MARK F. GOLDBERG

Portrait of Seymour Papert

Seymour Papert created LOGO to make the computer accessible to children, but LOGO is much more than a programming language—it is also a "philosophy of education."

ASCD Photograph

Seymour Papert, the father of the programming language LOGO, is a pensive, soft-spoken man. A bit over 60, he has a light South African accent and tousled salt-and-pepper hair and beard; he prefers to dress informally. He uses "perhaps" a great deal in his speech and tries to be careful and balanced in all that he says. His modest, relaxed appearance belies his importance in education: for 25 years he has been a pioneer in connecting computers to schools and learning. His brainchild LOGO is present in at least one-third of American elementary classrooms and has expanded internationally, reaching as far as small towns in Latin America and rural schools in the Soviet Union.

Life in Africa

Papert's father was an entymologist who studied the tsetse fly—that bloodsucking African insect which carries pathogenic parasites to humans and livestock. Before DDT, the only way to escape tsetse fly invasions was to predict their movement in order to avoid them. During the early 1930's, young Seymour spent months each year in "various wild places on the southeast coast of Africa" with his parents, their white assistant, and several black workers and their families.

It was in this "transparent little world" that Papert became interested in learning the mechanics of things. He recalls how as a small boy he once drove a truck two miles an hour, hit a tree, and jumped out of the stalled truck, wild with excitement to see how the gears worked. In this environment Papert's lifelong desire flourished—he always wanted to figure out "how physical things worked—but also how minds work."

The family moved to a permanent home in Pretoria; Papert entered school and "hit into segregationist South Africa." His logical mind and his familiarity with black people had left him without any racist stain. From his earliest memory, he says, "the racist thinking in South Africa seemed to me not only wrong, but profoundly unintelligible, mysterious."

When he was a schoolboy of 11 or 12, Seymour and three other boys, seeing the need for local black workers to learn how to read and to function in modern society, decided to lobby the administration of their school for an evening course of studies for blacks. The administration turned them down flat, so Papert and his friends organized a meeting of their parents. Simply assuming that their successful and respected mothers and fathers would apply pressure on the administration, they were astonished, recalls Papert, "that the parents supported the administration. The main argument was 'You can't have these people come here to our schools; they'll bring diseases.' These were the same people who were the cooks in their houses and the nursemaids of their children."

The boys sensed that the stated argument wasn't the real reason for keeping the blacks illiterate, and they were disturbed "that people could stand up and give this sort of argument and not be ashamed." Papert, who early in life had grasped the workings of a gear, could not fathom this "total irrationality." In this incident he now sees the "roots in my interest in philosophy of mind and the theory of intelligence. From the beginning it was tied up with an activist streak."

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Mathematics, practical activism, and philosophy merged in Papert's mind as he widened his experiences and studies. At South Africa's Witwatersrand University, he was attracted to mathematics, but only partially because of its content and structure; he also understood how powerfully mathematics related to philosophy. And part of the reason he had chosen mathematics as a course of study was because he saw it as a politically neutral subject at a time when his college activism kept him in trouble in South Africa.

Work With Piaget: Understanding Learning

In 1959 Jean Piaget invited Papert to work with him in Geneva. Piaget was studying how children begin to understand mathematics, and he was impressed with Papert's doctoral thesis on the understanding of topology as pure mathematics. To uncover the learning process, Piaget felt, "you really have to understand the deepest questions about the nature of mathematics." It followed then, Piaget said, that "mathematicians and especially people interested in the philosophy of mathematics are more important to have around than psychologists." His work with Piaget convinced Papert that it was more interesting to study what children can do than what they cannot do. The way to change education was not in concentrating on any particular technique but to change the entire culture in which education takes place.

The Cyprus Epiphany

In 1965, walking on a hilltop in Cyprus, Papert realized—"it just sort of hit me like a thunderbolt"—that computers had great potential for making a difference in our culture. The best way to contribute to education would be to "harness that cultural change to the lives of children, the growth of children."

This insight led him to the National Physics Laboratory in England, where he could use "the biggest computer in Europe." While learning to program and to think about computers and learning, he began to meet people from MIT, notably Warren McCulloch and Marvin Minsky. His association with them caused him to deepen his Piagetian belief "that children are builders of their own intellectual structures." At the same time, he pondered the paradox Piaget had voiced: "children are marvelous at learning, and yet in school it seems so difficult to teach them."

The MIT Years

Through his association with Piaget, Papert had found "a way of putting together these two poles of mathematics: philosophy of mind and a way that could have an activist facet, that could lead to re-thinking how children learn and change the nature of education perhaps." Soon Papert joined the computer revolution at MIT and began to use computers to change the culture of education.

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When he first arrived at MIT, he found "there weren't any people here involved in research on children, so for a while that aspect was eclipsed, and I concentrated on theoretical models of intelligence and artificial intelligence." By 1967, he was hard at work on his mission, although at the time people "put down what I was proposing as accessible only to the rich and privileged." Papert understood that the first personal computers would soon be available to the public, and he wanted to make it possible for children to master the computer. Describing the early drill-and-practice uses of computers as "the computer programming the child," he sought to create a computer microworld, not unlike the fascinating world of his father's research camp in Swaziland: a world that a child could master.

So he created LOGO to make the computer accessible to children. "The spirit," he says, "is to make the computer an expressive medium for a child to use in a natural way, in a way that's like a producer, not a consumer." For instance, children see animated cartoons all the time "but they have little opportunity to make their own. The computer as a instrument can allow children to make animated pictures—

then tell a story in action and movement on a screen by programming the computer."

The computer has logical rules, but Papert has shown they can be applied in multiple and creative ways. He speaks constantly of "opportunities," "multiple paths" and "masterful use." His desire is to "as far as possible put the user in charge ... and to avoid having arbitrary rules imposed by the design of software."

Today's Projects

Educational research is now the center of Papert's work. One important project is at Hennigan Elementary School, a typical "inner-city Boston public school"—30 percent black and 30 percent Hispanic. Unlike his prior projects in which only enthusiastic teachers volunteered to participate, the Hennigan project includes all the teachers in the school. "We've taken a group of 18 teachers in an inner-city public school. They're mostly women, average age well up in the 40's. We've made them learn to program. We've asked a lot from them in terms of time—summer activities, one afternoon a week, lunchtime meetings. No one's ever dropped out because they didn't want to learn this stuff." This is a LOGO-Lego project, one of the newest applications for LOGO. Lego is "something children know about outside of school and have a lot of skills in." The goal is to build a computer culture in the school that has "roots in the general culture." Students in Hennigan School are learning in their computer-enriched environment. Computers are in classrooms; they are not restricted to a centralized computer lab. The teachers constantly "look for ways of making connections" using LOGO-Lego. Students learn design, physics, math, and mechanics. They learn computer programming fundamentals when they build Lego structures—not simulations but actual structures—using Lego pieces, motors, gears and sensors. A Lego robot on a magnetic track actually builds structures on computer command.

Another of Papert's efforts is a computers-in-the-schools program in Costa Rica, entirely based on using LOGO. President Oscar Arias made the project part of his platform when he ran for office and is determined to carry it through. Before beginning the project, Papert asked the Costa Ricans to consider whether they wanted to adopt a program that would be very easy for the teachers to implement (put a diskette in the machine and have software that would run pretty well automatically without any effort from the teacher) or whether they wanted to require the teachers to really learn the computer. Costa Rica opted for the second alternative and sent teachers to MIT for a three-week experiment: they came, they learned, and they mastered the computer. To Papert, "they were spectacular. It was an affirmation of their country, it was an affirmation of their profession—not a low-grade profession that can't contribute anything sophisticated—and since many of them were women, it was an affirmation of their gender, too."

Through LOGO, Papert has realized his dream of making children masterful users of computers and providing them with many ways to solve problems, including some that have never occurred to him. When I asked him for his thoughts on why LOGO is so deeply appealing to children, he paused, as always, to think for a moment. Then he replied, "many schools appear to kids as a look to the past. This is a piece of the space age that you can hold in your hand. It's a connection with what you see on the television set; it's a connection with the future."☐

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