Down with School! Up with Logoland!

The Children's Machine: Rethinking
School in the Age of the Computer
by Seymour Papert, *Basic Books, New York,
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IN 1956, the mathematician John McCarthy coined the term "artificial intelligence" for a new discipline that was emerging from some of the more imaginative and playful explorations of that new mind-tool, the computer. A few years later he developed a radically new sort of programming language, Lisp, which became the lingua franca of AI. Unlike the sturdier, stodgier computer languages created by and for business and industry, Lisp was remarkably open-ended and freewheeling. Instead of concentrating on numbers, it was designed to take any symbols or strings of symbols (lists) as its objects, and because its own machinery consisted of just such lists (and lists of lists), Lisp creations easily inhabited the very world they acted upon, and hence could reflect upon themselves and their own reflections indefinitely, revising and reinventing themselves, breaking down the artificial barrier between program and data.

Seymour Papert was one of the most playful of the AI pioneers, and more than any of the others, his own reflections turned to the nature of that playfulness and its role in learning and discovery. In 1980, he published *Mindstorms*, in which he presented his Utopian vision of computers in the classroom, of which the centrepiece was Logo, a dialect of Lisp that he and others had developed specifically for very young children.

The key element of his design was Turtle graphics, an inspired interface that made children's interactions with Logo not just visible, but instantly comprehensible— feelable, you might say. The tales he told of those early encounters were compelling. These became an important ingredient in the barrage of persuasive literature that led teachers and schools all over the US, and indeed the world, to invest huge sums in "computerising the classroom". Thousands of teachers tried their hand at Logo

in the classroom, with mixed results.

I was one of them. About ten years ago, I was part of a team that developed and taught an introductory course in computer science aimed at university students who hated and feared computers but whose parents, in many cases, had said "You must learn about computers before you graduate." These students were seasoned veterans of what Papert calls School—experts at

piling on the facts, drilling for the big test— and they were pathologically uncomfortable in any setting where they had to think. (My impression then was that many of them, given a choice between solving a simple puzzle and memorising two pages of the phone book, would gratefully choose the latter project.) I had read Papert's book and discussed its ideas with him at length. Logo was designed for five-year-olds, so it might, I thought, be just right for my university students. In fact, it was spectacularly successful. The students forgot their phobias and inhibitions and took flight, creating a trove of idiosyncratic projects, effortlessly learning the fundamentals of programming, and building a robust base on which we could then help them to construct a more "adult" set of edifices. So I am one of the many who can personally attest that Logo, in the right circumstances, does work wonders.

The right circumstances are hard to come by, alas. In the years since *Mindstorms*, Papert has participated in a host of projects,

large and small, designed to implement his ideas, and has received a wealth of feedback, much of it deeply discouraging. But one can learn even more from "mistakes" than from a string of successes—that is a central tenet of Papert's vision of learning, and he practices what he preaches. So this sequel engagingly recounts what he has learned, and especially the mistakes he made along the way. His own thinking has undergone a transformation; he is still an infectiously optimistic visionary, but a wiser one.

Logo has now joined forces with Lego, the plastic building blocks, and a new wave of delectable settings for learning has been created and explored. Papert favours parables; in these pages you will find no statistical surveys of the effects wrought by Logo-Lego projects and no data on control groups with which to compare the inspiring tales he tells. Indeed, at several points he says that he is quite sure that no test could be counted on to reveal by before-and-after comparison the benefits he has anecdotally conveyed. As you read further you come to realise that this is not a dodge on his part, but a fundamental implication of his message: the sort of testing required by such attempts to measure success destroys the very conditions for learning that the computer, at its best, can create.

There is a recurrent pattern that has bedevilled many—in the end, almost all— attempts to use computers in education; no sooner are the classrooms equipped than the dead hand of educational bureaucracy begins to impose conditions that systematically squander the power the equipment promised to deliver. Of all the teachers who enthusiastically took up the themes of *Mindstorms*, "many felt seduced and abandoned by the talk of a computer revolution as the use of the computer became routinised". Instead of railing at the system or blaming the teachers or administrators, Papert looks at the broader problem, and sees that it springs from deeply held—and of course ill-examined—assumptions about the point of School.

Consider the awkward confrontation you would inevitably create were you to implement one of Papert's fundamental principles of learning: take your time. Learning

happens best when you can browse around in a problem space, savouring the shapes, fiddling with the bits and pieces, twiddling the knobs—but always, always, taking your time. So there you are, noodling away contentedly and constructively when the bell rings, and you have not finished your assignment. Well? What sort of payoff does society want? And how soon? It is always a nagging problem.

Lying behind this and other confrontations is an assumption that Papert calls the Gothic cathedral model of learning. Suppose educating a child were like "building a 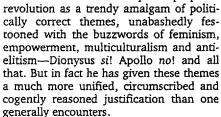Gothic cathedral out of 40 000 blocks of stone. Clearly, strict organisation is needed to perform such a task. One cannot have individual workers deciding that they want to put a block here or there just because they are inspired to do so." Instead of conceding that education must, after all, be a building process conducted under the wisest set of controls we can muster, Papert takes on the task of persuading us that education is not that sort of task at all. We must dare to let go—not always, but as much as we can bear. We must adopt a more "systemic" view of learning as a variegated family of "emergent" phenomena. This is a truly radical idea, which Papert cannily makes more palatable by an analogy. His revolutionary proposals would create a market economy of educational experimentation, in contrast to today's traditional educational hierarchy, which he likens to the Soviet Union's disastrous planned economy: ". . . while our economic system, with all its faults, is above the threshold of functionality and theirs was below it, our education system falls on the same side of the line as the Soviet economy". The timing of Papert's proposal could not be more ticklish: just as the US is finally coming to grips with the spiralling cost and diminishing effectiveness of a health-care system that has been shaped by the pressures of a market economy, he encourages us to make a leap of faith, and trust in the distributed wisdom of many local experiments under minimal control: "The Rigorous Researcher will object to the populist tone of this argument. It is appropriate to buy a food processor or garlic press on the basis of individual whim, but education is more serious. Every child deserves the best. Science should be used to find out what is the best, and then everyone should adopt the proven methods."

Papert has a good retort. What makes the Rigorous Researcher think there is a best way? Herbert Simon, another of the founders of AI, has built his distinguished career around showing the importance of Voltaire's maxim: "The best is the enemy of the good", and Papert would replace the hyper-rationalist quest for the best—which has given us a series of stultifying, straitjacketed systems of education—with a free-roaming, "cybernetic", feedback-guided tracking of the good. Many will be tempted to dismiss Papert's proposed revolution as a trendy amalgam of politically correct themes, unabashedly festooned with the buzzwords of feminism, empowerment, multiculturalism and anti-elitism—Dionysus si! Apollo no! and all that. But in fact he has given these themes a much more unified, circumscribed and cogently reasoned justification than one generally encounters.

And then there are the details. There is just no escape from his shrewd analyses of the crushing obstacles to learning that stand untouched by traditional pedagogy. To my mind, the most important of these analyses are his observations on the crippling taboos against self-exposure. We learn in School to conceal our own ignorance and confusion, and this not only inhibits us from exploring the very moves that would be crowned with success, but saps our self-confidence. With no fund of shared experience of screwing up, we are apt to harbour wildly unrealistic fantasies about the intellectual prowess, the clarity and rigour, of our teachers and peers. This Victorian prudishness about our own cognitive disabilities is built right into the fundamental structure of School, and it spawns a host of secondary effects, all debilitating. There are some wonderfully liberating passages in which Papert, as usual practising what he preaches, describes his own confusions, false starts and insecurities, and then recounts the childlike solutions he discovers. We should all be such children.

I am a believer, but the adult in me says that responsible scepticism has still not been met halfway. Take a few thousand children and feed them a lovingly prepared diet of Logo-Lego, and it is not surprising that you can harvest a few—or even a few hundred—inspiring success stories. What happened to the other children? I don't think anybody knows, at least not in detail. Presumably they were at least not harmed in any way, but were there enough benefits to justify expanding these programmes? When the thrill of pioneering has to be traded in for year-in, year-out practices that can be reliably adopted by thousands of less inspired teachers, will the same wonderful effects be in evidence? Papert is cautiously optimistic, and he suggests that in any case the current systems are so toxic for so many children that we risk little by taking the leap, but he offers no blueprints and no guarantees—it would fly in the face of his radical message to offer either. For the time being he is content to make it clear that there must be feedback if these experiments are to sort themselves out in a desirable direction, but he has little to say about how to design the appropriate feedback mechanisms. We can hope that his next book will have more to say on this important topic.   ☐

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