



**Project of the *Vermont Research Partnership* among the Vermont Agency of Human Services, Vermont Department of Education, Vermont Association of Regional Partnerships, and The University of Vermont**

**Project: The Relationship of Language Abilities to Mathematics Achievement as Demonstrated by Student Performance on the Primary Observation Assessment and the New Standards Reference Exam in Mathematics**

**Outcome of Well-Being:** *Children Succeed in School (# 4)*

**Project Participants:** More than 3000 students in 39 schools in the Northeast Kingdom area of Vermont and an additional group of 5705 students in 169 schools at grade 4.

**Project Location(s):** Elementary schools having grade 4 in Vermont, with a particular focus on the 39 schools that heavily participated in the Primary Observation Assessment (POA) during 1999 through 2004.

**Project Description:** This study describes the relationship between early language abilities and mathematics achievement using five years of student data from over 3,000 students in the East Central Vermont Literacy Consortium (ECVLC). This data were obtained from Grades 1 and 2 Primary Observation Assessment (POA) results and Grade 4 New Standards Reference Exam (NSRE) results in mathematics. The first two research questions were designed to determine the relationship between the POA early language abilities known as Hearing and Recording Sounds, Writing Vocabulary, Text Level, and Paragraph Dictation and achievement in the mathematics NSRE clusters, skills, concepts, and problem solving, and the subset of Stanford Achievement Test – Version 9 (SAT9) questions. The third question was designed to determine whether early language interventions, based upon the POA performance, supported student mathematics achievement in Grade 4.

**Indicators Used to Track Progress:**

1. Primary Observation Assessment (several scales)
2. New Standards Reference Examination, Grade 4 mathematics
3. Eligibility for free or reduced priced lunch

**Findings To-Date / How this Project Contributes to Outcome of Well-Being # 4:**

Data analysis showed significant relationships between early language abilities and mathematics achievement in Grade 4. Students who did not meet the standard on the POA variables, hearing and recording sounds and text level in Grades 1 and 2 were more likely to not meet the standard in all three NSRE mathematics clusters, skills, concepts, and problem solving in Grade 4 than those students meeting these POA standards. Students not meeting the POA paragraph dictation standard in Grade 2 were more likely to not meet the mathematics skills and concepts standard in Grade 4 than those meeting the paragraph dictation standard.

Finally there was a significant difference in the mean NSRE SAT9 scores for the groups of students formed by whether or not they had received early language interventions. The group of students in schools served by the POA outperformed the groups of students in schools not served by the POA on the mathematics SAT9. Both the groups of students that were eligible and not eligible for free and reduced lunch in POA schools outperformed their counterparts in non-POA schools.

For educators and parents, this project contributes to the understanding that students' early language abilities assessed by the POA may have a relationship to their later achievement in mathematics. A program that identifies and measures the specific language abilities that are related to later mathematics performance, and supports teachers in development of those abilities in children can lead to higher performance in mathematics. The differences among schools are modest, but significant, suggesting that if these programs were expanded and supplemented with additional instruction all students might perform better in mathematics. The finding that students who are eligible for free or reduced lunch do particularly well in these programs is particularly encouraging.

**Project Timeline / Status:** The project was completed in April, 2005. The complete report (dissertation) will be available by June 30, 2005.

**Program Partners:** The University of Vermont's doctoral program in Educational Leadership, the Vermont State Department of Education and the Vermont Institutes and the East Central Vermont Literacy Consortium.

**Researchers and Institutional Affiliations:** Dr. Carol Eckels, Principal Investigator; Advisor, Professor H. 'Bud' Meyers; Committee members, Professors Kenneth Gross, Charles Rathbone and Kieran Killeen.

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