Middle School Math Systemic Improvement using the TI-Navigator™ System Shows Three Steady Years of Growth

Case Study 11

Teacher/Researchers – Pamela Bernabei-Rorrer, Canton, OH
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Location	Canton, OH
Course	Pre-algebra and Algebra I
Grade	7 and 8
Student Profile	District-wide
Technology	TI-Navigator™ classroom learning system with TI-84 graphing calculators' Cognitive Tutor

In this systemic improvement program, district-wide proficiency on the standardized state test climbed steadily during three years from 39% to 62% in both 7th and 8th grades. Before the program began, the district's 6th grade proficiency was approximately 24%.

Setting: Canton is the eighth largest urban district in Ohio. It has 16 elementary schools, four middle schools and two high schools. More than 71% of the student population is economically disadvantaged. Approximately 44% are minority students with an average total graduation rate of about 67%. Students entered the 7th grade program in Year 1 with average proficiencies on the 6th grade Ohio test ranging from 20% to 33% for the four middle schools.

Curriculum & Teaching: Canton's plan of action started by aligning the curriculum with state standards. First, the team of educators organized state standards in order to create a coherent curriculum map. The team aligned all available teaching resources to support the curriculum map.
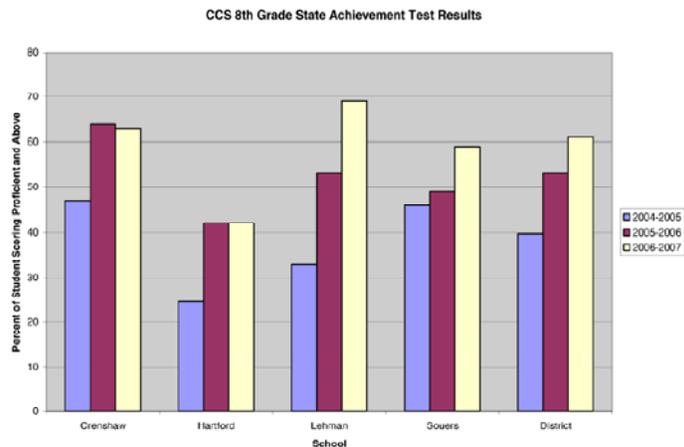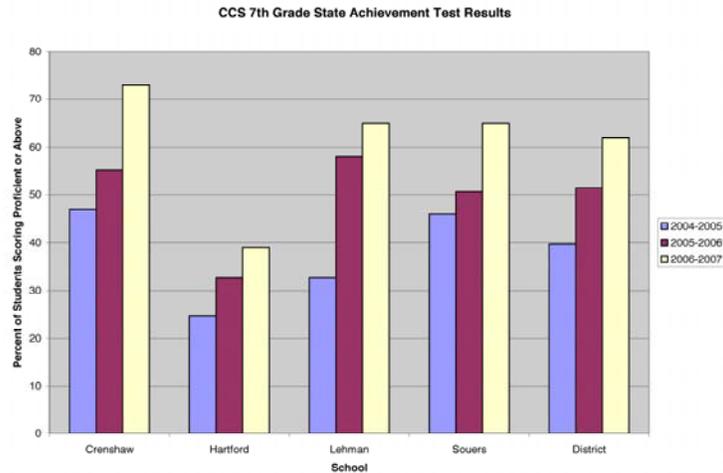
The next step was to upgrade the assessment system. Common quarterly assessments aligned to the curriculum map were developed. In addition, the assessment system included practice state achievement tests, a weekly standards quiz, and frequent use of the LearningCheck™ and Quick Poll features of the TI-Navigator classroom learning system. These features provided immediate student feedback to teachers during lessons.

Additional curriculum enhancements included the use of more concrete examples to build a bridge to abstract math problems, drawing from instructional resources available in the TI-Navigator system's Activity Center and the Cognitive Tutor system. The team of educators developed a district-wide math vocabulary book to support an increased focus on math vocabulary. Emphasis was increased on word problem dissection strategies for short answer and extended response questions. The functionality of graphing calculators was also reviewed. Cognitive Tutor was used to strengthen the conceptual framework of Algebra.

To support the program, a district-wide collaborative team of math teachers was formed. Block classes of 90-minute extended instructional time were implemented. In Year 1 of the program, the department chairs in each school were exclusively involved with the new education technology. In Years 2 and 3, all 7th and 8th grade math teachers were implementing the TI technology.

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Results

The two graphs below show the steady growth of proficiency across the three years of the program. The pattern is generally similar across all schools, in both 7th and 8th grades. In the 7th grades, first-year average proficiency levels in the four middle schools ranged from 24% to 46%, with a district-wide average of 40% (only department chairs were involved in the first year). By Year 3 of the program, proficiency levels ranged from 38% to 73%, with a district average of 62% – a gain of about 22% when compared to the first year's gains. The pattern for 8th grades is similar.

CCS 7th Grade State Achievement Test Results

CCS 8th Grade State Achievement Test Results

These three-year gains are remarkable for three reasons:

1. They demonstrate that the improvement program is sustainable, a major issue in school improvement projects.
2. They demonstrate a pattern of continuous improvement across all four middle schools in the district. This suggests the power of formative data, when teachers and curriculum leaders use it effectively to guide their practice.
3. The program is an excellent example of how education technology can have a major effect when it is used effectively as part of an integrated improvement plan.

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