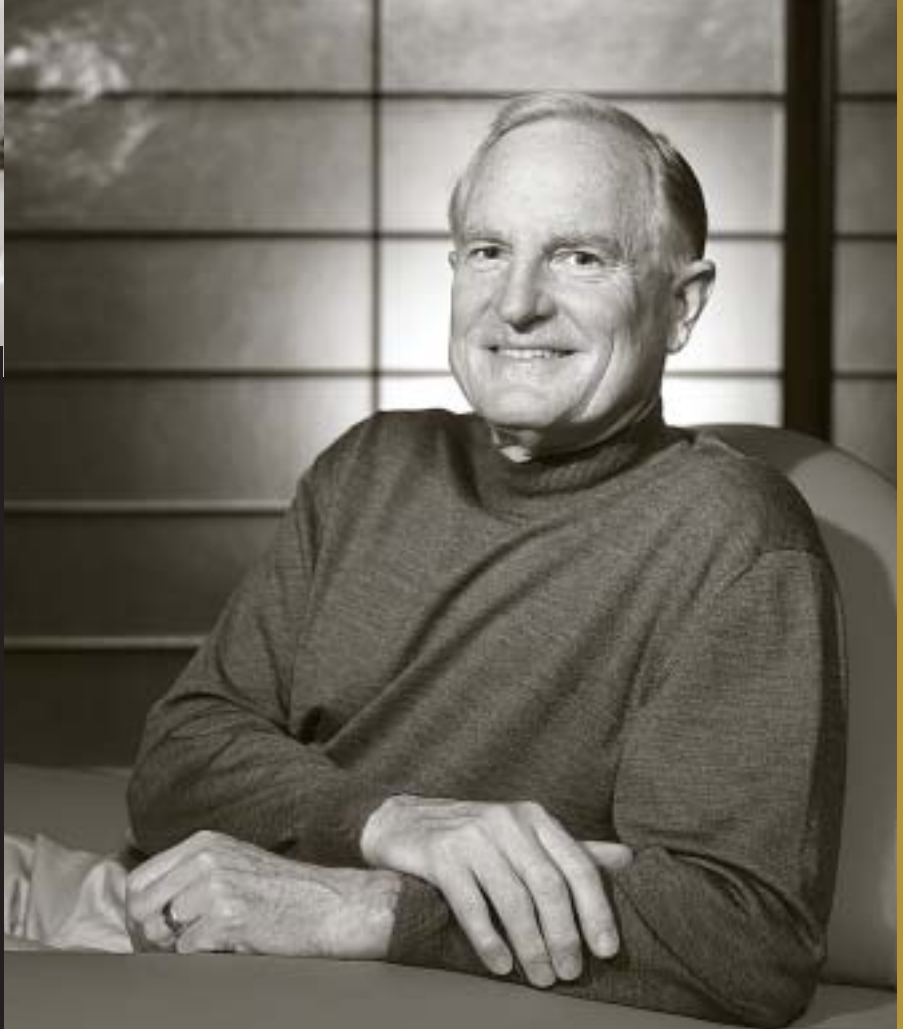




1) A former high school teacher, Jeanne Butcher is now a senior trainer for Intel Teach to the Future, a worldwide professional development program. (Photo by Denise Jarrett Weeks)



2) "Ultimately, education is the teacher in the classroom," says Craig Barrett, a former Stanford University professor and now chief executive officer of Intel Corporation. Under Barrett's leadership, Intel's education programs seek to raise the quality of teaching around the world. (Photo courtesy of Intel Corporation)

3-4) Intel trainer Jeanne Butcher consults with teacher Dianne Dronkers of St. Cecilia School in Beaverton, Oregon, as Dronkers prepares a lesson plan using Intel's Seeing Reason, a Web-based tool for investigating cause and effect. (Photos by Denise Jarrett Weeks)



# TRAINING TEACHERS THE WORLD OVER

Intel Corporation's Vision for the Future

By Denise Jarrett Weeks

**SANTA CLARA, California—** A third of the world's people, some 2.2 billion souls, are just emerging into the glare of the global marketplace as hungry consumers and eager workers—many of whom are particularly well educated. So, when you ask a corporate leader in the United States what's at stake for public education in this country, he leans across the table to tell you.

"There's a major dislocation taking place," says Craig Barrett, chief executive officer for Intel Corporation, from his Silicon Valley headquarters.

"Interesting thing happened about 10 years ago. Not just that the Berlin Wall came down, but three major geographic areas opened up to the world's economy that had been basically closed or nonparticipating: China, India, and Russia."

Barrett does the math. Rounding up, he says, "That's 2.5 billion people who come from countries with a nominally rich educational ethic. Even if you argue that 90 percent of the people are uneducated agrarian types, that's 250 million educated people, which is about the size of the U.S. workforce."

In this frontier of new commerce, workers are well prepared to fill jobs and governments are receptive to collaborating with industries.

Illustrating his point, he says, "Taiwan, with a population of 25 million people, has had a very ma-

terial impact on the IT [information technology] industry as a whole, in terms of accepting low-wage manufacturing jobs and, more recently, being the engineering hub for the computer and communication industries. If this island area of 25 million people can have a major impact on the United States, think what 2.5 billion people can have."

## United States vs. the World

Production by U.S. technology industries has comprised as much as a third of the world's high-tech commerce—which, in turn, dominates the global marketplace, according to the National Science Foundation brief, "High-Tech Industries Drive Global Economic Activity" (1998).

As the world's largest maker of computer microprocessors—or chips—Intel's decision to begin investing heavily in Asia and Russia is significant. The \$27 billion company is plowing money, research, and development into technology and education in these regions. As the company sees it, these parts of the world offer great potential in new customers and well-prepared workers.

It's a horse race of considerable stakes.

"There are only three things the U.S. can do to be competitive in this challenge," he says: Improve technology infrastructure, research and development, and above all, make

education in this country world-class. "Stop talking about California versus Arizona, Arkansas versus Louisiana" in measures of educational progress, he says. "It's the U.S. versus the world."

## It Takes All Kinds

Students in the United States have yet to distinguish themselves in the running. Since 1995, the year the Trends in International Mathematics and Science Study, or TIMSS, began assessing student achievement in math and science around the world, U.S. students have ranked in the middle.

In 1999, TIMSS tested eighth-grade students in 34 countries in math and science. Students in Singapore, Korea, China, Hong Kong, and Japan ranked in the top five in math. They largely dominated science, too, with China, Singapore, Japan, and Korea joining Hungary in the top five. By comparison, U.S. students ranked 19th in math and 18th in science—below Russia as well, which ranked 12th in math and 16th in science.

Here at home, the National Assessment of Educational Progress tested fourth- and eighth-graders in reading and mathematics this year. Overall, students continue to improve in math, but large gaps persist between white students and students who are African American, Hispanic, and Native American.

Learning gaps are a social in-

equity and an economic liability that stymie workforce diversity, says Wendy Hawkins, who directs Intel's education initiatives.

"As an industry, it will be impossible for us to be successful in the long term unless we have good representation of all of our potential customers, and the world represented in our own workforce."

For example, she says, "It's pretty ludicrous to think that a bunch of middle-aged white guys sitting in front of computer monitors are going to be able to design products that are going to be relevant and useful to 23-year-old Hispanic mothers.

"We need representation in our own workforce of a broad diversity of people in order to be able to understand what those lives are like and what products are going to be relevant and useful to them."

## Reaching Over the Ivory Wall

Five years ago, Intel turned the force of its wealth, clout, expertise, and powerful partnerships to addressing the underrepresentation of minorities and women in science, math, and engineering. Intel Corporation and the Intel Foundation contribute about \$100 million annually to education, largely through the Intel® Innovation in Education initiative. The goal of the initiative is to train the world's teachers to teach math and science expertly, using technology

## CONSIDER THIS

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When Yvonne Katz came to Washington County's Beaverton School District in 1993 as superintendent, she was "appalled" at the district's meager technology resources, despite being in the midst of the Silicon Forest. An alliance with Intel Corporation—as well as Tektronix and Sequent—helped lead to bond measures that raised millions of dollars for technology and a new regional high-tech high school, Capital Center.

It was a transformative experience, says Katz, who led the district until 2002 when she left to head a district in Houston, Texas. Initially, the business partners voiced pent-up grievances about public education, she recalls.

"You do a lot of listening . . . and reflecting, and then you try to do a lot of coaching." She coached them to visit schools and to look closely at what data reveal about the realities of public education—student demographics, achievement data, labor laws, education laws and regulations, and the like—before making judgments.

"They just didn't realize that so many children had so many problems outside of the school setting," says Katz.

For the district's part, it used the companies' cash grants, in-kind gifts, equipment donations, and volunteer time judiciously. It soon became a partnership built on trust. The district continues to reap the benefits of a local economy stimulated by the technology industry. Intel Corporation, alone, infuses about \$1.5 billion a year into Washington County's economy, far more than the millions it receives in tax breaks from the county.

to facilitate teaching and learning.

Today, 1 million teachers in 30 countries have taken part in the initiative's Intel® Teach to the Future, a partnership between Intel and Microsoft Corporation. In this program, "lead" teachers—who've been trained by Intel's experts—teach other teachers how to develop standards-based lessons that incorporate the Internet, Web page design, and other technology tools.

From Intel's Innovation in Education Web site, teachers can find lesson plans, technology-rich projects, digital tools, curricula, and online professional development courses ([www.intel.com/education/](http://www.intel.com/education/)). Intel also funds after-school "computer clubhouses" and presents institutes and training programs for teachers and administrators around the world. These offerings are largely free.

At every step, Intel looks for ways to strike up relationships with officials at the top of the education pyramid. While the company donates money and equipment to individual schools through grants, it much prefers to collaborate with governments and education leaders on projects of wide scope.

"We did not want to be behind our ivory walls, throwing money over and saying, 'Go do good things.' We felt that we wouldn't know what was good and what was bad unless we rolled up our sleeves

and engaged and were part of the process, and really developed an understanding . . . of what was being done with the dollars," says Hawkins.

Intel works directly with ministries of education, state and national departments of education, large school districts, and university education programs.

"We're looking for places where we can engage in a meaningful fashion and have as large an impact as possible," she says. Often, that means in other countries where decisions about such things as teacher preparation and curriculum are made at the national level.

"We use the influence that we have through those collaborative efforts" to advocate for education standards and accountability, she says, adding the maxim: "That which is important, we measure; and that which we measure, gains in importance."

And one of the most important things to measure is teacher performance, she says. A fact of life in the business world, performance measures unnerve some educators who point out that they aren't manufacturing widgets, but are in the highly variable business of teaching human beings.

Hawkins nods and says, "It's a scary thing to enter into an environment where you're judged on the

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**PORTLAND, Oregon**—It's 8:30 on a Saturday morning and cold and grey outside. Yet here, in the computer lab at St. Mary's Cathedral School, a dozen teachers are alert and chipper as they settle behind computer terminals and log onto the Intel Innovation in Education Web site.

The teachers, from various Oregon schools, are here to learn from an Intel trainer how to use a free, Web-based mapping tool called Seeing Reason ([www.intel.com/education/seeingreason/](http://www.intel.com/education/seeingreason/)). The tool helps students investigate cause-and-effect relationships. Prompted by a guiding question from their teacher, students—typically in pairs—map causal relationships between factors involved in a complex system.

For example, a guiding question might be: What happens when human and bear habitats overlap? Factors involved may include human intolerance, natural food source, drought, and so forth.

Students can revise their maps as they develop an understanding of such multiple influences. Each version of their map is saved for the teacher's benefit, who, following the "paper trail" of their reasoning, can identify any misconceptions and gauge students' depth of understanding.

#### **MAKING THINKING AUDIBLE**

Seeing Reason was developed by Eric Baumgartner of the Center for Innovative Learning Technologies (CILT) in Berkeley, California. While cognitive mapping is usually described as making thinking visible, Baum-

gartner developed Seeing Reason to make thinking *audible*. "The tool was designed to raise the level of discourse about causal relationships," he said, according to Intel's Web site.

It is certainly stimulating discussion among the teachers in St. Mary's computer lab this morning. During the course of the day, they will each develop a lesson plan for a Seeing Reason project. Some of the ideas being tossed around for topics to investigate are the Christian crusades, water quality, school climate, and the structure of fairy tales. Clearly, these teachers see many ways to use the tool across the curriculum.

Intel senior trainer Jeanne Butcher reminds the teachers to choose an open-ended guiding question that will elicit factors that are definable, quantifiable, and measurable. Seeing Reason was developed so that relationships are measured only by whether one factor "increases" or "decreases" another factor.

Jim Pollard develops online teaching tools for Intel. When Intel made Seeing Reason available in 2002 on its Innovation in Education Web site, Pollard provided online examples of how teachers and students had found innovative ways to use the tool in projects. Teachers can learn how to use Seeing Reason by studying the examples, says Pollard, but it's best to tap into the free training sessions offered by Intel.

"The face-to-face training is on how to do project-based learning using Seeing Reason,"

he says. The sessions not only help teachers learn to use the tool, but to craft well-made unit plans that align with academic standards.

So far, 1,400 teachers around the world are registered to use Seeing Reason. Teachers create "work spaces" on Intel's server for their students' Seeing Reason projects, and, because it's Web-based, students and teachers can access their work anyplace, anytime.

#### **SKILLS FOR THE AGE**

A former special education teacher with a doctorate in curriculum and instruction, Pollard explains how Seeing Reason differs from other mapping tools, such as Inspiration by Inspiration Software, Inc. of Beaverton, Oregon.

"One big difference between Seeing Reason and Inspiration is that it constrains your mapping to cause-and-effect relationships. So, in one way, it's not as versatile as Inspiration, but that's one of its strengths: It constrains you to just thinking about *this* factor increasing or decreasing *that* factor. Inspiration's primary use is to say that one element is associated with another; that is concept mapping."

The "increase/decrease" parameter develops mathematical reasoning, says Pollard, a focus of Intel's education efforts.

"We think increasing math skills is important to any student who's going to grow up in the knowledge economy, and we know that, because it's important to people [like those] who work at Intel," says Pollard. When he

and others develop teaching tools, they incorporate math processes that the National Council of Teachers of Mathematics has said are essential for mathematical literacy: problem solving, reasoning, communication, connection, and representation.

So-called "21st-century skills" derive from these mathematical processes, Pollard says.

#### **A TEACHING TOOL**

Stefni Stephens is a teacher at Mountain View Elementary School in Corvallis. She drove 80 miles to attend this morning's Seeing Reason training session.

"I do think that kids are 'wired' differently [today], and we are slow to pick up on the difference," says Stephens. "Kids now are even more visual than my generation, and we need to update our teaching techniques to include that aspect of their learning."

As good teachers do, she's constantly looking for new and better ways to teach. "The bad part of this is that it is very time intensive," she says, so she often uses technology to facilitate her search. "Computers and the Internet do a lot to help me, because ideas are available at all times of the day."

She's eager to get started with this new tool.

"I was very excited about Seeing Reason, because it is free and available to anyone. There is nothing worse than getting excited about something and then finding out there is no way you can afford it," she says. "I can't wait to try it with kids. I especially like that they have a way to explain their reasoning."

districts that serve as demonstration sites. At present, Tahoma, Cle Elum-Roslyn, and West Valley school districts are demonstration sites where the institute is helping to create a scope and sequence for integrating environmental education into the curriculum at all grade levels.

### Working Together for Quality

It can be tough for industry organizations to convince every skeptic that the curriculum they promote is objective and science-based. Michael Sanera, coauthor of the book *Facts, Not Fear*, asserts that most environmental education programs rely on slogans at the expense of critical thought. Ironically, even though Project Learning Tree was funded by the timber industry, Sanera believes the materials overly reflect the views of environmental groups. He expressed similar concerns about Project WET and Project WILD.

At the other end of the spectrum is John Borowski, an environmental and marine science teacher at North Salem High School in Salem, Oregon. In his article, "Project Learning Tree: Education by Omission" ([www.commondreams.org/views03/0922-02.htm](http://www.commondreams.org/views03/0922-02.htm)), Borowski criticized Project Learning Tree for failing to address the environmental impact of short rotation forestry, monocultures, and habitat fragmentation. He refers to Project Learning Tree as "a

pet to timber interests." Moreover, environmental organizations should be wary, he said, of being co-opted by resource industries that develop environmental education programs.

Nevertheless, the Audubon Society in Washington recently deepened its partnership with the WFPA, helping it to establish the Environmental Education Partnership Fund. The fund will provide financial support to "proven and innovative environmental education programs across the state."

"Our partnership with WFPA raises eyebrows for some folks," said Audubon Field Director Heath Packard. Packard acknowledged that the organizations sometimes differ over policy issues and that WFPA's materials contain "a few omissions." However, he stressed that those factors do not preclude working together to facilitate environmental education programs.

"Audubon and WFPA both focus on high-quality, inquiry-based education that emphasizes critical thinking," Packard said. "The bottom line is that WFPA's materials get students and teachers engaged and improve student learning."

It's evident that AMEREF and WFPA have strong support among educators. "I don't think we can do without the help of organizations like WFPA," said Ann Cavanaugh of the Longview School District. "They're doing a great job." ■

## TEACHERS

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result of some things that you feel you have little or no control over. But it would be disingenuous to pretend that it's not our hope that lousy teachers get out of the profession." **'It's OK To Be Smart'** Sharp teachers, in Intel's view, are those that teach through projects that are extended and involve students in real-world problems. They blend multiple subjects and incorporate technology. They call on students to demonstrate their learning and skills through performance assessments, rather than mere paper-and-pencil tests.

"Ultimately, education is the teacher in the classroom," says Barrett. "Kids learn from teachers when teachers are efficient, enthusiastic, and professional. They should be treated like professionals: They should have development time, they should be compensated for performance, and they should not be afraid of new things, because, my goodness, the world around us is changing every day."

Sharpening teachers' interests and abilities in math and science is key to tapping what Barrett sees as a deep reserve of students with latent talents for mathematics, science, and engineering.

"Enrollment and degrees in electrical engineering and computer

science . . . are diminishing," says Hawkins, and the fall-off in interest begins as early as grade school.

It's Barrett's gravest concern, and Intel devotes millions of dollars to stirring interest in the subjects by sponsoring the national Intel Science Talent Search and the Intel International Science and Engineering Fair, prestigious competitions with \$100,000 and \$50,000 grand prize scholarships, respectively.

"It's OK to be smart. It's OK to be interested in science," Barrett says. "You can get peer recognition, you can get school recognition, you can get community recognition by applying your brain."

Ultimately, businesses want youth to develop good minds and good personal qualities.

"We're looking for people who are well prepared to communicate with other human beings; to work well in groups; and to get up in the morning, get dressed, and get someplace on time," Hawkins says. "Some of those very fundamental skills are the things that industry has been clamoring for most urgently.

"So, we're not asking for kids to be taught how to work on a factory line or in dead-end jobs and not to appreciate art and poetry. We're typical parents ourselves. We don't want that for our own children, and we don't want that for society's children at large." ■