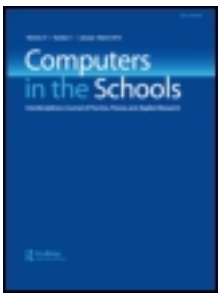

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Seymour Papert PhD [a]
[a] Professor, Logo Group, MIT

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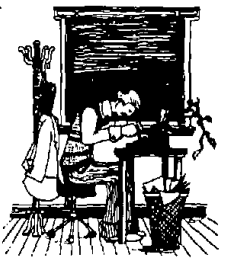

Seymour Papert

Different Visions of Logo

There are tremendous differences in the ways that Logo is being used by different people—even in their perceptions of what Logo is or is not. In *Psychology Today*, Jan Hawkins of the Bank Street College was recently quoted as saying that Logo has promised more than it delivered (Hassett, 1984). For me, this immediately conjured up an image of Logo with its delivery van backing up to the rear door of a school, or of a politician on the whistle stop train making speeches (and promises) at every town.

The point is that Logo is not a person; it neither promises nor delivers. It's a medium of expression, for both children and teachers; and, when I travel across the country and the world seeing Logo in many different contexts and many different classrooms, I'm struck by the variety of forms it takes in these different settings with different teachers and different children.

This isn't just casual observation. One of my major research interests at the moment is, in fact, examining the way that Logo is taken up by different people in different cultural, social, and educational settings, and becomes something thoroughly different in each of them. If there is anything that Logo promises, it's this protean ability to take different forms—and, if you use it right, to become a kind of mirror in which you can see reflections of yourself.

But there is, of course, no "right way" of using Logo. Trying to

SEYMOUR PAPERT, PhD, is currently a professor at MIT where he heads the Logo Group. He has two doctoral degrees in mathematics, one from Witwatersrand in South Africa and the other from Cambridge University. Dr. Papert worked with Jean Piaget at the University of Geneva for five years. He was a co-founder of the Artificial Intelligence Laboratory at MIT and was the developer of Logo. He is author of *Mindstorms: Children, Computers, and Powerful Ideas.*

establish one would destroy the very diversity I just described. But there *are* ways of "using it wrong" which I'd like to clarify by quoting a child in an interview—a nine-year-old child who contrasted the fun he'd had during the summer when he had access to Logo on his friend's computer, and what was happening in his school. "In the summer," he said, "we learned to program. At school, they are teaching us to write a program."

I couldn't have put it better myself. Indeed, you can imagine what's going on in this classroom: everybody writing a program to draw a house. The nine-year-old knew well enough to put his finger on a not-so-subtle difference. And that's certainly not using Logo right.

This is one of the ways of using Logo which I think is clearly wrong, however you look at it. It has nothing to do with the spirit of how Logo was conceived and can be most valuable. But by definition, there isn't any one way of "using it right." That implies that some particular correct way exists—and *that* would be against the spirit of what Logo is all about. It's like asking, "Did Shakespeare and Hemingway 'use English right?'"

Each used English in his own, unique way, just as one can and "should" use Logo. None of the "right ways" I've seen can be reduced to some sort of formula that I could hand to you in some neat package. Nevertheless, there are ways of using Logo which I find exciting and instructive for everyone.

One example is an experimental classroom in Pittsburgh where Logo teacher Leslie Thyberg runs a very open class for children in the lower grades, K through 3. Leslie found a particular way to capture something that I think is characteristic of the best uses of Logo. She had a rule in her class: "Ask three before you ask me." This usually meant asking three other children—which had many results, all good.

Asking one another questions fostered the kind of climate in which a computer culture can thrive.[1] Also, in *answering* one another's questions, the children learned to play the role of teacher. Leslie herself found that the number of trivial questions—where to place RETURN, or do you put a space, or why did it say I DON'T KNOW HOW TO—decreased markedly. This left her free to deal with the more subtle questions that needed her greater distance, maturity, and insight.

In other words, by turning learning into a cultural process, she was free to be a teacher. This also put her in close touch with the threshold of the developing culture and knowledge. She could let the questions raised by her students guide her decisions about what directions to take next and with whom.

There's another kind of—not so much "wrong way" as bias. A bias has crept into the way that Logo is used, even when people are trying very

[1] "Computer culture" means that knowledge about computers is spread among the people one interacts with. (In this instance, the group of children.) This makes information about computers and what you can do with them readily available and thus easy to acquire.

hard to encourage the children to take their own direction and choose their own projects. When you look at what these children do, you often see a lot of squares and right angles and triangles, what you might call "hard-edged drawings," very geometric.

There's something about the ease of describing these things in print that encourages this kind of Logo project. I myself am guilty of this, having often used the example of drawing a house by putting a triangle on top of a square.

That's great in itself—but when it begins to set a style, when book after book on Logo shows these very geometric drawings, I become concerned. This bias tends to encourage something that I hadn't thought of when I used that example in *Mindstorms.* Telling children to draw a house, of all things, tends to evoke very stereotyped pictures of houses. There are only a few images of houses embedded in our culture: my square with a triangle, a rectangle with a trapezoid, perhaps a few others. And this sort of suggestion tends to trap the children into stereotyped and hard-edged ideas.

A breakthrough in freeing such constraints took place recently in a local Logo workshop that had been following somewhat rigid Logo procedures. One of the participants decided to put smoke in her house. She didn't have enough time to make the smoke by putting together semicircles or other very geometric forms, so she put a little bit of randomness into it.

This set a new style that got to be known in that workshop as "smoky programming" and produced a whole new spirit in that class. It also gave me a whole new set of insights into how Logo is often used in ways that encourage stereotypical sorts of expression—but with just a slightly different twist, it could be used to break away from these hard-edged stereotypes.

Another example of a very different kind of Logo project has been developing at The Computer School in New York, District Three. Somebody asked if you can run as fast as a Sprite, which sparked off quite a discussion. Those of you who have seen a Sprite zooming along at SPEED 120, say, might reflect for a moment. People have very diverse opinions, ranging from: "You can't. Nothing goes as fast as that. It goes as fast as an airplane," to: "Of course you can if you run very fast."

The most interesting thing about this use of Logo was—as usual—not so much the answer, but the process used to obtain it: "How do you know? How will you find out? Let's try and settle it."

Out came the stopwatches—everyone has them in these days of electronic watches—and everyone started trying to time the Sprite's movement. But it's not so easy. Try it yourself. The Sprite is going a little too fast to be able to time it precisely. You have to resort to indirect methods, perhaps making it cross the screen 20 times and timing how long it took.

Why does timing 20 trips work out better than timing one? This puts us immediately into interesting questions about how to make observations and about statistics. We are using Logo as an object of study—in this case the behavior of a Logo object: the Sprite—and we're doing this as scientists, just as biologists study animals and astronomers study stars—so we have to use the same kinds of methods.

In any group struggling with how to time that instant when the fast-moving Sprite has completed 20 trips across the screen, other methods will always crop up sooner or later. "Why don't we slow it down?" somebody will ask. "Why don't we make it go at SPEED 10? Then we can multiply by 12."

"Ah," but someone else might say—"How do you know? Just because that's called '120' and the other one's called '10,' how do you know it goes 12 times as fast?"

"We can do the experiment," another might reply; "we can time both and then compare the two."

But that's a vicious circle, isn't it? How are we going to time the fast one? Our whole problem is that we don't know how to do that. So we ask, "Well, anybody got any ideas?"

Lots of ideas will come out of any group that's been drawn into this. The one pursued here was that we'll start the two at the same place and let one poke along at SPEED 10 and the other zoom ahead at SPEED 120. The faster one will zoom across and wrap around the screen and then overtake the slower one. When it does, we'll stop them both and see how far each has traveled. In other words, we can do a qualitative experiment, comparing the speeds of the two Sprites, and see if it comes out.

Well, try it. Even then it's not so easy to stop them when one is precisely on top of the other. But it *is* easy to write a program that will do this—so you could press a key to center them, press another to set them off, then press another to stop them. Or you could have them stop themselves when one is on top of the other. So you can soon settle the question.[2]

Notice that this use of Logo programming is very different from what is usually done. We wrote a little Logo program here on the fly, as a tool for doing something else. Most of the programs I see are being done as exercises: because somebody said "do this" or "do that" to demonstrate something or prove a point—or as projects: to make something interesting happen.

But here we have something else. This program was written in order to study these objects. It's a utility program, a use of Logo that is now very neglected but which I think will become important.

In the course of a science class interested in projects that involve time,

[2]It turns out that at SPEED 120, the Sprite moves at about the speed of a moderate walk, not quite leisurely but not so very fast either. Its speed *looks* so much faster because the screen is relatively small.

rates, and distances, many such little programs might be written. None of them would be very spectacular as programs, but making and using them in this casual, day-to-day way develops an ease and fluency with programming.

Another question that kindled a lot of excitement in this same school developed into a race among the computers. It started when we asked, "How long would it take you to count to a million? And could you use the computer to help?" Other questions soon arose out of this, such as: "Could the computer do it for you?" and "How long would it take the computer to count to a million?"

A Logo program was quickly written to count down from a million. In this school, there happen to be Ataris, Apples, and IBM PC-Juniors, and all of them were set to racing one another (with smaller differences than one might expect).

In the course of counting to a million, many other side questions came up. One person (who happened to be a teacher) said, "The computer is different from people, because people slow down. You start fast: one-two-three-four-five. But by the time you count up to five hundred and seventy-two thousand six hundred and twenty-nine, you slow down. The computer would do each number at the same speed." But it didn't. It has to slow down for the bigger numbers too, and for very similar reasons.

One aspect of these situations is especially important. When we're programming the computer in order to accomplish some other goal, rather than simply for the sake of learning to program, the computer is part of the culture. And I think this is ultimately a better model of its role in the learning and teaching situation than any other. The essence of teaching, surely, is that you explain something new by referring it to things that a student already knows. The computer presence enables you to have a rich new source, provided that for teacher and student alike, the computer is sufficiently well known and familiar to be a reference.

The idea of a million became far more tangible to the participants in this activity, just by playing with "million" with the computer—and not only with the computer. In the course of this activity, they also played with how long it would take a person to count to a million. Here they used the computer as a tool. If you count one number each second: take a million seconds, divide by 60 makes so many minutes, divide by 60 makes so many hours, divide by 24 makes 14.5 days—which is apparently how long it would take if you didn't have to eat or sleep and could keep up the rate of one number per second.

I'd like to end with another example that comes from a workshop for teachers. One member of this workshop frequently expressed her excitement at learning a new Logo idea or concept by saying, "My kids will love it." One is touched by her concern for her students, but I think there's something very wrong with this.

By focusing on the children and how *they* would feel, the teacher was

depriving herself of what can be most valuable in a Logo experience: the experience of self-learning, of letting yourself become totally engrossed in a personal learning experience, and through that, of recapturing the pleasure and excitement of learning something so naturally, in such an immersed and engrossed way, that you hardly notice that you're learning something. By constantly thinking of the children, she was depriving herself of this.

Her learning was instrumental—it served a purpose other than the experience of learning. And in the end, by being so concerned for the children, perhaps she was depriving them as well, for the most valuable thing she could give them was an attitude and a feeling not so much about Logo as about learning, and surely she couldn't give this without letting herself experience it as well.

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