New Jersey Partnership for Excellence in Middle School Mathematics

A partnership of Rutgers University and the public schools of

Carteret, Long Branch, Old Bridge, Orange, Plainfield, Sayreville, & Toms River

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PROJECT DESCRIPTION

Long term goal: Enhance students' engagement and progress in learning mathematics

Immediate goals:

- Deepen teachers' understanding of the mathematics that they teach and of the issues of motivation and cognition that they face in their classrooms.
- Enhance cooperation between mathematics teachers and special education staff.
- Develop teachers' leadership skills for roles as teacher-leaders, mathematics coaches, and facilitators of professional learning communities.

Project Participants:

- Mathematics Department Faculty and Mathematics Education Faculty
- 7 New Jersey School Districts / 100 Middle School Teachers

NJ PEMSM Project Components:

Activities for Districts and Teachers

- Seven graduate courses at Rutgers University over two years, applicable to a Masters Degree in Mathematics Education and/or Middle Grades Mathematics Specialization Certification
  - Seminar in Mathematical Ideas *
  - Number, Operation, and Algebra* (offered during summer)
  - Geometry and Measurement* (offered during summer)
  - Motivation and Affect
  - Practicum in Mathematical Reasoning
  - Data and Probability* (offered during summer)
  - Discrete Math and Problem Solving* (offered during summer)

  *courses cross-listed in Mathematics and Education Departments

  Stipends for teachers (provided by NSF) upon successful completion of each 4-week Summer Institute.

  Tuition provided by Rutgers for these seven NJ PEMSM Institute courses.

- Periodic seminars in special education and leadership open to Partner Districts generally, not just to Partnership Fellows

- Leadership mentoring in home districts

Research Questions

1. As teachers acquire mathematical content knowledge in the domains of integers and rational numbers, operations, algebra, geometry and measurement, discrete mathematics, probability, and data representation and interpretation, what are specific areas of conceptual breakthrough and of cognitive difficulty, and why? What institute activities are of greatest effectiveness?

2. What effects of increased content knowledge and pedagogical content knowledge in mathematics can be observed in teachers' pedagogical development, particularly in teachers' strategies for achieving students' conceptual understanding, mathematical fluency, and powerful affect and motivation? How and to what extent is increased content knowledge brought into classroom practice, and how is this perceived by teachers and school administrators? What consequences are observed in strategies for working with special education students? What changes in teachers' own affect and beliefs relating to mathematics learning can be identified? How are these results influenced by urban and suburban contexts?

3. What specific effects in mathematics classrooms are noted at two key transitional points – entry to middle school (typically grade 5), and transition from middle school to high school?

4. What measurable gains are observed in mathematical proficiency, depth of mathematical understanding, and academic achievement by the students of participating teachers? What differential effects can be identified across various student populations? What evidence can be gathered to help attribute measurable gains to specific changes in teaching practices, and to particular components of NJ-PEMSM activity?

5. To what extent and through what processes do teachers exercise increasingly influential leadership roles in their school districts, and what are the identifiable consequences for districts of that leadership? What are the ongoing processes and effects of participating university faculty's leadership on mathematical instruction at Rutgers?

INDICATORS OF SUCCESS

NJ PEMSM INSTITUTES
- Recruit Partner Fellows/Teachers in Partner Districts
- Recruit University Faculty, design courses, develop materials
- Offer courses, high levels of course completion
- High levels of completion of entire Institute sequence (7 courses)

PARTNER DISTRICTS
- Teachers complete M. Ed. Degree or Middle Grades Mathematics Specialization Certification
- Partnership Teachers take on leadership roles
- Enhanced interaction between mathematics and special education teachers

NEW JERSEY
- Growing interest within the State in content-based professional development

RESEARCH
- Design and complete research studies
- Disseminate research in articles and conference presentations

EVALUATION
- Shows changes as planned

SUSTAINABILITY
- Institutionalize courses developed for NJ PEMSM
- Create Masters Degree in Mathematics Teaching offered by Rutgers University Mathematics Department

EVALUATION FRAMEWORK

Formative Evaluation			
Research Questions	**Methodology**	**Data Source**	**Data Collection**
1. Who are the teachers participating in the NJ-PEMSM Partnership activities?	Quantitative analysis of participants' demographic information	Participant Demographic Form	Year 1 Summer Institute
2. With what frequency does each of the proposed NJ-PEMSM Partnership activities occur and what are the corresponding participation rates?	Quantitative analysis of the number and type of institutes, courses, and conferences offered Quantitative analysis of teacher attendance	Sign-in/attendance rosters	Ongoing in fall, spring, and summer: years 1, 2, and 3
3. Do teachers perceive	Quantitative and qualitative	Participant Evaluation of	Ongoing in fall, spring,

the institutes and conferences as valuable experiences?	analysis of surveys	Workshop Form	and summer: years 1, 2, and 3
4. What kinds of experiences do teachers have as participants in institutes, courses, and conferences?	Observation of PD provided (for teachers & coaches)	RTOP	Ongoing in fall, spring, and summer: years 1, 2, and 3
Summative Evaluation (Outcomes/Impact)			
Research Questions	**Methodology**	**Tools**	**Data Collection**
1. Are participants gaining mathematical content knowledge and applying effective teaching strategies in the classroom?	Baseline/pre-post comparisons of teachers' scores Baseline/pre-post comparisons of teachers' instructional practices	Diagnostic Mathematics Assessment for MS teachers SEC Mathematics ability- based measures constructed by institute, conferences, and course facilitators	Year 1 pre-post summer institute and once annually in Years 2 and 3 SEC annually years 1, 2, and 3 Ongoing in fall, spring, and summer: years 1, 2, and 3
2. Does the NJ-PEMSM develop teacher leaders in partner middle schools' who assist colleagues in more effective instruction or development of content knowledge?	Baseline/pre-post comparisons of teachers' leadership abilities and knowledge Baseline/pre-post comparisons of teachers' leadership activities	Leadership Academy ability-based measures constructed by academy facilitators Teacher leadership activity questionnaire	Ongoing in fall, spring, and summer: years 1, 2, and 3 Ongoing annually: years 1, 2, and 3
3. Does the NJ-PEMSM support high achievement by all students, and do state test data indicate a narrowing of the achievement gap when disaggregated by subgroup?	Baseline/pre-post comparisons of students' test scores and final mathematics grades	NJ ASK/GEPA (Math) District report card grades in Mathematics	Ongoing annually: years 1, 2, and 3 Ongoing annually: years 1, 2, and 3