Students glimpse the future. And it's tiny.

By Ari Kramer
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SNOHOMISH, WASH.

After weeks of preparation, the teams finally face the test.

They must examine the prospects and pitfalls of using nanotechnology aboard the space station Athena in the year 2033. What could the tiny science do for surveillance and defense, the competitors asked themselves. Where would it fall short?

Now, chatting heatedly and scribbling furiously, they spend the next two hours applying themselves to the task.

Finally the time is up. Pencils are set down and a lively discussion of nanotechnology ensues.

Not bad for a group of elementary school students.

Students at the Dutch Hill Elementary School in Snohomish, Wash., are among several hundred thousand students across the country who this year are devoting class time to nanotechnology – the science of manipulating structures from the atom up, or literally, the technology of one-billionth.

The tiny topic was handed to Dutch Hill and other schools by the Future Problem Solving Program, a Lexington, Ky., not-for-profit educational corporation. The program is designed to enrich honors curriculums with timely lessons and friendly competition. Winning teams will eventually advance to state contests in June.

Each year, student competitors vote for five topics from a list supplied by FPSP. This year choices included e-commerce, sports medicine, and DNA identification.

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But nanotechnology has surprised some student participants with the breadth of its applications.

Part of the curriculum has required them to read articles such as "Taiwan sees US $8 billion nanotechnology market by 2008" and "A trillion-dollar market within a decade?" in magazines such as Scientific American and Small Times – Big News in Small Tech. And in preparing for the tests, teachers and guest speakers explored the notion of nanorobots and man-made materials stronger than diamonds.

"You can talk about anything" in relationship to nanotechnology, says fourth-grader Nick Mitchell. "There's a limit but you can still go far," agrees classmate Kimberly Conrad.

"It gets them to think out of the box," says Zan Peterson-Moens, who teaches fourth- through sixth-graders in the school's FPS program. On the wall behind her are crayon illustrations of the latest topic, one of "Optical Tweezers" – lasers used to make and turn microscopic objects. "That's what you want kids of the future to be able to do."

As jobs go, the science fits into a broad array of fields. Companies such as Boeing, Toyota, and Samsung already use nano-based sensors and composite materials, and Eddie Bauer uses the technology in stain-resistant slacks.

Universities and corporate research and development departments are investing hundreds of millions of dollars in nano-based electronic circuits and drug-delivery systems.

The need for future workers in the field is one of the reasons the National Science Foundation in Washington is supporting nanotechnology education in elementary and high schools – with introduction to preliminary concepts as early as kindergarten – in addition to funding undergraduate, graduate, and PhD-level programs.

Relying on NSF funding, Cornell University in Ithaca, N.Y., recently launched "It's a Nanoworld," an interactive traveling museum focused on students aged 5 through 8.

Business, industry, and higher-education leaders agree, saying early education gives students a jump on a job market many expect to blossom in the future.

"Industries will be developed that we can't even think of today," predicts Leonard Pritchard, principal with Avogadro Partners, a Seattle-based venture-capital firm that eyes prospects for the science. "It's going to affect almost every sector of the economy, which means it will affect almost every kind of business."

But regardless of job prospects, some science teachers see nanotechnology as a relevant part of a standard contemporary science curriculum.

"It's important for kids of all ages to learn something about scale, whether they're focused on nanotechnology or not," says Anna Waldron, director of education for Cornell's Nanobiotechnology Center. "You can't teach nanotechnology to a 6-year-old, but you can explain that there are things you can't see, and they are very tiny things and very neat things. It's important to understand that everything is made up of smaller parts. That fits into every curriculum."

Worldwide government funding for nanotechnology totaled nearly $3.4 billion through 2002, according to Forrester Research in Cambridge, Mass. US venture capitalists have invested more than $1 billion, and Forrester expects nanotechnology "economies of scale" to double the number of new products introduced every two years by 2007.

"People who already have jobs will start doing it at the nanoscale," says Griffith Kundahl, western regional vice president of the NanoBusiness Alliance, a business association in New York. "I think the opportunities are already established. I think they'll be more entrenched when these kids get out of college."

A potential career? It's tough to rule it out.

"It's kind of cool to picture," says Dutch Hill sixth-grader Nathan Mullins after the test.

His team recently learned that they will be advancing to the state finals this June.

"It pretty much just goes with everyday life."