyzed.
- In the 5<sup>th</sup> grade literacy portfolio, an authentic assessment measurement, the Brookside students scored an impressive 24% higher than their traditional counterparts at Cummins.
- Brookside students scored higher than did Cummins students in all four math assessments.

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**EIC — Brookside Elementary School**  
**Control — Cummins Elementary School**

		EIC	Control
<b>Language Arts</b>			
Reading 2 <sup>nd</sup> (ST)	6.7% higher	↑	
Reading 3 <sup>rd</sup> (ST)	0.3% higher		↑
Reading 4 <sup>th</sup> (ST)	4.3% higher	↑	
Reading 5 <sup>th</sup> (ST)	2.0% higher	↑	
Language 2 <sup>nd</sup> (ST)	5.3% higher	↑	
Language 3 <sup>rd</sup> (ST)	4.0% higher	↑	
Language 4 <sup>th</sup> (ST)	7.0% higher	↑	
Language 5 <sup>th</sup> (ST)	2.0% higher		↑
Literacy 5 <sup>th</sup> (PA)	24% higher	↑	
Spelling 2 <sup>nd</sup> (ST)	7.3% higher	↑	
Spelling 3 <sup>rd</sup> (ST)	3.0% higher	↑	
Spelling 4 <sup>th</sup> (ST)	8.7% higher	↑	
Spelling 5 <sup>th</sup> (ST)	2.7% higher	↑	
<b>Mathematics</b>			
Mathematics 2 <sup>nd</sup> (ST)	6.0% higher	↑	
Mathematics 3 <sup>rd</sup> (ST)	3.3% higher	↑	
Mathematics 4 <sup>th</sup> (ST)	6.7% higher	↑	
Mathematics 5 <sup>th</sup> (ST)	2.7% higher	↑	
<b>Attendance</b>			
Attendance rates 2 <sup>nd</sup>	0.2% higher	↑	
Attendance rates 3 <sup>rd</sup>	0.5% higher	↑	
Attendance rates 4 <sup>th</sup>	0.6% higher	↑	
Attendance rates 5 <sup>th</sup>	0% difference		

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ST = standardized test

PA = portfolio assessment

## Paired-schools Overview

### Edna Maguire Elementary School and Cummins Elementary School

- Maguire teachers appear to utilize a diversity of environment-based settings more regularly than do Cummins' teachers.
- Instructional practices at Maguire are grounded in interdisciplinary, real-world learning more consistently than at Cummins.
- Student-generated, problem-based learning seems to be a greater educational focus at Maguire than at Cummins.

#### Environment as the Context

At Maguire, diverse learning settings are used for instruction. These settings include a local creek, a half-acre school garden and nearby trails.

Cummins teachers use field trips as their primary outdoor learning venue. Fifth-graders attend outdoor school. Other classes utilize a school garden.

#### Integrated, Interdisciplinary Instruction

Teachers at Maguire focus on connecting knowledge and skills in multiple subject areas. All disciplines are integrated into the program using a theme or issue as the context. Community members and parents contribute to the curriculum planning and instruction.

Cummins teachers coordinate learning across multiple subject areas using projects that link several disciplines. Students apply various disciplinary skills and knowledge through simulations. Generally, individual teachers provide instruction, although some collaboration takes place.

#### Problem-, Issue-based Instruction

Maguire students identify and pursue the study of real-world problems and issues within their community. Topics of interest to the students are often the starting point for learning. Community members and parents are the audience for performance assessments.

Most instruction at Cummins is teacher-directed with some teachers using community service projects to supplement the curriculum. Generally, Cummins' teachers direct student learning, although, student-generated research is sometimes used to supplement the curriculum. Culminating projects are often incorporated into major units of study.

#### Key Results

- Maguire students (EIC treatment) scored higher than Cummins students (control) in 17 of the 21 academic and attendance assessments analyzed.
- In 10 of 14 language arts comparisons, Maguire students scored higher than did Cummins students.
- At all grade levels, Maguire students ranked higher than their counterparts at Cummins on all four standardized mathematics assessments, with second graders demonstrating a 15% higher score.

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**EIC — Maguire Elementary School**  
**Control — Cummins Elementary School**

		EIC	Control
<b>Language Arts</b>			
Reading 2 <sup>nd</sup> (ST)	12.0% higher	▲	
Reading 3 <sup>rd</sup> (ST)	0.7% higher	▲	
Reading 4 <sup>th</sup> (ST)	4.0% higher	▲	
Reading 5 <sup>th</sup> (ST)	2.7% higher		▲
Language 2 <sup>nd</sup> (ST)	13.0% higher	▲	
Language 3 <sup>rd</sup> (ST)	0.3% higher		▲
Language 4 <sup>th</sup> (ST)	6.3% higher	▲	
Language 5 <sup>th</sup> (ST)	2.3% higher		▲
Literacy 5 <sup>th</sup> (PA)	0.6% higher	▲	
Literacy 5 <sup>th</sup> (PT)	26.0% higher	▲	
Spelling 2 <sup>nd</sup> (ST)	18.0% higher	▲	
Spelling 3 <sup>rd</sup> (ST)	2.0% higher	▲	
Spelling 4 <sup>th</sup> (ST)	4.0% higher	▲	
Spelling 5 <sup>th</sup> (ST)	3.0% higher		▲
<b>Mathematics</b>			
Mathematics 2 <sup>nd</sup> (ST)	15.0% higher	▲	
Mathematics 3 <sup>rd</sup> (ST)	3.3% higher	▲	
Mathematics 4 <sup>th</sup> (ST)	6.7% higher	▲	
Mathematics 5 <sup>th</sup> (ST)	2.7% higher	▲	
<b>Attendance</b>			
Attendance rates 3 <sup>rd</sup>	0.3% higher	▲	
Attendance rates 4 <sup>th</sup>	1.6% higher	▲	
Attendance rates 5 <sup>th</sup>	1.6% higher	▲	

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ST = standardized test

PT = proficiency test passing rate

PA = portfolio assessment

## Paired-schools Overview

### Open Charter School (elementary) and Community Charter School (elementary)

- Open Charter's teachers appear to use a greater diversity of natural and community settings than do Community's teachers.
- Open Charter's educators place a greater school-wide emphasis on interdisciplinary learning than do educators at Community.
- Problem-based learning focuses on real-world, local issues identified by the students at Open Charter more often than at Community.

#### Environment as the Context

Open Charter's teachers use a range of learning settings. Some integrate multiple-site investigations at a nearby wetland, while others utilize field trips or visits to local community settings. Community's teachers use instructional locations that include the school grounds, neighborhood surrounding the school and various field-trip locations.

#### Integrated, Interdisciplinary Instruction

Creating interdisciplinary curriculum, based on unifying themes and issues, is a school-wide effort at Open Charter. Teachers consistently encourage students to examine the connections between various subject areas as they study interconnected systems.

Community teachers instruct both individually and in teaching teams. Some grade-level teams work together to instruct students in multiple disciplines. The teachers use themes to coordinate student learning in multiple subject areas.

#### Problem-, Issue-based Instruction

Open Charter's curriculum is driven by real-world problems related to various grade-level themes. Instruction is often taken in new, unexpected directions as a result of student interest in issues and problems they identify in their community.

At Community, thematic units and current events are used to introduce and discuss worldwide issues. Periodically, teachers guide exploration of issues raised by the students.

#### Key Results

- Open Charter's students (EIC treatment) scored higher than did Community students (control) in 20 of the 33 academic and attendance assessments analyzed.
- Scores for Open Charter's 4<sup>th</sup> and 5<sup>th</sup> graders were consistently higher than scores for their Community counterparts. A possible explanation for this pattern is that the interdisciplinary environment-based program at Open Charter begins in earnest at the 4<sup>th</sup> grade level.

**EIC — Open Charter School (elementary)**  
**Control — Community Charter School (elementary)**

		EIC	Control
<b>Language Arts</b>			
Reading 2 <sup>nd</sup> (ST)	1.0% higher	↑	
Reading 3 <sup>rd</sup> (ST)	3.0% higher		↑
Reading 4 <sup>th</sup> (ST)	8.3% higher	↑	
Reading 5 <sup>th</sup> (ST)	8.7% higher	↑	
Reading (PA)	15.2% higher	↑	
Language 2 <sup>nd</sup> (ST)	3.0% higher	↑	
Language 3 <sup>rd</sup> (ST)	5.3% higher		↑
Language 4 <sup>th</sup> (ST)	6.0% higher	↑	
Language 5 <sup>th</sup> (ST)	10.0% higher	↑	
Spelling 2 <sup>nd</sup> (ST)	9.0% higher		↑
Spelling 3 <sup>rd</sup> (ST)	10.0% higher		↑
Spelling 4 <sup>th</sup> (ST)	4.3% higher	↑	
Spelling 5 <sup>th</sup> (ST)	8.0% higher	↑	
Using information 3 <sup>rd</sup> (ST)	11.5% higher		↑
Using information 4 <sup>th</sup> (ST)	5.5% higher	↑	
Using information 5 <sup>th</sup> (ST)	11.5% higher	↑	
Listening skills 2 <sup>nd</sup> (ST)	9.7% higher	↑	
Listening skills 3 <sup>rd</sup> (ST)	1.0% higher		↑
Listening skills 4 <sup>th</sup> (ST)	7.5% higher	↑	
Listening skills 5 <sup>th</sup> (ST)	18.5% higher	↑	
<b>Mathematics</b>			
Mathematics 2 <sup>nd</sup> (ST)	3.3% higher		↑
Mathematics 3 <sup>rd</sup> (ST)	10.0% higher		↑
Mathematics 4 <sup>th</sup> (ST)	1.0% higher		↑
Mathematics 5 <sup>th</sup> (ST)	1.0% higher		↑
<b>Other Areas</b>			
Science 3 <sup>rd</sup> (ST)	8.3% higher		↑
Science 4 <sup>th</sup> (ST)	5.3% higher	↑	
Science 5 <sup>th</sup> (ST)	10.7% higher	↑	
Social studies 3 <sup>rd</sup> (ST)	9.5% higher		↑
Social studies 4 <sup>th</sup> (ST)	5.5% higher	↑	
Social studies 5 <sup>th</sup> (ST)	8.0% higher	↑	
Thinking skills 3 <sup>rd</sup> (ST)	5.5% higher		↑
Thinking skills 4 <sup>th</sup> (ST)	8.0% higher	↑	
Thinking skills 5 <sup>th</sup> (ST)	11.0% higher	↑	

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ST = standardized test

PA = portfolio assessment

## Paired-schools Overview

### Thomas Elementary School and Bel Aire Elementary School

- Teachers at Thomas appear to use a greater variety of community settings for learning than do Bel Aire teachers.
- Interdisciplinary learning seems to be a focus at Thomas, while Bel Aire utilizes theme-based, multi-disciplinary approaches.
- Problem-, issue based learning is used as an instructional focus with greater regularity at Thomas than at Bel Aire.

#### Environment as the Context

Teachers at Thomas utilize learning sites at the school garden, local ranches, museums and businesses in the community. At Bel Aire, the classroom is the primary instructional setting with occasional field trips and lessons that take students into the school's surrounding neighborhood.

#### Integrated, Interdisciplinary Instruction

At Thomas, presenting curriculum in an interdisciplinary manner is a school-wide effort. Planning often occurs within grade-level teams, although individual teachers most often deliver instruction.

Thematic units are used to emphasize a multi-disciplinary approach at Bel Aire. Teachers plan and instruct both individually and as grade-level teams.

#### Problem, Issue-based Instruction

Project-based learning is an instructional focus at Thomas. Students perform community service projects on local ranch lands. Instruction also focuses on topics derived from real-world problems and issues identified by the teachers and students.

Textbooks, current events and simulation projects provide the majority of the topics studied in Bel Aire's classrooms. Class work at Bel Aire involves projects, but they do not generally have a real-world context.

#### Key Results

- Thomas students (EIC treatment) scored higher than Bel Aire students (control) in 11 of the 17 academic and attendance assessments analyzed.
- In 7 of 11 language arts comparisons, Thomas students scored higher than did Bel Aire students.
- Thomas students scored higher than Bel Aire students on every standardized mathematics assessment.

**EIC — Thomas Elementary School**  
**Control — Bel Aire Elementary School**

		<b>EIC</b>	<b>Control</b>
<b>Language Arts</b>			
Reading 3 <sup>rd</sup> (ST)	4.7% higher	▲	
Reading 4 <sup>th</sup> (ST)	4.0% higher	▲	
Reading 5 <sup>th</sup> (ST)	0.1% higher	▲	
Language 3 <sup>rd</sup> (ST)	2.3% higher	▲	
Language 4 <sup>th</sup> (ST)	1.0% higher	▲	
Language 5 <sup>th</sup> (ST)	1.3% higher	▲	
Writing 5 <sup>th</sup> (PA)	1.2% higher		▲
Writing 5 <sup>th</sup> (PT)	4.3% higher		▲
Spelling 3 <sup>rd</sup> (ST)	1.0% higher	▲	
Spelling 4 <sup>th</sup> (ST)	2.3% higher		▲
Spelling 5 <sup>th</sup> (ST)	1.3% higher		▲
<b>Mathematics</b>			
Mathematics 3 <sup>rd</sup> (ST)	4.3% higher	▲	
Mathematics 4 <sup>th</sup> (ST)	1.7% higher	▲	
Mathematics 5 <sup>th</sup> (ST)	2.0% higher	▲	
<b>Attendance</b>			
Attendance rates 3 <sup>rd</sup>	0.1% higher		▲
Attendance rates 4 <sup>th</sup>	0.2% higher		▲
Attendance rates 5 <sup>th</sup>	0.5% higher	▲	

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ST = standardized test  
 PT = proficiency test passing rate  
 PA = portfolio assessment

**Summary**

When data from all eight sets of comparative pairs were combined:

- EIC students scored higher than their traditional counterparts in 72%, 101 of 140 academic assessments.
- In 76%, 69 of 91 language arts comparisons, EIC students scored higher than did students in the traditional programs.
- EIC students demonstrated higher scores than their traditional peers in 63%, 17 of the 27 math assessments analyzed.
- In 64%, 7 of the 11 science assessments, EIC students scored higher than did the traditionally educated students.
- When contrasted with the traditional student populations, students in EIC programs scored higher in 8 of 11 social studies assessments (73%).
- Compared to their peers in traditional programs, the EIC students demonstrated higher scores in 77%, 17 of the 22 attendance assessments.

**Summary of Paired Comparisons**

<b>Assessment Content</b>	<b>Number of Assessments Indicating Higher Scores for EIC Students</b>	<b>Total Number of Assessments</b>	<b>Percent</b>
Language Arts	69	91	76%
Math	17	27	63%
Science	7	11	64%
Social Studies	8	11	73%
<b>TOTALS</b>	<b>101</b>	<b>140</b>	<b>72%</b>

<b>Assessment Content</b>	<b>Number of Assessments Indicating Higher Scores for EIC Students</b>	<b>Total Number of Assessments</b>	<b>Percent</b>
Attendance	17	22	77%
<b>TOTALS</b>	<b>17</b>	<b>22</b>	<b>77%</b>

**SEER's National Research Data**

The data from this study were combined with SEER's national research data. The combined information yielded the following results:

- EIC students demonstrated higher scores in 77%, 137 of the 179 academic assessments analyzed.
- In language arts, 86 of 108 assessments (80%) indicated higher scores for students in the EIC programs, when compared to their traditionally educated counterparts.
- Compared to their peers in traditional programs, EIC students' math scores were higher in 22 of the 34 assessments (65%).
- In 10 of the 15 total science assessments (67%), EIC students demonstrated higher scores than students in the traditional programs.
- When contrasted with the comparison populations, students in EIC programs scored higher in 10 of the 13 social studies assessments (77%).
- Compared to their traditional peers, EIC students had higher scores in 84%, 26 of 31 combined discipline and attendance assessments.

**Summary of SEER's  
National Research Data Including this Study**

<b>Assessment Content</b>	<b>Number of Assessments Indicating Higher Scores for EIC Students</b>	<b>Total Number of Assessments</b>	<b>Percent</b>
Comprehensive	9	9	100%
Language Arts	86	108	80%
Math	22	34	65%
Science	10	15	67%
Social Studies	10	13	77%
<b>TOTALS</b>	<b>137</b>	<b>179</b>	<b>77%</b>

<b>Assessment Content</b>	<b>Number of Assessments Indicating Higher Scores for EIC Students</b>	<b>Total Number of Assessments</b>	<b>Percent</b>
Discipline	4	4	100%
Attendance	22	27	81%
<b>TOTALS</b>	<b>26</b>	<b>31</b>	<b>84%</b>

The findings of this study will hopefully help advance discussions on connecting EE and EIC to state academic standards. A collaborative inter-state network will further strengthen the credibility of research by increasing the number of sample schools and broadening the geographical diversity of study sites.

Parallel research endeavors are currently being organized in other SEER member states. Maryland, Pennsylvania, Florida, Washington and Colorado have already indicated a strong desire to participate in similar efforts. At a future date, the results of this study will be incorporated into a report that includes findings from other states.