

Evaluation of the VMI

The VMI Evaluations. The VMI has undergone formal evaluation since 2004 conducted by the Evaluation Center of the Vermont Institutes under the oversight of Dr. Herman “Bud” Meyers and Dr. Douglas Harris. .

In 2004-2005 funds for a comprehensive quantitative and qualitative evaluation were provided through the US Department of Education. The evaluation was reviewed by a Validation Panel comprised of the celebrated mathematician Dr. Peter Lax (Abel Prize, numerous honorary degrees), distinguished educator Dr. Bruce R. Joyce, and national educational consultant Dr. Cynthia Char. Cross sectional and longitudinal studies were continued in 2005-2006, 2006-2007, and 2007-2008.¹

Summaries of these evaluations follow.

A. Quantitative Student Outcomes

• Summary Review of Formal Evaluation in 2004-2005.

Since VMI is a professional development program that targets teacher leaders, and the impact of the teacher leaders occurs at the school level, the unit of analysis for the quantitative evaluation is the school (rather than students of just the VMI teachers in the school). Student outcomes on statewide standardized testing are the variables being measured, and these are aggregated to the school level.

Finding 1: Cross-sectional Comparisons. *Comparisons of VMI grouped schools with control schools yielded an overall consistent pattern of the VMI schools exceeding the performance of Control schools in the cross-sectional analysis.*

Finding 2: Longitudinal Comparisons. *A pattern of gain favoring the VMI schools having more concentrated numbers of VMI teachers emerged from the comparison of percentile rank gains over time. Students in these VMI schools progressed at a rate more than three times that of their peers in either the group of schools having a single VMI teacher or the group of Control schools having no VMI teacher.*

• **Follow-up Longitudinal Analysis in 2005-2006.** The follow-up quantitative study in 2005-2006 used a value added model that followed a panel of about 1000 students who began with VMI teachers in 1999 at grade 4 and were tracked forward to grade 10 in 2005 and compared with a similar number of students who likewise formed a panel of control students in schools matched with the intervention schools according to school size and concentrations of low income students. We will call this the 1999 VMI cohort study.

¹ In 2006, Vermont adopted a new statewide assessment system, the New England Common Assessment Project (NECAP) which, unfortunately, was not vertically equated, rendering longitudinal comparisons problematic after 2006. Additionally, the NECAP data set did not enable matching students to the student’s teacher. Hence, the analysis of student data considered all students in a school and could not delineate between the performance of students taught by VMI teachers and those taught by teachers who lacked VMI training.

Finding 1. *The aggregate group of VMI schools showed a statistically significant advantage over the matched comparison group of schools when students are matched from grade 4 through grade 8 to grade 10.*

In order to investigate how the level of school implementation of VMI relates to student achievement, the VMI schools were divided into two groups on the basis of the number of teachers who were enrolled in the VMI curriculum (three or more teachers as opposed to one or two teachers).

Finding 2. *The VMI High Concentration Schools significantly out-performed the matched schools and appear to carry most of the difference between the VMI and matched schools.*

Next, one asked: Are school level effects related to income level of students and levels of content implementation of the VMI curriculum? In order to investigate this question, scores of students eligible for free or reduced lunch vs. those that were not eligible were compared at grades 4, 8, and 10.

Finding 3. (i) Not surprisingly, whether in intervention schools or matched schools, students eligible for free or reduced lunch scored significantly lower than their non-eligible for free or reduced price lunch peers. This pattern continued through the grade 8 testing.

(ii) Rather surprising is that given the lack of cohort differences at grades 4 and 8, at grade 10 *the free or reduced lunch eligible students in the VMI schools significantly out-scored their free or reduced lunch eligible peers, and they gained on students who are not eligible for free or reduced lunch in the matched schools.*

• **Follow up Longitudinal Analysis in 2006-2007.** The previous year's evaluation followed students of teachers who entered VMI in 1999. This report follows a second panel of students of teachers who entered VMI in the next year, 2000. We will call this the 2000 VMI cohort study. As in the previous year, students in two groups of VMI intervention schools, one with a higher concentration of VMI teachers, were compared with a control panel of students from a matched control group of 18 schools. The findings were similar to those of the 1999 cohort study.

Finding 1. *Again, intervention schools consistently outperformed control schools.*

Finding 2. *Again, the VMI High Concentration Schools significantly out-performed the matched schools and appear to carry most of the difference between the VMI and matched schools.*

Finding 3. *Again, the free or reduced lunch eligible students in the VMI schools significantly out-scored their free or reduced lunch eligible peers, and they gained on students who are not eligible for free or reduced lunch in the matched schools.*

In other words, the studies in both 2005-2006 and 2006-2007 indicate that the gap is narrowing between the free or reduced lunch eligible students in the VMI schools and their non-eligible peers in the matched schools.

• **Evaluation in 2007-2008.** In 2006 Vermont discontinued the New Standards Reference Exam (NSRE) as the statewide mathematics student assessment system and instituted the New England Common Assessment (NECAP). In cross-sectional analyses, the new

NECAP assessments continue to reveal a comparison in which students in schools with VMI teachers outperform their peers in control schools.

Although the new NECAP assessment will provide for a more robust set of assessment data in future years, it is unfortunate that this change in assessment measures does not allow a continuation of the longitudinal studies of prior years. However, the evaluators did undertake a further longitudinal study of the previous NSRE data sets in which they tracked performance of grade 4 students taught by VMI teachers in the year 2000² through grade 8 in 2004 and grade 10 in 2006. The evaluation then compared the results of the VMI taught students with a control group of students drawn at random from students at grade 4 in 2000 in schools which did not have any VMI teachers and for which the sample matched the distribution of free or reduced lunch eligibility of the VMI taught students.

Finding 1: *Both groups gained significantly over time; however, the VMI taught students gained more by grade 8 and continued to gain at a higher rate through grade 10.*

Finding 2: *When the data is disaggregated according to income, as measured by free and reduced lunch, a large portion of the differential between the VMI taught students and the Control group may be attributed to the effect on low income students who were taught by VMI teachers.*

To summarize the totality of quantitative findings across the evaluation studies in the years from 2004 to 2008, students in VMI schools significantly outperformed their peers in control schools, and the VMI appears to have a major impact on the achievement of low income students.

B. Qualitative Teacher and School Outcomes

Beginning in 2004-05 and continuing through 2007-08 evaluators have also collected qualitative data related to implementation of the Vermont Mathematics Initiative.

• Qualitative methodology

Qualitative outcomes are derived from the following sources:

- Interviews with VMI:
 - Participants
 - Instructors and VMI Leaders
 - Graduates
 - Site Coordinators
- Observations of course sessions
- Review of course syllabi and materials
- Review of participant portfolios
- Observation of final oral master's degree presentations
- Course evaluations

² 2000 was the first year in which the statewide data matched students to teachers. It is also the last year in which the NSRE data can yield longitudinal comparisons through grade 10.

• Qualitative Findings

The following findings represent the three years of evaluation studies.

Finding 1: Mathematical content.

An overarching theme is the impact of the VMI experience on participants' understanding of mathematical content. This is consistent across all the three years.

Finding 2: Increased confidence related to mathematics

Increased understanding of mathematics content strongly impacts the confidence of participants, especially as related to enhancing the teaching of mathematics, and personal enjoyment of mathematics.

Finding 3: Impact of assessment and instructional practice

Graduates, principals, math leaders, and current participants report profound impact of VMI on classroom practice. This emerges as a powerful major theme in final oral master's degree presentations.

Finding 4: Impact of action research on classroom practice

The impact of action research is mixed, with some participants, graduates, and principals reporting profound impact, others less so.

Finding 5: Principal support

The active support of principals significantly enhances the work of participants as classroom teachers and teacher leaders.

Finding 6: Personal impact on participants

Over the three years many participants form lasting friendships and meaningful professional associations with fellow participants, instructors, and VMI staff.

Finding 7: Transfer of VMI content into the classroom

Participants report direct transfer of mathematics content used in VMI to the mathematics experiences of their students.

Finding 8: Impact on student problem solving

Participants report that the emphasis on problem solving – including modeling of multiple problem solving methods, problem-solving in lesson and unit planning, and discussions of the problem solving process – combine to profoundly impact problem solving in the classroom.

Finding 9: Impact of action research on students

Some interventions and related initiatives of participants have significant impact in their schools and districts.

Finding 10: Impact on teacher leaders

Participants and their administrators credit VMI for providing the knowledge, confidence, and support for them to take on leadership roles (including leadership of Phase 2 in the district). This is true of participants in leadership roles at all levels – school, district, and statewide.

Finding 11: Impact on curriculum, instruction, and assessment

There is substantial evidence in many districts that teacher leaders and principals have made profound changes in curriculum, instructional and assessment as a direct result of VMI.

Finding 12: Need for ongoing professional community

This need is frequently expressed by graduates. VMI has plans for postgraduate courses to meet this need.³

³ Note: VMI began to offer postgraduate courses in 2007.