

Promoting Elementary Teachers' and Students' Content Knowledge in Science and Engineering

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The instructional practices, materials, and assessments were chosen to meet the needs of our program. Other options exist, and the use of the practices, materials, and assessments chosen by our project is not intended as an endorsement by the U. S. Department of Education.

NJ MSP Partnership & Roles

- Stevens Institute of Technology
- Montclair State University
- Liberty Science Center
- Institute for Learning Technologies;
Teachers College, Columbia University
- 5 large urban school districts
- 4 non-public schools
- 46 Grade 3-5 teachers
- 796 students of MSP
teachers



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Goals

- Improve teachers' content knowledge in science & engineering
- Improve teachers' pedagogical knowledge in creating & adopting science inquiry & engineering lessons
- Improve students' content knowledge in science & engineering (Grades 3-5)

Year 1: 2007-08

Life &
Environmental Science

Year 2: 2008-09

Earth & Space Science

Year 3: 2009-10

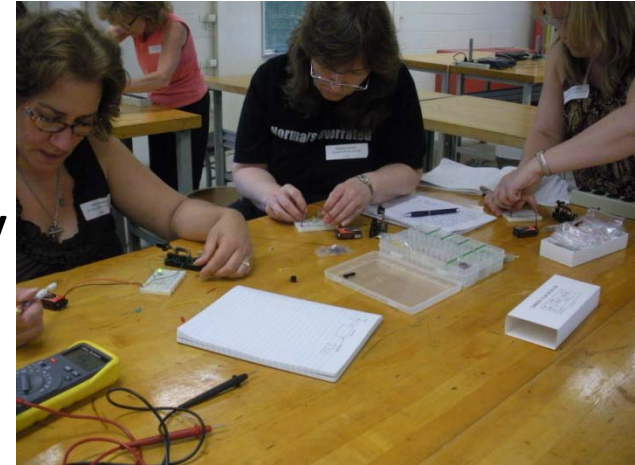
Physical Science & Math



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Program Structure

- Two-week summer institute
 - Science lessons with focus on scientific inquiry
 - Engineering curricula
 - Real-time data, telecollaborative projects
 - Faculty-led workshops, lab tours, & hands-on activities
- 3 PD workshops during school year (f2f & online)
- Monthly classroom visits
- Total: 124 hrs PD for each participant



Teacher Evaluation

- Pre- and post- tests in treatment and comparison groups
- Questions taken from TIMSS, MOSART, NJASK & MOS (20 science & related math, 5 engineering)
- Surveys (science inquiry and classroom implementation)
- Development of STEM Portfolio



Student Evaluation

- Pre- and post- tests for treatment and comparison groups
- Questions taken from TIMSS, MOSART, NJASK & MOS (14 science & related math, 5 engineering)
- Teacher evaluation of student work (part of the teacher's STEM portfolio)



Year 3 Results- Teachers

Treatment Teachers:

- 17% increase
- statistically significant
- ($t(45) = -3.453, p < .01$)

Treatment Group	Mean (n=46)
Teacher Score Pre-test	14.09
Teacher Score Post-test	16.52

Comparison Teachers:

- 7% increase
- Not statistically significant
- ($t(37) = -1.386, p > .05$)

Comparison Group	Mean (n=38)
Teacher Score Pre-test	12.55
Teacher Score Post-test	13.42



Year 3 Results - Students

Treatment Students:

- 46% increase
- statistically significant
- ($t(637) = -23.543, p < .01$)

Treatment Group	Mean (n=638)
Raw Score (pre)	6.68
Raw Score (post)	9.77

Comparison Students:

- 17% increase
- statistically significant
- ($t(540) = -10.346, p < .01$)

Comparison	Mean (n=541)
Raw Score (pre)	7.16
Raw Score (post)	8.39



Year 3 Findings

- Teachers' post-test scores were a significant predictor of students' post-test scores
- The more program activities a teacher performed, the higher the students' post-test scores
- The number of engineering activities that the students were exposed to in the classroom was a significant predictor of their science post-test scores.



Summary of Findings Years 1-3

TEACHERS	Year 1	Year 2	Year 3
Overall			
Did the treatment teachers have statistically significant increases in their test scores?	Yes (10%)	Yes (13%)	Yes (17%)
Did the comparison teachers have statistically significant increases in their test scores?	No (1%)	No (3%)	No (7%)
Did the treatment teachers perform significantly better than the comparison teachers?	Yes	Yes	Yes
Science			
Did treatment teachers perform significantly better than the comparison teachers on the science tests?	--*	Yes	Yes
Engineering			
Did treatment teachers perform significantly better than comparison teachers on the engineering test?	--*	Yes	Yes

* Analysis for science and engineering scores is not available for Year 1.



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Summary of Findings Years 1-3

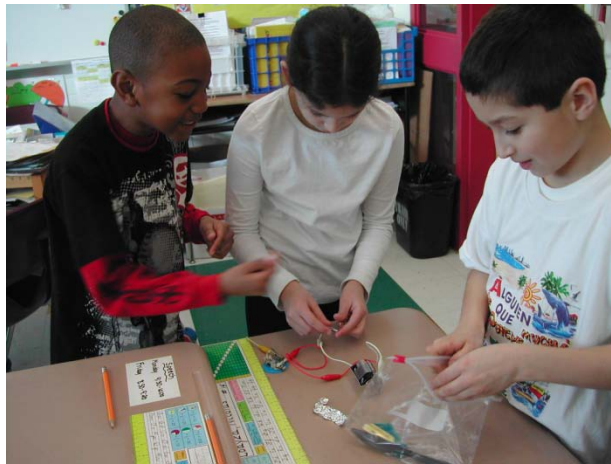
STUDENTS	Year 1	Year 2	Year 3
Overall			
Did treatment students have a statistically significant increase in their test scores?	Yes (38%)	Yes (27%)	Yes (46%)
Did comparison students have a statistically significant increase in their test scores?	Yes (14%)	Yes (16%)	Yes (17%)
Did treatment students perform significantly better than the comparison students?	Yes	For most students	Yes
Science			
Did treatment students have a significant increase in their science test scores?	Yes* (33%)	Yes (23%)	Yes (46%)
Did comparison students have a significant increase in their science test scores?	Yes* (14%)	Yes (15%)	Yes (18%)
Did treatment students perform significantly better than comparison students on the science questions?	Yes*	Yes	Yes
Engineering			
Did treatment students perform significantly better than comparison students on the engineering questions?	—*	Yes	Yes

* Analysis done by different evaluator



GPRO Summary Years 1-3

TEACHERS	Year 1	Year 2	Year 3
TEACHERS			
% of teachers who showed significant gains in science content knowledge	77%	65%	65%
STUDENTS			
% of students with state assessment data in science scoring proficient or above	62%	87%	89%



Disclaimer

The instructional practices and assessments discussed or shown in this presentation are not intended as an endorsement by the U. S. Department of Education.

