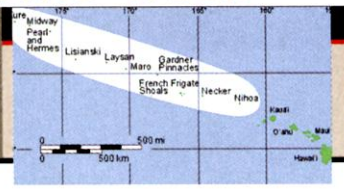

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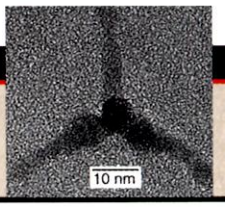
Protecting paradise



1875
Custom-shaped crystals

MIDDLE SCHOOL ACHIEVEMENT

Asia Stays on Top, U.S. in Middle In New Global Rankings

Eighth graders from the United States are still running in the middle of the global pack when it comes to science and math achievement, according to the latest results from the Third International Mathematics and Science Study (TIMSS). And Asian nations continue to lead the way, with Singapore and Taiwan emerging as the star performers among the 38 participating countries.

The original TIMSS issued three reports, starting in 1996, on fourth, eighth, and 12th graders. The new findings, called TIMSS-R (for repeat), provide longitudinal data that allow countries to measure their progress over time (isc.bc.edu/timss1999.html).

The news is not good for U.S. science and math educators, who have spent much of the decade pursuing reforms aimed at raising student achievement. Today's eighth graders look pretty much like the ones tested in 1995 (*Science*, 22 November 1996, p. 1296). "We were particularly interested" in seeing how student cohorts tested as fourth graders in 1995 did as eighth graders in 1999, says Larry Suter of the National Science Foundation.

Compared with the 16 other countries that were in TIMSS both years, the U.S. cohort is the only country to show a "significant drop" in both science and math achievement as its students mature. Whereas in 1995 U.S. fourth graders tied with Austria for third place in science and were above average in math, they had slipped to below average in both subjects by the time they reached eighth grade. "It just shows that other countries do a lot better job of educating their students between elementary school and middle school than we do," says Suter. The 19th-place ranking in science comes despite the fact that U.S. eighth-grade teachers are more likely to teach concepts in biological and physical sciences than their international peers.

The hope that U.S. students would show benefits from the reforms is "a hope gone awry," laments statistician William Schmidt of Michigan State University in East Lansing, who directs the U.S. portion of TIMSS. "Basically, we have not changed the middle school curriculum in any systematic fashion." Although educators agree that U.S. math and science education need to be more "rigorous," they fight over the definition. Schmidt sees "rigor" in terms of course content: Reform efforts haven't worked "because we haven't looked at the core issue of substance, rather than pedagogy," he says. But Arthur Eisenkraft, president of the National Science Teachers Association, believes it's more about process, including "high expectations for students, experiments … and exams that not only test for knowledge of facts but how we know them."

One apparent irony on the international front is that some Asian countries are trying to move away from lectures and rote learning despite its apparent success in boosting test scores. Education officials in South Korea, for instance, told *Science* that "the students are all well trained to do well on tests," so their impressive TIMSS scores "don't really mean much." Educators there are focused instead on shortening the all-important college entrance exam and giving students more time for creative thinking.

Singapore, at the top of the heap, has several factors in its favor, says Tham Tuck Meng, principal of one of the participating schools. That includes a rigorous curriculum, well-trained teachers, supportive parents, and abundant resources. "Principals have wide autonomy to plan curriculum according to student needs," adds Tham about the 3.5-million-person city-state, the financial hub of Southeast Asia.

One thing that emerges from this latest assessment is the relative insignificance of technology. The use of calculators in math class—a topic hotly debated in the United States—doesn't seem to shape the rankings. Most students in Hong Kong, which ranked fourth, use them, for example, but calculators are rare in Taiwan, Japan, and Korea. Around the world, the study found that computers are also not major pedagogical tools. One-quarter of students have Internet access, but only about 10% use it for class work in math or science. U.S. educators may get a better idea of what works and what doesn't in April, when the TIMSS-R results from more than two dozen states and districts are released.

—CONSTANCE HOLDEN

With reporting by Michael Baker in Seoul.

SCORES FROM SELECTED COUNTRIES

MATHEMATICS		SCIENCE	
Country	Average achievement	Country	Average achievement
Singapore	604	Taiwan	569
South Korea	587	Singapore	568
Taiwan	585	Hungary	552
Japan	579	Japan	550
Netherlands	540	South Korea	549
Hungary	532	Netherlands	545
Canada	531	Australia	540
Russia	526	Czech Republic	539
Australia	525	England	538
Finland	520	Finland	535
Czech Republic	520	Canada	533
Bulgaria	511	Russia	529
United States	502	Bulgaria	518
England	496	United States	515
New Zealand	491	New Zealand	510
Lithuania	482	Italy	493
Italy	479	Lithuania	488
Romania	472	Thailand	482
Thailand	467	Romania	472
Israel	466	Israel	468
Tunisia	448	Jordan	450
Turkey	429	Iran	448
Jordan	428	Indonesia	435
Iran	422	Turkey	433
Indonesia	403	Tunisia	430
Chile	392	Chile	420
Philippines	345	Philippines	345
South Africa	275	South Africa	243
INTERNATIONAL AVERAGE	487	INTERNATIONAL AVERAGE	488

SOURCE: TIMSS-R