

## CHAPTER III

When students were required to use their knowledge and skills to solve authentic problems, the U.S. scored lower than 22 countries, the same as 8 countries, and higher than 9 countries. The top-scoring countries on problem-solving included Korea, Hong Kong-China, Finland, and Japan. The nine countries scoring lower than the U.S. were Greece, Thailand, Serbia, Uruguay, Turkey, Mexico, Brazil, Indonesia, and Tunisia.

### *Summary of International Comparisons - United States*

Statistically, the U.S. students performed at approximately the international average on TIMSS and PISA mathematics and science exams. These statistics, however, can be deceiving because the scaled scores for the U.S. students were predominately lower than the scores of other industrialized nations on all of these tests. Also, U.S. students outscored only 9 countries on the PISA problem-solving tests.

To remain competitive with the top-scoring countries—Hong Kong-China, Singapore, Chinese-Taipei, Korea, Japan, and the Netherlands—the U.S. needs to improve the mathematics, science, and problem-solving skills of all students. These skills lay the foundation for innovation, increased productivity, and the development and implementation of new technologies. A starting point is to look at the curricula and instructional strategies, which are discussed in Chapter VI.

### **International Comparisons - Illinois**

In 1997 and 1999, TIMSS allowed subgroups within a state to participate in the international studies. Illinois was represented in 1997 by the First in the World Consortium, a group of 17 Chicago suburban districts and the Illinois Math and Science Academy (IMSA). These districts and IMSA were determined to learn how their students were doing in a global competition and to make the necessary changes to become “first in the world.”<sup>68</sup> These school districts were already among the highest performing in Illinois and the nation. The students in the consortium were predominantly white (78%), only 7% were low income, and 6% had limited English proficiency. With considerably more fiscal resources than most schools, the districts’ per-pupil expenditures were 55% higher than the national average. The teachers within the consortium had higher levels of education and more years of teaching experience than the national and state averages.

Compared to their global competitors, the First in the World students did extremely well in 1997. In 4th and 8th grade mathematics, only students in Singapore performed better. No nation outperformed the consortium in 4th and 8th grade science.

At the 12th grade level, students were assessed for general achievement in mathematics and science knowledge and in a separate test for advanced topics. In the general test, First in the World students performed similarly with the top seven countries; however, the consortium students scored around the average in the advanced tests. A bright spot on the advanced tests was a subgroup of consortium students taking Advanced Placement courses; they were

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the highest performers in mathematics, and another Advanced Placement subgroup shared the highest tier in physics with five countries.

In 1999, the First in the World Consortium again participated in TIMSS, joined this time by Chicago Public Schools and Naperville District 203.<sup>69</sup> Naperville and the First in the World Consortium performed in the second tier in mathematics and were only outperformed by Singapore, Korea, Chinese Taipei, Hong Kong, and Japan. In science, Naperville and the First in the World Consortium performed in the top-tier along with Chinese Taipei, Singapore, and a consortium of Michigan schools. Chicago Public School students performed below the U.S and international averages in mathematics and science.

The consortium implemented teacher learning networks and collaborative learning communities to improve students' performance through professional development and activities using new curriculum models, instructional practices, assessment strategies, and technology.

The TIMSS project collected additional data to identify factors associated with student achievement. The top performers came from homes with high levels of educational resources. Students from the Chicago Public Schools, similar to other large inner city districts with high levels of low-income students, performed at a lower level.

The 1997 TIMSS and the 1999 TIMSS Benchmarking study highlight a theme that will recur in the following sections on student indicators of STEM performance: **Illinois has some of the highest performing students and some of the lowest performers. Keeping Illinois competitive requires that the gap between the achievements of these students be reduced, if not eliminated. The single factor that has the highest correlation to achievement is the income status of the student; e.g., low-income students are struggling to reach even average levels of performance.**

### Illinois and U.S. Comparisons - NAEP

The National Assessment of Educational Progress (NAEP) tests, which sometimes are called "the gold standard" of U.S. assessments, provide an external benchmark for academic achievement for all of the states. The results of these tests are disseminated on the "Nation's Report Card" and include measures of 4th and 8th grade student academic achievement in mathematics and science.

Student results are reported in both numerical scores and by the performance levels "basic", "proficient", and "advanced". "Basic" is defined as partial mastery of the skills and knowledge, but not competence in the subject. "Proficient" represents a solid academic performance for the grade assessed. "Advanced" describes superior performance.<sup>70</sup> Using standards and frameworks that are internationally respected, the National Assessment Governing Board that oversees NAEP regards "proficient" as the acceptable level.