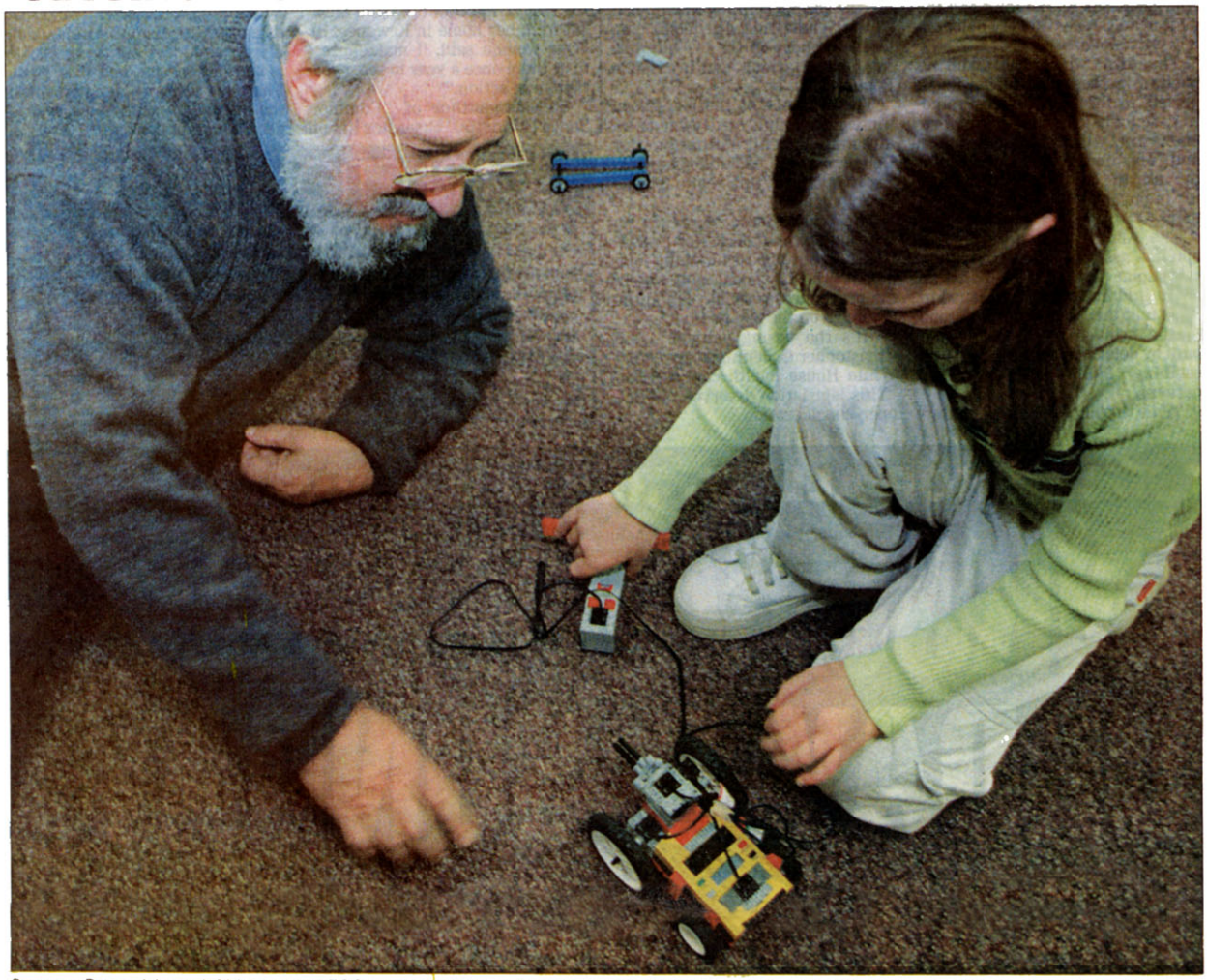
MAINE WEEKEND

Bangor Daily News Saturday/Sunday, November 25-26, 2000

'GETTING AT SOMETHING'



Seymour Papert (above, left) looks at a LEGO vehicle built by second-grader Ariel Dauk recently at Sedgwick Elementary School. LEGOs (below) allow children to be creative while learning about computer programming. (NEWS Photos by Anthony Robert La Penna)

Computer guru logs on to schools

Technology challenges kids' problem-solving skills

By Gordon Bonin
Of the NEWS Staff

BLUE HILL. Seymour Papert beamed like a grandfather watching his grandchildren master a new mechanical toy. But the little vehicles scudding and pivoting down the hallway and in a classroom of the Sedgwick Elementary School were no toys.

Embedded with tiny computers, they were designed and pieced together by Sedgwick second-graders as part of a project overseen by the 72-year-old computer guru. The pupils had programmed the on-board computers to move the battery-propelled vehicles in specified patterns.

The project epitomizes Papert's principle that learning is about "getting at something," and that computers can revolutionize education by giving students relevant, multifaceted problems to solve.

Papert is the visionary credited with inspiring Gov. Angus King's proposal to provide portable laptop computers to every seventh-grader in the state until all seventh- through 12th-graders have them.

For more than 40 years, he has coupled training as a mathematician with an intense interest in using computers to transform education.

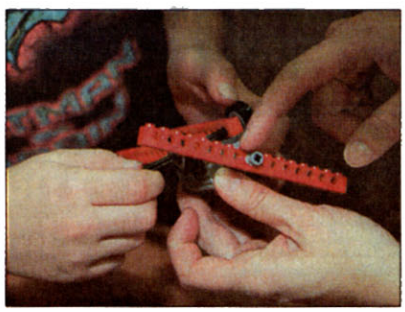
Papert, an MIT professor emeritus who now lives in Blue Hill, serves as a King appointee on the task force charged with figuring out how best to use a $50 million endowment for educational technology in Maine.

King and Papert both speak about computers being able to bridge the gap between the "haves" and "have-nots" in the world.

The governor also talks about "putting Maine on the digital map" and giving the state's economy a sustained shot in the arm.

Changing schools

Papert sees computers as the technology that



can radically alter school for the better.

Children are naturally eager and inquisitive learners, he said, who pursue both what interests them and what is relevant in their lives.

Schools and teachers, rather than imposing a uniform curriculum that at times suffocates enthusiasm, can guide students along the paths

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that intrigue them by using computers, according to Papert. Instead of teaching in abstractions, schools and teachers can use the machines to lay out relevant problems for students to overcome.

Computers in and of themselves "don't make everything different," Papert said in an interview in what he calls the Learning Barn on his Blue Hill property. Computers provide "an infrastructure to make everything different."

Computers allow students and people in general to get at knowledge more easily, he said. They also allow individuals to take charge of learning, to explore freely, to take their individual paths.

"That is why it is important to have computers in your own time and place," Papert said about his support for providing students with portable machines. "Taking computers out of the school is very different from having another computer lab."

Current education is based on the 19th and early 20th centuries' "old way of handling knowledge," he said. And that way has many assumptions that aren't necessarily true or that no longer have to be true.

One of those assumptions is that children "can't find ways to knowledge spontaneously, that they have to be taught, or that knowledge can't be tied to their interests," he said.

The mathematics taught in school today has hardly any relevant place in people's lives, according to Papert. "So math has to be learned as an abstract formal subject, which is a bad way to learn anything.

"I look at activities that are rooted in students' interests but spread their branches [of learning] as wide as possible," Papert said.

"I see the interconnectedness of knowledge," he said. "To do one thing deeply one needs a lot of other knowledge. What's important for people to know is important because it comes up in many places."

The upshot of all this is that knowledge should be used "to get at something." There ought to be a purpose behind inquiry, not just a demand that something be learned, he said.

Working principles

Papert is putting his principles to work with Caroline Werth's second-grade class at Sedgwick Elementary School.

Members of the nonprofit Seymour Papert Institute, which is housed in the Learning Barn, are having pupils build small vehicles out of parts supplied by the LEGO Co. One of those parts is a small computer.

After building the vehicles, which include battery-powered motors, the children will learn to program them using "iconic" software that Papert's team is developing.

The icons in the program are arrows that indicate which direction the vehicle will move: orange arrow for straight ahead; purple arrow for straight reverse; red arrow for forward left turn and so on.

The children string together the arrows on a laptop computer from which they download the sequence into the LEGO computer — which is known as the "yellow brick" or RCX 1.0 — using an infrared device.

Eventually they will learn the commands behind the icons and will begin to create new commands to accomplish different tasks.

The LEGO project enables children to learn something with technological, mathematical, scientific and design aspects. In the past, Papert said that was difficult to do.

The project is being funded entirely with money raised by the foundation. LEGO has provided the vehicle equipment.

The iconic program, based on the most recent version of Logo, a computer language Papert created in the 1960s, is being developed as the class goes along. The Sedgwick school is a test site.

"We've been pretty astounded by this second-grade class," said Judy McGeorge, executive director of the Learning Barn.

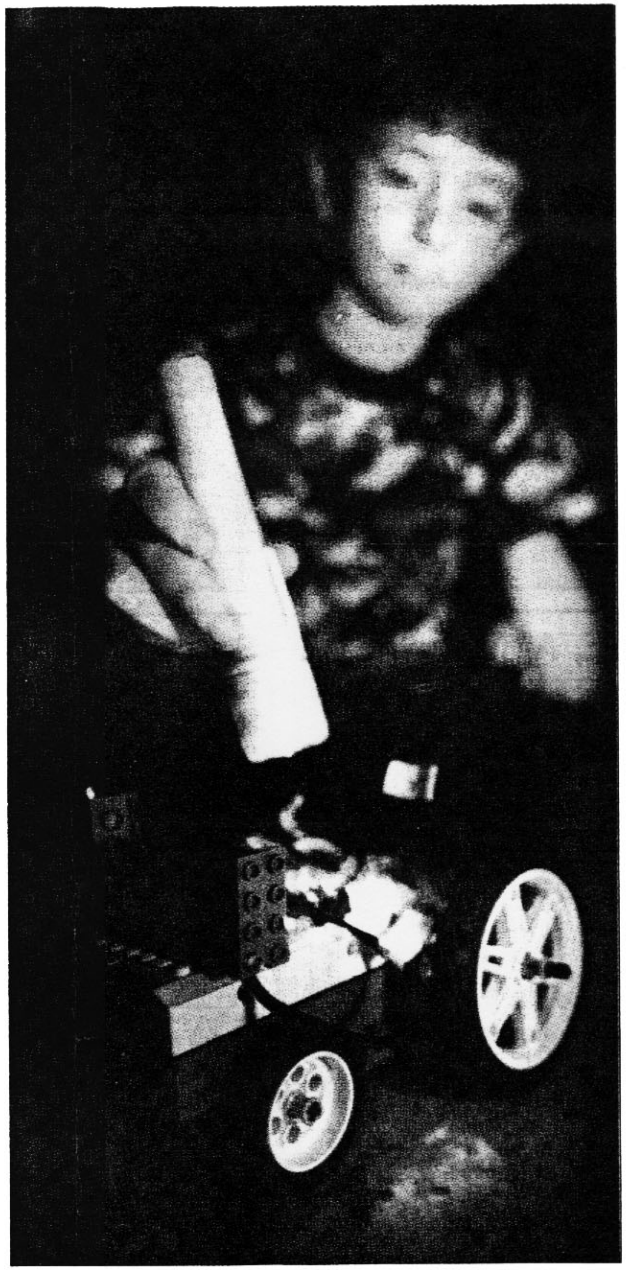
The students have taken to it quickly; one girl is so good that Papert's team has had to pick up the pace to stay ahead of her.

"Kids really like to get control over that computer," Papert said. Children "want to do things, learn things to have control over their world [and] they can do more with computers than they can with anything else."

Irrelevant curriculum

The hands-on vehicle design and assembly in Sedgwick exemplify something David Cavallo, a Papert colleague and MIT professor, told the task force on learning technology in October.

"We don't believe in every kid sitting in front of a [computer] screen," Cavallo said. Kids can also be active participants in reinventing their education.



Second-grader Brandon Young uses a flashlight to steer his LEGO car equipped with light-sensitive blocks recently at Sedgwick Elementary School. (NEWS Photo by Anthony Robert La Penna)

The assumption that the school curriculum doesn't need to be relevant to life, Papert said, is "the most powerful negative influence in our society."

His prime example is the teaching of fractions. Learning anything beyond halves, thirds and quarters is irrelevant, he said.

Even worse is the requirement that children learn common denominators, which "has no redeeming value," he said.

In the past, people needed to know fractions when they stood in front of a market stall about to buy something, he said.

But now cash registers and unit-pricing labels do all the calculating that used to go on in people's heads.

Children understand that and interpret school's emphasis on the importance of learning common denominators as a "tacit lie" that undermines their enthusiasm for learning, he said.

In contrast, there are many mathematical concepts that children could put to use in everyday life.

Learning about probability is worthwhile, he said. But while fractions were easy to teach using chalk and blackboards, ease in teaching probability required the advent of the personal computer. For example, probability can be taught by having students program a random element into a computer game.

Every deep thinker who has looked at the way society organizes education and schools has said it's too abstract, too formal and too one-size-fits-all, said Papert.

John Dewey, a philosopher whose writings have influenced Papert, said that education shouldn't be coercive, but should be rooted in a student's experience and willingness to pursue knowledge.

The greatest danger with the current structure of schools is that it suppresses children's natural instincts for self-directed exploring and inures them to "other-directed learning," where someone else tells them what to learn, he said.

"A very important part of learning, and something school is least adequate at giving, is putting the learner in charge of his learning," Papert said. Children ought to be "active agents following their own agendas."

When it comes to computers, good software "empowers children to explore, to delve deeper than they could without it," he said. "I don't like educational software that pushes school-style learning ... it strangles young minds."

Absolute clarity

While talking with Papert, one gets the sense that with his mind's eye, he sees something with absolute clarity and understands its implications, that others see only vaguely, if at all, in the distance of a foggy landscape.

A native of South Africa, Papert was in his 20s when he joined the faculty of the University of the Witwatersrand. He left South Africa in 1954 for England to become a research student at Cambridge University. There, he studied mathematics and its relationship to the nascent field of artificial intelligence, the science of developing "thinking" machines.

In the late 1950s he met and teamed up with the Swiss philosopher and child psychologist Jean Piaget, with whom he subsequently worked for four years on how children think and learn.

In 1964, Papert joined the faculty at MIT, founding the Artificial Intelligence Lab with Marvin Minsky.

His 1980 book, "Mindstorms: Children, Computers and Powerful Ideas," is considered a seminal work on the subject of computers and education.

LEGO has named its most recent product line Mindstorms after the book. It has also endowed the LEGO-Papert Chair of Learning Research at MIT.

As well as working with the Sedgwick Elementary School, Papert is working at the Maine Youth Center in South Portland and with the nations of Costa Rica and Thailand using technology in education.

He moved to Blue Hill in the early 1990s after he married second wife, Suzanne Massie, a writer specializing in Russian culture, who spent summers on Deer Isle.

In his 1996 book, "The Connected Family," Papert wrote, "I am no Pollyanna about technology. The record of how society took up earlier technologies is frighteningly bad."

A danger with computers and the Internet is that a child's interests will become too broad and superficial, he said during the interview in the Learning Barn.

The "net effect of the Internet on young people" is to broaden the range of things they know about but in so doing leaving that knowledge shallow, he said. "What's scary is the way kids jump around the Internet, [their] grasshopper mentality."

Nonetheless, he thinks computers can dramatically improve education.

What is important about the governor's technology initiative is that in very short order, 95 percent of children will have computers at home, whether or not the state provides them, he said.

"Let's jump in and start learning in the context of what's going to be there," he said.

"It's about getting the whole system prepared. Schools have to adapt to the new ways of learning that become possible with computers."