

**Logo
Philosophy
and
Implementation**

TABLE OF CONTENTS

INTRODUCTION

What is Logo? Who Needs It? <i>by Seymour Papert</i>	IV
---	----

THE COMPUTER IN COSTA RICA:

A New Door to Educational and Social Opportunities <i>by Clotilde Fonseca</i>	2
---	---

THE SAINT PAUL LOGO PROJECT:

An American Experience <i>by Geraldine Kozberg and Michael Tempel</i>	22
--	----

THE RUSSIAN SCHOOL SYSTEM AND THE LOGO APPROACH:

Two Methods Worlds Apart <i>by Sergei Soprunov and Elena Yakovleva</i>	48
---	----

A LOGO POSTCARD FROM ARGENTINA

<i>by Horacio C. Reggini</i>	78
------------------------------------	----

LOGO IN AUSTRALIA:

A Vision of Their Own <i>by Jeff Richardson</i>	96
--	----

THE CONSTRUCTIONIST APPROACH:

The Integration of Computers in Brazilian Public Schools <i>by Maria Elizabeth B. Almeida</i>	106
---	-----

PROJECT LIGHTHOUSE IN THAILAND:

Guiding Pathways to Powerful Learning <i>by David Cavallo</i>	128
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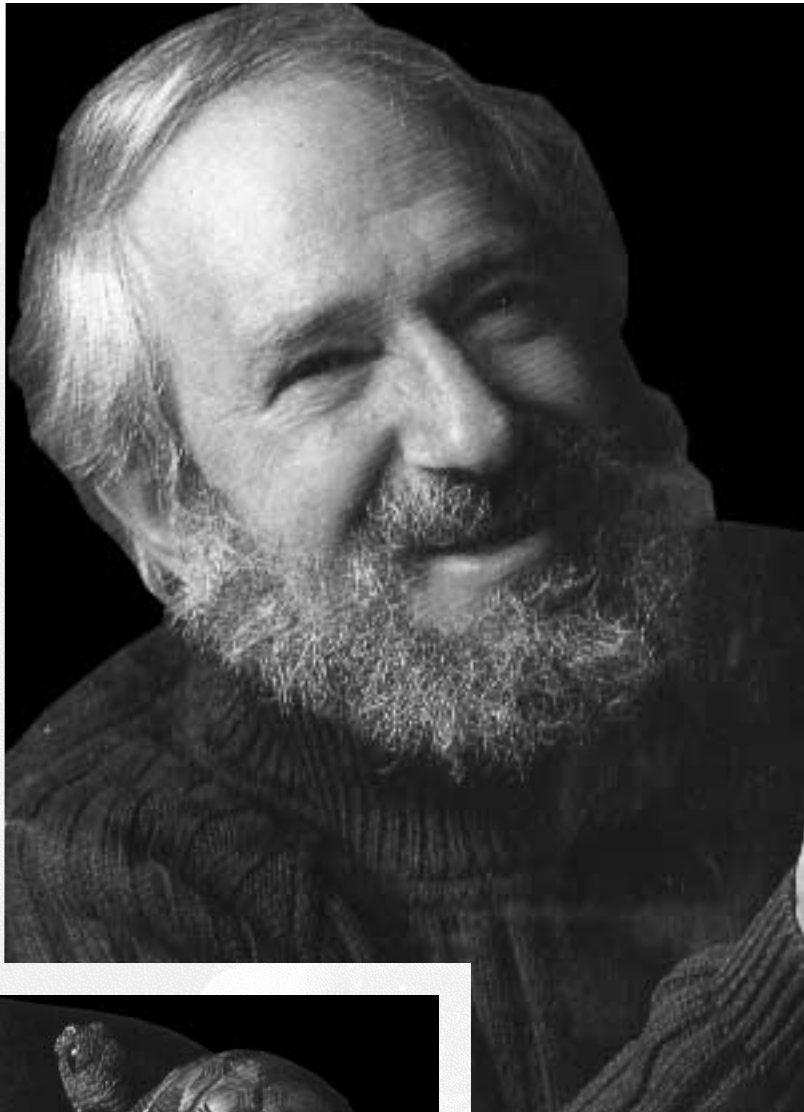
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Introduction: What is Logo? And Who Needs It?

By Seymour Papert

Seymour Papert is currently LEGO Professor of Learning Research and Director of the Epistemology and Learning Group at M.I.T. He contributes actively to LCSI research and development keeping LCSI abreast of innovations in the fields of education and technology.

In 1993, Dr. Papert was given the Lifetime Achievement Award by the Software Publishers Association. He was the sixth individual to be so honored. He has published several books, including *Mindstorms*, *The Children's Machine*, and *The Connected Family*, all acclaimed discussion of computers, children and learning. Dr. Papert's interest with children grew as a result of his work with Jean Piaget in the late 1950's and early 1960's in Switzerland.

The great religious teachers of the world have understood that if you want to communicate a powerful idea you may do better by telling stories than by spinning abstract definitions. In the spirit of their ways I am sure that this book of stories, each of which describes a large scale Logo implementation in a different country, will make a significant contribution towards communicating the powerful idea that is captured for me, as for the authors of its chapters, by the word “Logo.”

Why then does it need an introduction? Don’t the stories suffice in themselves? Sure: the stories would suffice. But the idea that the stories will be enhanced by commentaries is in line with the practices of the religious teachers I take as my model and does not at all contradict the principle that concrete stories are better vehicles for communicating ideas than abstract theorizing. The point is the same as the first of two extensions to the principle of learning by doing: *we learn better by doing ... but we learn better still if we combine our doing with talking and thinking about what we have done.* The chapters of this book are written by people who not only have done something important but who have thought and talked a lot about their actions. What I plan to do in this introduction is just a little more of the talking part.

A good starting point is to ponder what the several projects described in the chapters have in common. What makes them all *Logo projects*?

An easy answer might seem to be that they all use a programming language called “Logo.” They do, but this is not enough to qualify, for when you read the chapters you will see that what is important to the writers is not the programming language as such but a certain spirit of doing things: I (and again I guess all the authors) would see many projects that use Logo as thoroughly counter to the “Logo spirit.” And, in the other direction, I can imagine, though I have seldom seen, computer-based projects comparable in spirit and scope to those described in this

book which use a different programming language. So the question posed becomes, “what is this Logo spirit?” And “why is this spirit so rarely found in computer work without Logo?”

I have myself sometimes slipped into using an answer given by many Logoists in the form of a definition: “Logo is a programming language plus a philosophy of education” and this latter is most often categorized as “constructivism” or “discovery learning.” But while the Logo spirit is certainly consistent with constructivism as understood, for example, by the author of the Brazilian chapter, there is more to it than any traditional meaning of constructivism and indeed more to it than “education.” In fact a feature of this book itself exemplifies an aspect of the something more. As you read it I want you to consider the idea that the right answer to “what is Logo” cannot be “An X plus a Y.” It is something more holistic and the only kind of entity that has the right kind of integrity is a culture and the only way to get to know a culture is by delving into its multiple corners.

The feature of this book that begins to make my point appears in the fact that although the book is published by a company that has a commercial interest in Logo, it nevertheless reports as many examples of difficulties in the implementation of Logo as examples of uncomplicated successes. This acceptance of “negatives” is very characteristic of the Logo spirit: what others might describe as “going wrong” Logoists treat as an opportunity to gain better understanding of what one is trying to do. Logoists reject School’s preoccupation with getting right or wrong answers as nothing short of educational malpractice. Of course rejecting “right” vs. “wrong” does not mean that “anything goes.” Discipline means commitment to the principle that once you start a project you sweat and slave to get it to work and only give up as a very last resort. Life is not about “knowing the right answer” – or at least it should not be – it is about getting things to work! In this sense you will see on reading the chapters that the writers

“practice what they preach” or rather “use practice in place of preaching” and in so doing make the moral of the story stand out more strikingly than any abstract words could possibly do.

The frame of mind behind the Logo culture’s attitude to “getting it to happen” is much more than an “educational” or “pedagogic” principle. It is better described as reflecting a “philosophy of life” than a “philosophy of education.” But insofar as it can be seen as an aspect of education, it is about something far more specific than constructivism in the usual sense of the word. The principle of getting things done, of making things — and of making them work — is important enough, and different enough from any prevalent ideas about education, that it really needs another name. To cover it and a number of related principles (some of which will be mentioned below) I have adapted the word constructionism to refer to everything that has to do with making things and especially to do with learning by *making*, an idea that includes but goes far beyond the idea of learning by *doing*.

I shall return to the idea of constructionism but want to emphasize here what might for educational decision-makers be the most important difference between the “n word” constructionism and the “v word” constructivism. The v-word refers to a theory about how math and science and everything else is learned and a proposal about how they should be taught. The n-word also refers to a general principle of learning and teaching, but it also includes a specific content area that was neglected in traditional schools but which is becoming a crucial knowledge area in the modern world. Choosing constructivism as a basis for teaching traditional subjects is a matter for professional educators to decide. I personally think that the evidence is very strongly in favor of it, but many teachers think otherwise and I respect their views. But the constructionist content area is a different matter. *This is not a decision about pedagogic theory but a decision about what citizens of the future need to know.* In the past most

people left the world only slightly different from how it was when they found it. The rapid and accelerating change that marks our times means that every individual will see bigger changes every few years than previous generations saw in a lifetime. So this is the choice we must make for ourselves, for our children, for our countries and for our planet: acquire the skills needed to participate with understanding in the *construction* of what is new OR be resigned to a life of dependency.

Another way in which the stories in this book go beyond the description “programming language plus constructivism” is captured in the Costa Rican story by a student whose surprise at seeing a teacher learn evokes the exclamation: “Wow, I never knew that teachers have to study.” A crucial aspect of the Logo spirit is fostering situations which the teacher has never seen before and so has to join the students as an authentic co-learner. This is the common constructivist practice of setting up situations in which students are expected to make their own discoveries, but where what they “discover” is something that the teacher already knows and either pretends not to know or exercises self-restraint in not sharing with the students. Neither deception nor restraint is necessary when teacher and student are faced with a real problem that arises naturally in the course of a project. The problem challenges both. Both can give their all.

I like to emphasize this last point by the following analogy. The best way to become a good carpenter is by participating with a good carpenter in the act of carpentering. By analogy the way to become a good learner is by participating with a good learner in an act of learning. In other words, the student should encounter the teacher-as-learner and share the act of learning. But in school this seldom happens since the teacher already knows what is being taught and so cannot authentically be learning. What I see as an essential part of the Logo experience is this relationship of apprenticeship in learning. Logo, both in the sense of its computer system and of its culture of

activities, has been shaped by striving for richness in giving rise to new and unexpected situations that will challenge teachers as much as students.

Doubts about the feasibility of Logo are often expressed by policy-makers who say “but *our* teachers can’t do that.” I always ask: “Why not?” And policy-makers in several dozen countries have told me that it is because their teachers have limited education, are not used to such ideas, are conservative, lazy, dominated by unions... you name it. Several of the stories in this book, notably the St. Paul story, the Thai story, and again the Costa Rican story bear on these beliefs, exposing them to be somewhere between superstitions and cover stories for reluctance to change. The experiences reported in the stories confirm that the skeptical policy-maker is absolutely right but only if “can’t do it” means “can’t do it without getting a chance to learn how.” And they suggest that “getting a chance to learn how” might require far more than is usually offered – a few hours of staff development time under the guidance of a “trainer” from some computer company. But it can be done. In fact one of the more impressive features of this collection is providing insight into how seriously the Logo culture approaches teachers as intellectual agents. The teacher development components of the projects not only give an exceptional level of time and support but also are outstanding in conception and organization. This costs, *but Clotilde Fonseca gives compelling reason to believe that there are very few countries in the world which could not do as well if they had the political will that Costa Rican leaders have brought to bear on education.*

I turn next to something that many readers might perceive as inadequately represented in the stories: the role of the Internet and the World Wide Web. Indeed for many the low-key presence of the “information highway” could give the stories a slight feel of coming from another

epoch. (How quickly we are overtaken by the latest fashions!) In part the perception is correct: because the prominence of the Web is only a few years old and because these stories are selected to show what can be done in more than just a few years, it is inevitable that this component is less present than it would be in a successor volume to this written in five years time. But in part the sense of being old-fashioned offers a salutary correction to an unbalanced focus on connectivity in contemporary thinking about computers and learning. To explain what I mean I draw on some ideas that I developed in the 1998 Colin Cherry Memorial Lecture which you can find in the ConnectedFamily.com web site. (As you see, I might want to redress the balance of attention given to the Web, but I certainly do not neglect its value.)

In that lecture I complained about the harmful effect on popular culture of using the name “information technology” to refer to what would more properly be called “digital technology.” In a very technical sense of “information” everything digital belongs to information theory. But for most people the word “information” has a popular sense of getting something that informs. But most of what computers are used for has nothing to do with information in this ordinary sense. Think of making a spaceship. The task of designing the space shuttle would be too complex for any human mind to manage without computers and, even further from the informational aspect of computing, the control mechanisms to guide it make extensive use of digital chips.

In short I like to recognize – only slightly simplifying a complex issue—two wings of digital technology: the technology as an informational medium and the technology as a constructional medium in which garb it is more like wood and bricks and steel than like printing or television. Of course the two wings are equally important; but popular perception is dominated by the informational wing because that is what people see and ceaselessly hear about

and that is what reflects the predominant role of informational media in their lives.

Now let me turn to education to recognize that this one-sidedness in perception of the technology has produced a deep distortion of how people think about its contribution to education. This has happened because education itself has two wings which also could be called “informational” and “constructional.” Part of learning is getting information which might come from reading a book or listening to a teacher or by visiting sites on the Web. But that is only one part of education. The other part is about doing things, making things, constructing things. However here too there is an imbalance: in large part because of the absence of suitable technologies, the constructional side of learning has lagged in schools, taking a poor second place to the dominant informational side.

In my view, a key to the current trends of discussion about technology and education is an ironic fact about the imbalance between informational and constructional. Whereas the most qualitatively original contribution digital technology could make to education lies in redressing the imbalance, in fact the imbalance is increased by popular perception that so strongly favors the informational sides both of schools and of computers. Educational reform is being seriously held back by this match between an unrecognized dichotomy in digital technology and a generally unrecognized dichotomy in the education system. As a result, although there is a great deal of talk about putting more control in the hands of the students and replacing teaching by facilitating, in fact the image of computers in school becomes one of supporting the traditional role of teaching.

To bring this discussion back to the Logo culture’s view of the teacher, I want to register my horror when I hear talk about how the Web will allow every student to be taught by the “best teacher” in the world. Nothing could be further from our view in which the best teacher in the world

is one who has a close and empathic relationship with students. The primary way that digital technology will help is to provide more opportunity for wonderful teachers to work with wonderful students on projects where they will jointly exercise wonderfully powerful ideas. This view does not in any way put down the value of the Internet. Quite the contrary, it leads to a greater recognition of its power. The true power of both sides – the constructional and the informational sides — of the digital technology comes out when the two are put together. The Web has been criticized – in my view quite rightly – for encouraging the superficial “grasshopper mentality” seen in a lot of surfing. The right response to the criticism is neither to justify nor to ban surfing, but to make it more purposeful by integrating the use of the Internet into constructionist project work. For students engaged in projects, the Web is a highly focused tool for finding relevant material, relevant ideas and even collaborators.

Reference to the very powerful idea of powerful idea brings me back to my promise to add a second extension to the principle of learning by doing. Yes doing is a good way to learn. And it is made better by talking and thinking. But we learn best of all by the special kind of doing that consists of constructing something outside of ourselves: a child building a tower, writing a story, constructing a working robotic device or making a video game are all examples of constructing and the list goes on indefinitely. All these activities have several features in common. They are subject to the test of reality; if they don’t work they are a challenge to understand why and to overcome the obstacles. They can be shown, shared and discussed with other people. But what causes some of them to be specially valued in the Logo culture is their contact with powerful ideas that enables them to serve as transitional objects for the personal appropriation of the ideas.

In this respect, it is Horacio Reggini’s contribution to this book that stands out although others are not far behind. Let me tell an oversimplified historical story to make a

point and introduce two epistemological words. The story is about geometry which began, as the name implies, as the art of measuring the earth. But at the beginning, it was a flat two-dimensional earth, no doubt part of the commerce and management of fields. Geometry became immensely more powerful when it took off into three dimension space. Pyramids could be built and the movements of the stars used for navigating the seas. The effort and interest of such feats of the mind deepened thinking so much that Euclid could bring geometry back to the plane in the spectacular construction of his system of axioms and proofs. But here is a paradox of our educational system: we want children to learn at least some of Euclid but deny them the opportunity to develop the wings of the mind that led geometry to its power. Why would anyone do such a foolish thing?

I think that the answer is really quite obvious: *The culprit is the influence of technology.*

To people who think that “technology” means stuff like computers and airplanes, this will appear absurd. The relevant aspects of the school geometry curriculum were established long before any of those existed. But pencil and paper, and chalk and slate and even sticks to draw in the sand are also technology. As Alan Kay is fond of remarking, most people just don’t call it technology if it existed before they were born. But its harmful results can be just as real. It was that old technology that pulled geometry down to earth, for it is essentially a technology for drawing static figures on flat surfaces. Thereby it contributed to disempowering geometry by taking away its most powerful uses and its most powerful intellectual connections not only with the stars but with the way machines work and flowers and earthquakes and with other powerful ideas. I see Reggini’s wonderful uses of 3D Logo turtles as a valiant attempt to re-empower the disempowered ideas of geometry. Not the only one: another way in which the technology of the pencil disempowers geometry is by confining it to static drawings. Much of

my own current work consists of extending earlier ideas about using turtles to re-empower geometric ideas by breaking the static barrier.

Before making my final point let me review some of the features of the Logo culture that I have mentioned in relation to the chapters of this book.

- The Logo programming language is far from all there is to it and in principle we could imagine using a different language, but programming itself is a key element of this culture.
- So is the assumption that children can program at very young ages.
- And the assumption that children can program implies something much larger: in this culture we believe (correction: *we know*) that children of all ages and from all social backgrounds can do much more than they are believed capable of doing. Just give them the tools and the opportunity.
- Opportunity means more than just “access” to computers. It means an intellectual culture in which individual projects are encouraged and contact with powerful ideas is facilitated.
- Doing that means teachers have a harder job. But we believe that it is a far more interesting and creative job and we have confidence that most teachers will prefer “creative” to “easy.”
- But for teachers to do this job they need the opportunity to learn. This requires time and intellectual support.
- Just as we have confidence that children can do more than people expect from them we have equal confidence in teachers.
- We believe in a constructivist approach to learning.
- But more than that, we have an elaborated constructionist approach not only to learning but to life.
- We believe that there is such a thing as becoming a good learner and therefore that teachers should do a lot of

learning in the presence of the children and in collaboration with them.

- We believe in making learning worth while for use now and not only for banking to use later.
- This requires a lot of hard work (we've been at it for thirty years) to develop a rich collection of projects in which the interests of the individual child can meet the powerful ideas needed to prepare for a life in the twenty-first century.

And even that is not all.

The “we” behind the thirty years of hard works contains the essence of an answer to the question: why are there so few educational projects like the ones represented in this book but based on a different programming tool? The Logo “we” represents a large number of people: well over a hundred books have been devoted to Logo, many more discuss it seriously as part of more general topics, several thousands of teachers have published short papers reporting something they have done with Logo. The real asset of Logo consists of the two necessary conditions for the growth of a culture: community and time.

Looking into the future, I certainly see the likelihood of new and more powerful programming systems. Many have been suggested. But one can be sure that an alternative culture of educational programming will not emerge soon, or ever. Such a process needs time, and all indications are that likely contenders for leadership in any such movement have espoused the central principles of the Logo culture. This claim is not based on an arrogant belief that we the inventors of the Logo philosophy are smarter than everyone else. It is based on the belief that the Logo philosophy was not invented at all, but is the expression of the liberation of learning from the artificial constraints of pre-digital knowledge technologies.

