Place-based Education & Academic Achievement

Prepared by:

Michael Duffin, PEER Associates, Inc.

Prepared for:

the Place-based Education Evaluation Collaborative (PEEC)

November 16, 2005

Suggested citation:

Duffin, M., Chawla, L., Sobel, D., & PEER Associates (2005). *Place-based education and academic achievement*. Retrieved November 14, 2005 from http://www.peecworks.org/PEEC/PEEC Research/S0032637E

* Place-based or environment-based education uses the environment as an integrating context (EIC) across disciplines. It is characterized by interdisciplinary learning, team teaching, hands-on learning experiences that often center on problem-solving projects, learner-centered education that adapts to students' individual skills and abilities, and the exploration of the local community and natural surroundings. The following studies show that this approach not only increases students' environmental literacy, but delivers other important benefits as well.



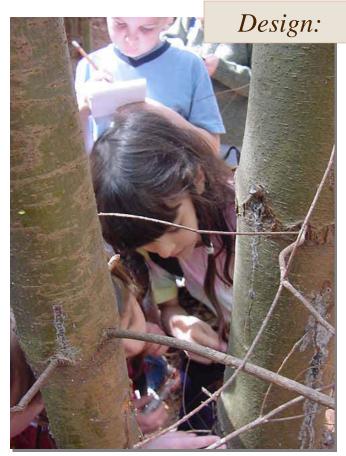
A Review of Research and Evaluation on Impacts of Place-based Education on Student Academic Achievement

- * Part 1: Ten studies from across the United States
 - Collectively cover 16 states, 265 schools
 - Recent (1998-2005)
 - Various combinations of standardized test scores, interviews, observations, demographics, documents
- * Part 2: Results from the Place-based Education Evaluation Collaborative (PEEC) and CO-SEED
 - Basic theory of change
 - Dose-response measurement strategy
 - Direct measures of student achievement

Ten Student Achievement Studies from across the United States

Environmental Education: Improving Student Achievement

(Bartosh, 2004, Washington State)

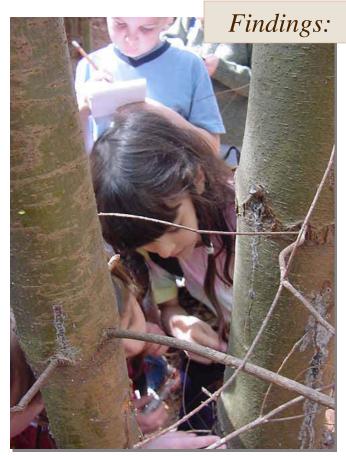


Gilford Elementary School, Gilford, NH

- * Statistically compared 77 pairs of demographically equivalent schools (fully implementing EE for at least 3 years v. schools w/o or just starting EE program)
- Standardized tests (Washington Assessment of Student Learning, and Iowa Test of Basic Skills)
- * Electronic survey to evaluate the teaching & learning environment

Environmental Education: Improving Student Achievement

(Bartosh, 2004, Washington State)



Gilford Elementary School, Gilford, NH

- Schools with systematic EE programs showed higher, statistically significant, test scores on standardized tests in math, reading, writing, and listening
- Pattern of EE school students having higher scores persisted for all five years of data investigated (1997-2002)
- EE schools used natural areas more, had more EE prof. devel., and more support from parents, community, and administration

Closing the Achievement Gap: Using the Environment as an Integrating Context for Learning (Lieberman & Hoody, 1998, national scope)

- ** EIC programs in 40 schools in 12 states (California, Colorado, Florida, Iowa, Kentucky, Maryland, Minnesota, New Jersey, Ohio, Pennsylvania, Texas, Washington)
- * Interviews with over 250 teachers and principals and over 400 students
- * Four surveys about site characteristics
- * 14 comparisons between EIC and traditional programs



Gilford Elementary School, Gilford, NH

Closing the Achievement Gap:

Using the Environment as an Integrating Context for Learning

(Lieberman & Hoody, 1998, national scope)

- Higher scores on standardized measures of academic achievement (reading, writing, math, science, social studies, GPA)
- In the 14 schools that compared EIC v. traditional programs, 36 out of 39 measures showed better performance by EIC students
- Reduced discipline, classroom management problems; Increased engagement and enthusiasm for learning; Greater pride, ownership in their accomplishments.



Gilford Elementary School, Gilford, NH

California Student Assessment Project: The Effects of Environment-based Education on Student Achievement (SEER, 2000, California)



Haley School, Roslindale, MA

- ** 8 paired sets of students: one class exposed to EIC programs and the other without (twice from same school, six times from different, neighboring schools matched by demographics/SES)
- Evidence came from standardized test scores, site visits, and teacher surveys and interviews

California Student Assessment Project: The Effects of Environment-based Education on Student Achievement (SEER, 2000, California)



Haley School, Roslindale, MA

Substantiates and builds upon findings from the *Closing the Achievement Gap* study

Assessment	Number of Assessments	Total Number	Percer
Content	Indicating Higher Scores for EIC Students	of	
		Assessments	
Comprehensive	9	9	100%
Language Arts	86	108	80%
Math	22	34	65%
Science	10	15	67%
Social Studies	10	13	11.00
TOTALS	137	179	77%
Assessment	Number of Assessments	Total Number	Percer
Content	Indicating Higher Scores for EIC Students	of Assessments	
Discipline	4	4	100%
Attendance	22	27	2170
TOTALS	26	31	84%

The Effects of Environment-based Education on Students' Achievement Motivation

&

The Effect of Environment-based Education on Student' Critical Thinking Skills and Disposition Toward Critical Thinking

(Athman (Ernst) & Monroe, 2004, Florida)

Design:

- * 400 students, grades 9 & 12 in 11 Florida high schools
- Norm-referenced tests(Achievement Motivation Inventory, Cornell Critical

POSCUI

President

Pre

uley School,

Thinking Test, California Measure of Mental Motivation) and interviews with selected students

* Studies published in two separate peer-reviewed articles (Journal of Interpretation Research, and Environmental Education Research)

The Effects of Environment-based Education on Students' Achievement Motivation

The Effect of Environment-based Education on Student' Critical Thinking Skills and Disposition Toward Critical Thinking

(Athman (Ernst) & Monroe, 2004, Florida)

Findings:

Controlling for GPA, gender and ethnicity, EIC programs significantly raised scores on all three tests



- Critical thinking attributed to environmental themes, open-ended research projects, student voice and empowerment, connection to community
- Motivation attributed to learning experiences tailored to students' interests/strengths, and applied to real-life issues/problems

Environment-based Education: Creating High Performance Schools and Students (NEETE 2000 national seems)

(NEETF, 2000, national scope)



Hinsdale School, Hinsdale, NH

- Case studies of schools with environment-based programs (five individual schools, a model school program involving five schools, and a statewide program)
- Compared scores on statewide standardized tests between students from environment-based programs and various comparison groups such as district or state
- * Augmented with qualitative data, presumably from interviews, observations and/or documents

Environment-based Education: Creating High Performance Schools and Students

(NEETF, 2000, national scope)



Hinsdale School, Hinsdale, NH

- All 3rd graders at Hawley Environmental Elementary School in Milwaukee, WI passed the Wisconsin Reading Comprehension Test (as compared with only 25% of the total Milwaukee public school population).
- At Isaac Dickson Elementary School in Asheville, NC, 4th grade students achieved a 31 percentage point increase in math achievement in just one year.
- Scores on college admission ACT test were higher for students from the School for Environmental Studies in Apple Valley, MN, than their peers in the district, the state, and the nation.
- At Condit Elementary School in Bellaire, TX, 3rd grade students who took part in the research-based environment program demonstrated higher-level thinking skills according to locally developed instruments.

Environment-based Education: Creating High Performance Schools and Students

(NEETF, 2000, national scope)



Hinsdale School, Hinsdale, NH

- First graders in the EIC classroom at Kruse Elementary in Pasadena, TX, performed higher on the Iowa Test of Basic Skills in all categories.
- Since incorporating environmental issues into the curriculum,
 Tompkinsville Elementary (and other Kentucky schools) have increased their achievement in science, reading, and social studies on statewide tests.
- All five schools in Florida's Model Schools in EE program showed steady increases over five years on Florida Writes and FCAT tests.

Effects of Outdoor Education Programs for Children in California

(American Institutes of Research, 2005, California)

- * At-risk 6th grade students, 4 schools, 3 hands-on, ecology-oriented outdoor programs
- * Delayed treatment design
 (119 students in treatment group,
 control group of 106 students
 participated later in the year)
- * Student, teacher, and parent surveys (pre-, post-, 6-10 weeks post), plus site visits and interviews
- * Measured social/personal skills, stewardship of the environment, knowledge/understanding of science, and benefits for English Language Learners



Beebe School, Malden, MA

Effects of Outdoor Education Programs for Children in California

(American Institutes of Research, 2005, California)

- Science scores on post-tests higher for treatment group
- Teachers reported increases in self-esteem, conflict resolution, relationship with peers, problem solving, motivation to learn, and behavior in class
- No significant change in environmental stewardship scores



Beebe School, Malden, MA

An Evaluation of the National Wildlife Federation's® Schoolyard Habitat Program® in the Houston Independent School District

(Danforth, 2005, Texas)





Dearborn Middle School, Roxbury, MA

- Compared 3 pairs of Houston schools, matched based on demographics
- Treatment group included 306 4th graders in schools implementing SYH, control group included 182 4th graders not doing SYH
- Measures include tests scores (Texas Assessment of Skills and Knowledge- Reading, Math, not Writing), attendance, and demographics
- **★** 3rd grade as pre-, 4th grade as post-

An Evaluation of the National Wildlife Federation's® Schoolyard Habitat Program® in the Houston Independent School District

(Danforth, 2005, Texas)

Findings:



Dearborn Middle School, Roxbury, MA

- SYH participation correlated positively and fairly strongly with increased math scores (.30)
- SYH participation correlated negatively and more weakly with improved reading scores (-.15)
- Author argued that the SYH curriculum did not address reading as directly as math
- Overall, non-whites and/or African Americans showed more improvement; Attendance results were mixed; Free lunch status correlations were not significant

They Remember What They Touch: The Impact of Place-based Learning in East Feliciana Parish

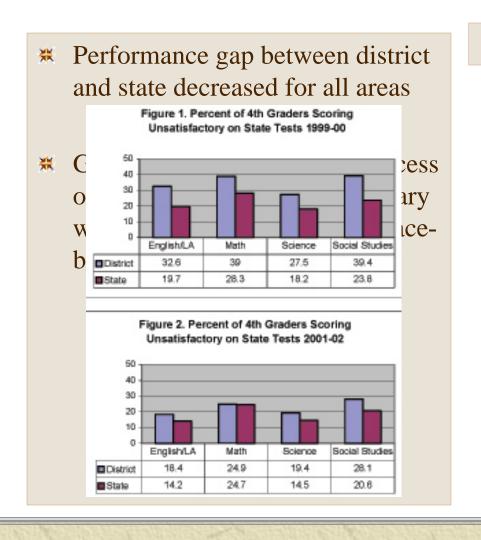
(Emekauwa, 2004, Louisiana)

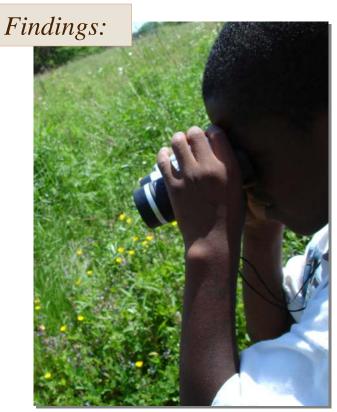
- * In 1999-2000, began Project Connect, a district wide place-based math and science initiative
- ★ 5 elementary/middle schools, over 2000 students, 80% African American, 85% free lunch
- ★ 52 teachers participated in 1 or more of 3 consecutive summer trainings
- ★ Investigated 4th grade ELA, Math, Science, Social Studies scores on Louisiana Educational Assessment Program (LEAP 21), 1998-2002
- Compared district to state for % of students at "unsatisfactory" level



Haley School, Roslindale, MA

They Remember What They Touch: The Impact of Place-based Learning in East Feliciana Parish (Emekauwa, 2004, Louisiana)





Haley School, Roslindale, MA

A Study to Keep Your Eye On

(Falco, 2004, South Carolina EIC School Network)

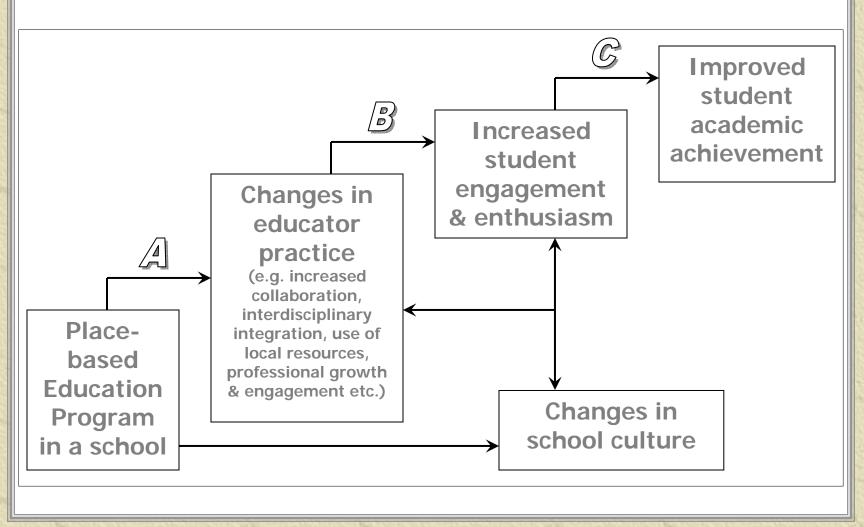
- * 10 middle schools participated in EIC implementation in South Carolina
- * In the first year all of the schools showed some degree of improved attendance, behavior, and academic achievement
- * Watch to see if future reports from this group continue to build on their growing body of evidence and also provide more details about the method and data for their investigations



Woodsville Elementary School, Woodsville, NH

Student Achievement Investigations from PEEC and CO-SEED

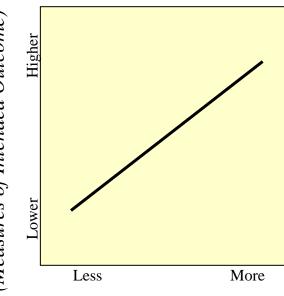
Basic Theory of Change for Student Academic Achievement



PEEC's Dose-Response Measurement Strategy

- * If participants with less dose have lower outcomes, and those with more dose have higher outcomes, then the program is likely to be an active ingredient
- * Coleman report claimed that schooling accounted for only 10% of the variance in student achievement (or $\triangle R^2 = .10$)
- * Marzano claims that that number is actually closer to 20%, with 13% deriving from teacher-level factors, and 7% attributable to school-level factors
- * Weight status predicts 17-19% of cost for treating cardiovascular disease





Program "Dose"

(Exposure + Implementation)

Link A in the Logic Chain

Changes in educator practice

Placebased Education Program in a school (e.g. increased collaboration, interdisciplinary integration, use of local resources, professional growth & engagement etc.)

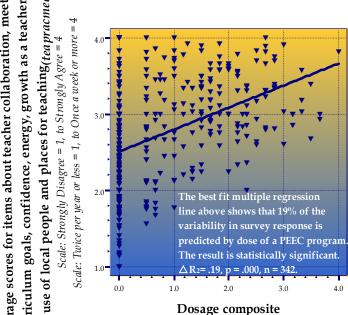
PEEC Cross-Program Survey Results 2003-04 Changes in Educator Practice (Link A)

- 338 educator surveys
- ** Very diverse sample

 (4 programs in 55 schools; Whole school change & Prof. development models;

 Urban, rural, suburban; Grades K-12)
- Averages from an aggregate of 12 survey items show PEEC dose accounts for 19% of variance in *Overall Educator Practice*

From PEEC educators surveys, 2003-04



Scale: No exposure to a PEEC program = 0,
Very high PEEC program exposure and implementation = 4

Link B in the Logic Chain

Changes in educator practice (e.g. increased collaboration, interdisciplinary

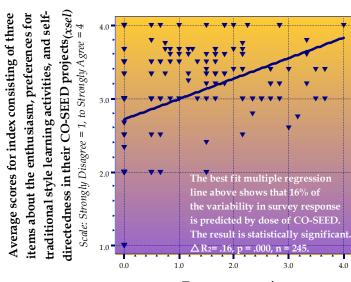
integration, use of local resources, professional growth & engagement etc.)

PEEC and CO-SEED Survey Results 2003-04 Increase in Student Engagement (Link B)

- 338 educator surveys for PEEC,245 educator surveys for CO-SEED
- * Averages from an aggregate of 3 survey items show CO-SEED dose accounts for 16% of variance in (adult reports of) Student Engagement in Learning
- Same effect size ($\triangle R^2 = .16$) for PEEC cross-program
- Similar results for (adult reports of)

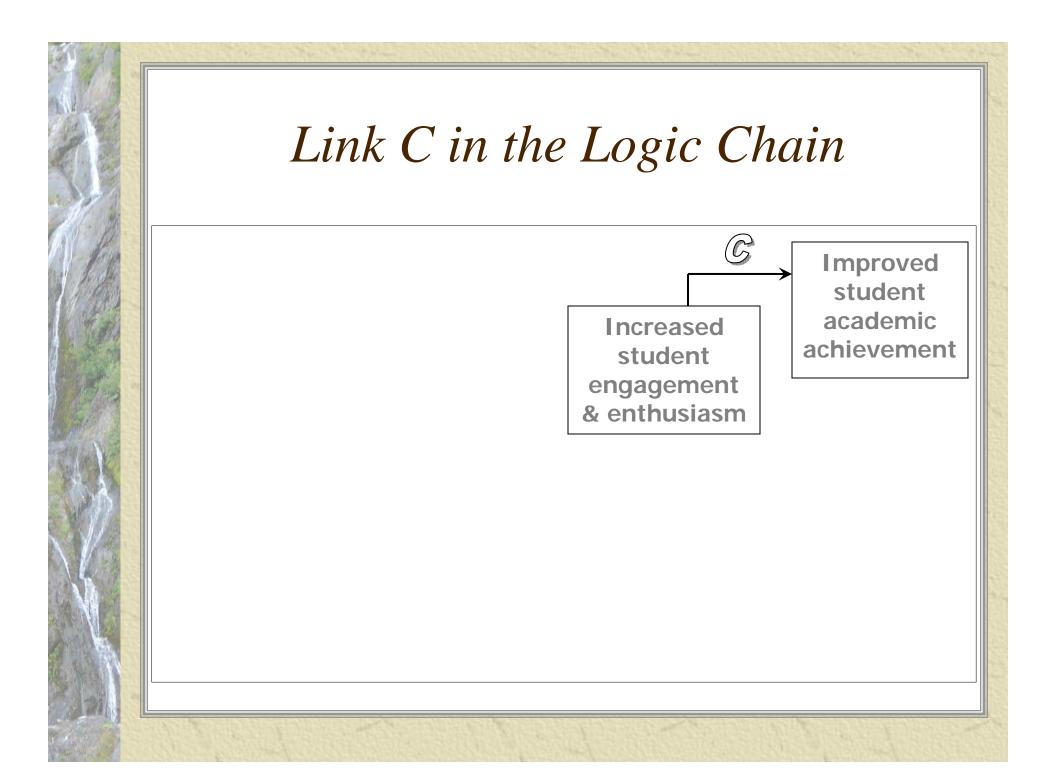
 Student Civic Engagement

Figure S3. Student Engagement in Learning (index)
From CO-SEED educator surveys, 2003-04



Dosage composite

Scale: No exposure to CO-SEED = 0, Very high CO-SEED exposure and implementation = 4



PEEC and CO-SEED Lit Review 2003-04 Improved Student Academic Achievement (Link C)

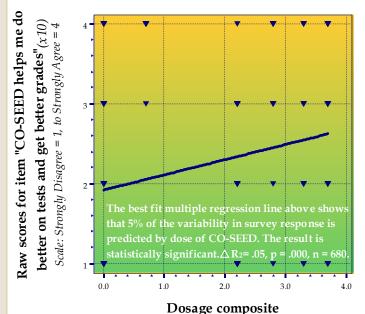
* Citing over 40 research studies, Marzano states (2003, p. 144) ...

"The link between student motivation and achievement is straightforward. If students are motivated to learn the content in a given subject, their achievement in that subject will most likely be good."

PEEC and CO-SEED Survey Results 2003-04 Improved Student Academic Achievement (Link C)

- ★ 721 student surveys for PEEC,680 student surveys for CO-SEED
- Raw scores from a single survey item shows CO-SEED dose accounts for 5% of variance in (student reports of) "CO-SEED helps me get better grades"
- Similar effect sizes for student reports of *Enthusiasm for Learning*, both for CO-SEED and PEEC
- Effect sizes get smaller (for students) as one gets further from the intervention (directed first at educators)...the closer you are to the fire, the more heat you feel

Figure S10. Helps with Grades and Tests (item)
From CO-SEED student surveys, 2003-04

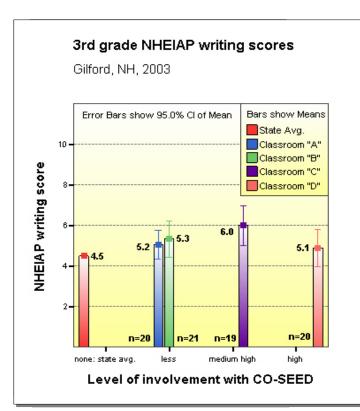


Scale: No exposure to CO-SEED = 0, Very high CO-SEED exposure and implementation = 4

Efforts to directly measure student academic achievement at CO-SEED sites

Interesting but Inconclusive Investigation of Writing Scores on Statewide Standardized Tests

(Beebe and Gilford Schools, 2003)



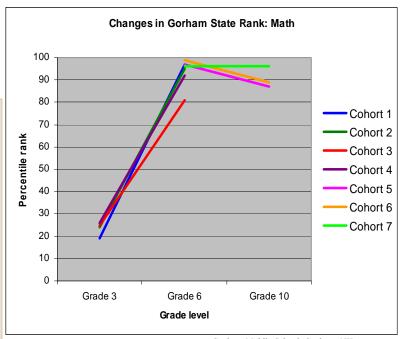
Young Achievers School, Jamaica Plain, MA

- * Previous evaluations had generated (unsolicited) assertions from interviewees at all sites that CO-SEED improved student writing
- ** At the Beebe school in Malden, MA, MCAS writing scores had increased in the three years since CO-SEED arrived, but roughly similar trends were found across the district
- In Gilford, NH, 3rd grade NHEIAP writing scores showed some but not a very strong correlation with level of CO-SEED involvement, though all Gilford students outperformed the state avg.

Extremely Strong Pattern in NHEIAP Test Scores but Inconclusively Linked to CO-SEED

(Gorham Schools, 2005)

- Interviewee claimed that CO-SEED helped Gorham students become top performers in the state on NHEIAP tests, so we looked at scores from 1997-2004
- For the last several years, Gorham 3rd graders score/rank very low, but by 6th grade the scores/ranks are very high
- Scores/ranks drop off a bit by 10th grade, but still high and there was no where to go but down
- * Similar patterns for Math, Language Arts, Science, but pattern may pre-date CO-SEED



Gorham Middle School, Gorham, NH

First Grade Academic Achievement as a Function of CO-SEED/ Community-Based Units

(Young Achievers School, 2005)



Young Achievers School, Jamaica Plain, MA

- ** Principal says "One thing we know is that kids' writing is much more interesting, complex, and detailed if they've had rich experience... The current first grade has about a third of the kids who didn't have Kindergarten here and in general it is breathtaking the difference in the academic achievement. Our Kindergarten has the strongest place-based education in the school, especially with language development." First grade is also strong.
- * 3 measures (Direct Reading Assessment, TERC Math, YA Writing Assessment) tracked in YA's assessment database
- * Compared 1st graders with one v. two years of exposure to strong PBE teachers

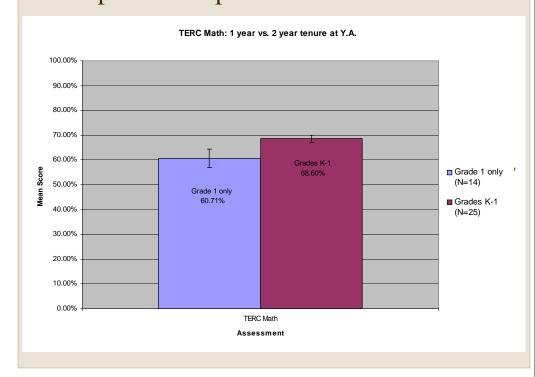
First Grade Academic Achievement as a Function of CO-SEED/ Community-Based Units

(Young Achievers School, 2005)



Young Achievers School, Jamaica Plain, MA

* 1st graders w/ more place-based education outperformed peers on all measures



(Beebe School, 2005, Massachusetts)

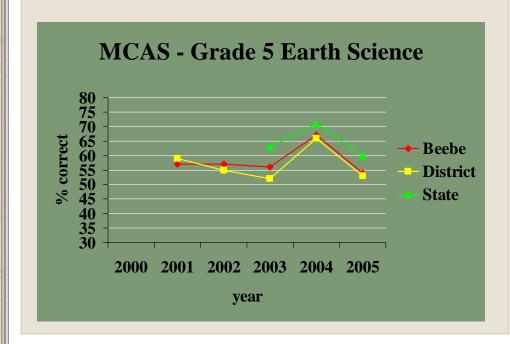
- * CO-SEED worked with Beebe 1999-2003, helped secure CSR funding to continue work 2002-2005
- * Several lines of evidence suggest that the environmental theme has become embedded in the school culture
- ** Before analyzing MCAS scores, we predicted that Beebe would deviate from the typical pattern and increase performance relative to district and/or state in the following content areas:
 - Math (mostly near 3rd and 4th grade)
 - English Language Arts Writing
 - Life Science
 - Earth Science



Beebe School, Malden, MA

(Beebe School, 2005, Massachusetts)

* Typical pattern: State performs highest, then Beebe, then district

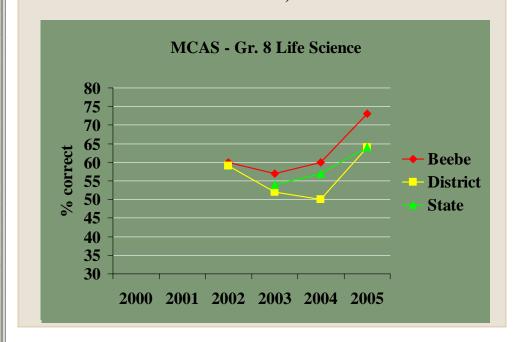




Beebe School, Malden, MA

(Beebe School, 2005, Massachusetts)

Only a few deviations from the typical pattern (6th & 8th grade Math, 8th grade Life & Earth science)





Beebe School, Malden, MA

(Beebe School, 2005, Massachusetts)

- * Analysis mildly supported the prediction for two areas (*Math & Earth Science*)
- * Analysis strongly supported the prediction in one area (*Life Science*)
- * Analysis did not support the prediction in one area (Writing, the typical pattern persisted in both grades 4 and 7)
- Future prediction: Strongest results will continue to show up in the upper grades (i.e. where students have the highest cumulative dose of the environmental/place-based theme integration)



Beebe School, Malden, MA

References

- * American Institutes of Research. (2005). *Effects of Outdoor Education Programs for Children in California*. Sacramento. Retrieved March 15, 2005 from http://www.sierraclub.org/insidetheoutdoors/downloads/outdoorschool_finalreport.pdf
- * Athman, Julie & Monroe, Martha. (2004). The effects of environment-based education on students' achievement motivation. *Journal of Interpretation Research*, 9(1): 9-25.
- ** Bartosh, O. (2004). *Environmental education: Improving student achievement*. Unpublished master's thesis, The Evergreen State College, Olympia, Washington.
- * Coleman, J. S., Campbell, E. Q., Hobson, C. J., McPartland, J., Mood, A. M., Weinfield, F. D., & York, R. L. (1966). *Equality of educational opportunity*. U.S. Government Printing Office, Washington, DC.
- Danforth, P. (2005). An evaluation of the National Wildlife Federation's Schoolyard Habitat Program in the Houston Independent School District. Unpublished master's thesis, Texas State University, San Marcos, TX.
- Duffin, Michael, Powers, Amy, Tremblay, George, & PEER Associates. (2004). *Place-based Education Evaluation Collaborative: Report on cross-program research and other program evaluation activities*, 2003-2004. Retrieved October 6, 2004 from http://www.peecworks.org/PEEC/PEEC_Reports/S0019440A.
- Emekauwa, E. (2004). They remember what they touch: The impact of place-based learning in East Feliciana parish. Rural School and Community Trust. Retrieved November 16, 2005 from http://www.peecworks.org/PEEC/PEEC_Research/0009D4FB-007EA7AB.0/Emekauwa%20East%20Feliciana%202004.pdf
- Ernst, Julie Athman & Monroe, Martha. (2004). The effect of environment-based education on student' critical thinking skills and disposition toward critical thinking. *Environmental Education Research*, 10(4): 507-522.
- Liebermann, J., & Hoody, L. (1998). Closing the achievement gap: Using the environment as an integrating context for learning. State Education and Environment Roundtable, San Diego, CA.
- * Marzano, R. J. (2003). What works in schools: Translating research into action. Association for Supervision and Curriculum Development, Alexandria, VA.
- National Environmental Education Training Foundation (NEETF). (2000). *Environment-based education: Creating high performance schools and students*. Retrieved October 1, 2004 from http://neetf.org/pubs/NEETF8400.pdf
- State Education and Environment Roundtable (SEER). (2000). *California Student Assessment Project: The Effects of Environment-based Education on Student Achievement*. Retrieved July 14, 2005 from http://www.seer.org/pages/csap.pdf
- * Wang, G., Zheng, Z., Heath, G., Macera, C., Pratt, M., & Buchner, D. (2002). Economic burden of cardiovascular disease associated with excess body weight in U.S. adults. *American Journal of Preventive Medicine*, 23 (1), 1-6.

Place-based Education & Academic Achievement

Prepared by:

Michael Duffin, PEER Associates, Inc.

Prepared for:

the Place-based Education Evaluation Collaborative (PEEC)

November 16, 2005

Suggested citation:

Duffin, M., Chawla, L., Sobel, D., & PEER Associates (2005). *Place-based education and academic achievement*. Retrieved November 14, 2005 from http://www.peecworks.org/PEEC/PEEC Research/S0032637E