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how children learn

JOHN HOLT

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PREFACE

How Children Fail described children using their minds badly. This book tries to describe children—in a few cases, adults—using their minds well, learning boldly and effectively. Some of the children described are in school; most are not yet old enough. It is before they get to school that children are likely to do their best learning. Many experts agree that this is so, though they differ about the reason. I believe, and try to show here, that in most situations our minds work best when we use them in a certain way, and that young children tend to learn better than grownups (and better than they themselves will when they are older) because they use their minds in a special way. In short, children have a style of learning that fits their condition, and which they use naturally and well until we train them out of it. We like to say that we send children to school to teach them to think. What we do, all too often, is to teach them to think badly, to give up a natural and powerful way of thinking in favor of a method that does not work well for them and that we rarely use ourselves.

> Worse than that, we convince most of them that, at least in a school setting, or any situation where words or symbols or abstract thought are concerned, they can't think at all. They think of themselves as "stupid" and incapable of learning or understanding anything that is complicated, or hard, or simply new.

What are the results? Only a few children in school ever become good at learning in the way we try to make them learn. Most of them get humiliated, frightened, and discouraged. They use their minds, not to learn, but to get out of doing the things we tell them to do—to make them learn. In the short run, these strategies seem to work. They make it possible for many children to get through their schooling even though they learn very little. But in the long run, these strategies are self-limiting and self-defeating, and destroy both character and intelligence. The children who use such strategies are prevented by them from growing into more than limited versions of the human beings they might have become. This is the real failure that takes place in school; hardly any children escape.

When we better understand the ways, conditions, and spirit in which children do their best learning, and are able to make school into a place where they can use and improve the style of thinking and learning natural to them, we may be able to prevent much of this failure. School may then become a place in which *all* children grow, not just in size, not even in knowledge, but in curiosity, courage, confidence, independence, resourcefulness, resilience, patience, competence, and understanding. To find how best to do this will take us a long time. We may find, in fifty or a hundred years, that all of what we think of as our most up-to-date notions about schools, teaching, and learning are either completely inadequate or outright mistaken. But we will make a big step forward if, by understanding children better, we can undo some of the harm we are now doing.

> All I am saying in this book can be summed up in two words—Trust Children. Nothing could be more simple—or more difficult. Difficult, because to trust children we must trust ourselves—and most of us were taught as children that we could not be trusted. And so we go on treating children as we ourselves were treated, calling this "reality," or saying bitterly, "If I could put up with it, they can too."
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> What we have to do is break this long downward cycle of fear and distrust, and trust children as we ourselves were not trusted. To do this will take a long leap of faith—but great rewards await any of us who will take that leap.
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> Since I wrote this book our schools have with few exceptions moved

steadily and often rapidly in the wrong direction. Schools are on the whole bigger than they used to be, more depersonalized, more threatening, more dangerous. What they try to teach is even more fragmented than it was, what Professor Seymour Papert in *Mindstorms* calls "dissociated," i.e., not connected with anything else, and hence meaningless. Teachers have even less to say than they used to about what they teach and how they teach and test it. The schools cling more and more stubbornly to their mistaken idea that education and teaching are industrial processes, to be designed and planned from above in the minutest detail and then imposed on passive teachers and their even more passive students.

I recall something that at the time seemed less significant than it does now. During the late sixties, at the height of the so-called revolution in education (which in fact never took place), a prominent educator, after spending a few days at a big top-level conference on the future of education, said to me, "Those people weren't the least bit interested in alternative schools or open classrooms or any of that stuff. You know what they were *really* excited about? Something called behavior modification and behavioral objectives." It proved to be so. Fragmented learning became even more so, the weekly test became the daily or hourly or even the fifteen-minute test.

The Back to Basics era is now seven or eight years old, with, so far, mostly bad results. But this only leads the schools to say, "Now we're *really* going back to basics," as if that particular wheel had been invented only the day before yesterday.

In any case, I no longer believe we can make schools into places in which all children grow in the ways described above. An exception might be a few very specific kinds of schools, like schools of the dance, or computer programming, or flying. But on the whole I don't think children with any range of real choices in the world are going to want to spend much time in places where nothing but learning happens, and where the only adults they meet are child specialists whose job it is to watch them and make them do things.

This book is more concerned with describing effective learning than explaining it, or giving a theory about it. In many places people are busy trying to find out what goes on in the brain, electrically, chemically, and otherwise, when we think and learn. Such research is interesting and may prove to be useful, but it has nothing to do with the aims of this book. We do not need to learn more about the brain, as an organ, in order to make schools better. We could make them a great deal better, knowing no more about the brain than most people know right now. Thus it is interesting that people should be finding evidence that experiences are stored in the brain, in the shape of complicated molecules, like file cards stored in a file. What teachers and learners need to know is what we have known for some time: first, that vivid, vital, pleasurable experiences are the easiest to remember, and secondly, that memory works best when unforced, that it is not a mule that can be made to walk by beating it. It is interesting to read Wolfgang Kohler's theory, perhaps now held by many others, that electrical fields are set up in the brain when we perceive, think, and feel. This would certainly account for the fact that we think badly, and even perceive badly, or not at all, when we are anxious and afraid. But we don't need the explanation to know that the fact is a fact, and to learn from it that when we make children afraid we stop their learning dead in its tracks.

This book is more about children than about child psychology. I hope those who read it will come to feel, or feel more than when they opened it, that children are interesting and worth looking at. I hope that when they look they will notice many things they never noticed before, and in these find much food for thought. I want to whet their curiosity and sharpen their vision, even more than to add to their understanding; to make them skeptical of old dogmas, rather than give them new ones.

A friend said to me after reading this book, “I always was very fond of little children, especially my own. But until now I could never have imagined that they might be *interesting*.”

They interest me now even more than when I wrote this book. Watching babies and children explore and make sense of the world around them is for me one of the most exciting things in the world. I have watched them and been with them at many times and places, and I find not just more pleasure but much more food for serious thought in what they say and do than in the sayings and doings of a great many older people. Not to like little children, or find them interesting and enjoy their company, is no crime. But it is surely a great misfortune and a great loss, like having no legs or being deaf or blind.

The human mind, after all, is a mystery, and, in large part, will probably always be so. It takes even the most thoughtful, honest, and introspective person many years to learn even a small part of what goes on in his own mind. How, then, can we be sure about what goes on in the mind of another? Yet many people talk as if we could measure and list the contents of another person’s mind as easily, accurately, and fully as the contents of a suitcase. This is not to say that we ought not to try to understand more about other people’s minds and thoughts, but only that we must be very modest and tentative about what we think we have found out.

There’s an old story about two men on a train. One of them, seeing some naked-looking sheep in a field, said, ‘Those sheep have just been sheared.” The other looked a moment longer, and then said, “They seem to be—on this side.” It is in such a cautious spirit that we should say whatever we have to say about the workings of the mind, and it is in this spirit that I have tried to write, and in which I hope others will read, this book.

LEARNING ABOUT CHILDREN

In the early sixties, when I wrote much of the original *How Children Learn*, few psychologists were paying close attention to the learning of very young children. As a field of research it was not important or well known—or in some places even respectable—precisely the reason why a friend of mine at a major university, who wanted to do a Ph.D. thesis on the work of Piaget, was told by his thesis adviser that he could not do so. And even Piaget himself, except perhaps for his own children, did most of his work with children four or five years old and older. Babies were still seen mostly as blobs, waiting for time to begin to turn them into people worthy of serious attention.

Now all this is changed. The study of very young children, their view of the world, their powers and abilities, and their learning, has become a very important field in psychology. Everyone agrees that we should know much more than we do about young children, and how they perceive the world, and live, grow, and learn within it. The question is, how to do so.

Many think the best way to do this is by doing direct research on the brain itself. Some of this was going on when I wrote the Foreword to this book; much more is going on now. So far, it has still had little effect on schools. Thus, one theory now much in fashion is the right-brain left-brain theory, which holds that for some kinds of thinking we use one side of our brain, while for other kinds we use the other. People who want to change schools try to use the theory as an argument. So far, they have not had much success. Thus, people who, because they liked or believed in art, have tried for years to get more of it in the schools, now say that we need it in order to develop the right side of children's brains. But the people who always wanted art out of the schools are no more impressed by the right-brain argument in its favor than they were by any other. They still want it out. It seems unlikely that in any near future schools will be much changed because of this or any other new theories about the workings of the brain.

For one thing, the theories themselves change faster than we can keep up with them. In a recent issue of *Omni* magazine an article called "Brainstorms" tells us that the still new right-left brain theory has already been disproved and that different kinds of mental activities cannot be precisely located in either one side or the other. The article says, in part:

> Alan Gevins, director of the EEG Systems Laboratory at Langley Porter Neuropsychiatric Institute at the University of California School of Medicine, in San Francisco, says, "What we're doing now is to try to develop a new way of imaging the functional electrical activity of the brain, to see things that couldn't be seen before." Electrical patterns never before seen in such detail have suddenly become coherent schematic designs.... The people at the EEG Systems Lab are now working to perfect their 64-channel EEG scalp recording helmet, which will allow them to carry out even more advanced types of computerized signal processing of the brain's functional electricity.... The long-term results of their line of research could virtually open a door into the brain, admitting its user for the first time to look in on his own "wiring."...
>
> But a few days at the EEG Systems Lab made it obvious to me that, *as in so much of science*, [emphasis added] the lab's new research ... was concerned with a subtle and complex series of experiments that would appear almost as incomprehensible to most of us as a tablet of ancient Sumerian trade regulations.

What happened to the old idea that a central task of science was to make the world

more comprehensible? Back to the lab:

> By careful design of their test conditions, and by using mathematical pattern-recognition analysis, they have charted rapidly changing, complex correlations of electrical patterns, involving many areas of the brain.... This suggests to them that different types of information are not processed in only a few specialized areas of the brain, as has been a theory for decades. Rather, many regions of the brain are involved, even in the most elementary cognitive functions.
>
> In a study of 23 persons, the lab initially confirmed the hypothesis that writing sentences [etc.] ... did indeed seem to be more associated with either the right or the left side of the brain. But by looking closer with the mathematical pattern recognizer, they failed to see any significant differences in electrical activity between the tests in which the participants were writing paragraphs or those in which they were just scribbling.... So they went back and wired up 32 more willing participants.... The researchers saw that hemispheric differences between tasks in the EEG "spectra" disappeared entirely. Instead, they witnessed rather uniform patterns involving many areas of both hemispheres. "This suggested," Gevins states, "that different types of tasks are not processed in a few specialized areas but that many widely dispersed areas of the brain are involved. So it is not correct to say that arithmetic, for example, is located in one place just because damage there results in an inability to add numbers. All you can say is that the damaged area is critical for doing arithmetic."

If I am doubtful of the value of this kind of research, as indeed I am, it is not because in this case I don't agree with its findings. I agree with them very strongly, and would be happy to see them confirmed by later research. From the first the right-left brain theory seemed to make far too simple what my own experience as a mind user told me was not simple at all. There is of course no doubt that we do indeed use our minds in different ways, sometimes a very conscious, directed, linear, analytical, verbal way—as when the car won't start and we try to figure out why—at other times (and perhaps even sometimes at the same time) much more randomly, inclusively (many things at once), intuitively, often sub- or unconsciously. We "hear" sounds, "see" images, experience directly our mental models of reality rather than any verbal or mathematical descriptions of them. We let our minds roam freely, keeping ourselves open to whatever they may tell us.

So far I have no quarrel with the brain theorists. It is even possible that some kinds of mental activity may be largely centered in some parts of the brain, and other kinds in others. But it would be simple-minded and silly to say that all the complicated varieties of thought, of mental experience, can be neatly separated into two kinds and that one of these can be exclusively assigned to the left side of the brain, the other to the right. When I say that I am sometimes surprised by what my mind tells me, I am talking about a very common experience. But where in my brain is the "my mind" who does the telling, where the "me" who is surprised?

The idea used to be that the "me," the conscious observer, was in a kind of upstairs, in the living room maybe, while "the mind" was down somewhere in the (often dark and dirty) basement. Has right-left brain theory merely shifted the old upstairs "me" over to the left brain and the old basement "mind" over to the right? How then do I account for this experience, well known to us all, that a name which I have been consciously and unsuccessfully struggling to remember will suddenly pop into consciousness, the awareness of the "me," while that "me" is thinking about something else? In right-left brain theory, it is the left brain that is supposed to be the maker, keeper, and rememberer of lists. What of the fact that often, while thinking of something else, I will find that "my mind" has suddenly presented "me" with a complete sentence, sometimes even two or three, which "I" like so much that I rush to write them down before I forget them? "I"

have certainly not produced those sentences in the way I am now producing these sentences on the typewriter, thinking about what words to use or where to put them. On which side of my brain is the producer of these sentences, on which side the observer, critic, editor who judges them to be good?

The right-left brain theorists, at least the more modest of them (some are far from modest), might say, "We're not trying to say that every kind of thinking can be clearly assigned to either the left or the right brain, but only that certain kinds of thoughts can. So we give our subjects simple tasks and see where the electrical squiggles turn up." The problem—as I've said for years—is that it is hardly ever possible to separate what we think about something from how we feel about it. It is dangerously simple-minded for any brain researcher (or other psychologist) to suppose that when as part of his experiment he gives us some "simple" task to do we are not thinking about anything except that task. Chances are we are thinking about many other things—why does he want me to do this, am I doing it right, am I being a good subject in this experiment, will he ask me back, what will happen if I do it wrong, will I mess up his data, what is this for, anyway? and so on.

The problem with all such research and researchers is that, even with sixty-four-channel helmets, the data is so crude compared to the activity. The living mind probably processes (to use their way of talking) many hundreds of thousands, perhaps millions of bits of information every second. Making judgments about how the mind or the brain (they're not the same) works on the basis of a few (or even sixty-four) squiggles on a chart is like deciding what lives in the ocean by lowering and then pulling up a five-gallon bucket and seeing what you can find in it. Nor is the situation much improved by using bigger buckets. You won't find out that way. Learning about the mind is a lot more like learning about the ocean than figuring out how to start a car. The only way we will ever learn much about it—and even this will be highly incomplete and uncertain—will be to dive, swim about, and see what we can see in the deep waters of our own thoughts.

There is another very profoundly mistaken assumption in all this research: that from what we can learn about people in a very limited, unusual, and often very anxious situation we can make reliable judgments about what they do in very different and more usual situations.

During the sixties a famous educational psychologist decided to do some research into how children look at things, in what kinds of patterns they scan unfamiliar objects. One of his team designed what they called an "eye camera." While the subjects looked at pictures put before them, the eye camera, only a few inches away, shone a fine beam of light at their eyeballs and took a series of photographs of its reflection. The idea was that these photographs of tiny dots of light would tell the researchers which way the eyes had been pointing from instant to instant. From this the researchers were supposed to be able to figure out the patterns in which the eyes moved as the subjects looked at the test pictures.

Since it was essential that the subjects not move their heads while these photos were being taken, the researchers attached to the subjects' chairs U-shaped bars of flat metal, into which the subjects were supposed to push their heads until the bar clamped them very firmly at the temples. Since they might still move their heads a little up and down, another piece of metal was put before them, the "bite bar." As the subjects pushed their heads as far as they could into the U-shaped clamp, they were also supposed to open their mouths, let the bite bar (covered with cardboard) go in, and then bite down hard on it, so that their heads could not move in any direction.

But, as anyone who knew anything about children could have predicted, more than half of those who were to be the subjects in these experiments were so frightened by the strange look of the apparatus that they would not go near it. Some bolder ones would go so far as to put their heads into the U-shaped clamp, but about half of these could not put the bite bar into their mouths and bite down on it without gagging. Only a small fraction of the children who were brought in to do the experiment could in fact go through with it. The question which naturally follows—and one cannot but wonder about the competence of the researchers who failed to ask it—is, What in the world could one possibly expect to learn about how children normally look at real objects in the real world from an

experiment done under such artificial and threatening circumstances?"

The Scottish psychiatrist R. D. Laing has for years written angrily and eloquently about these kinds of distortions and perversions of the "scientific method," as he has seen them in his own lifetime of training and work in medicine and psychiatry. In a recent book, *The Facts Of Life*, in a chapter called "The Scientific Method and Us," he writes:

> The scientific method is based on tampering with what would be happening if we were doing nothing to it.
>
> *Scientific* interference is the most destructive interference. Only a scientist knows *how* to interfere most destructively.
>
> Love reveals *facts* which, without it, remain undisclosed.
>
> A heartless intellect can do no other than investigate the hell of its own hellish constructions by its own hellish instruments and methods, and to describe, in the language of hell, its own hellish conclusions.

These strong words are well justified by what Laing tell us in this book and others about what modern doctors and psychiatrists actually write, say, and do. He later quotes a leading American psychologist as writing, in what was generally judged an extremely important book:

> Everything we learn of organisms leads us to conclude not merely that they are analogous to machines but that they are machines. Man-made machines are not brains, but brains are a very ill-understood variety of computing machines.

I disagree flatly with that sentence on the face of it. Everything *I* learn of organisms, *including what these people tell me*, leads me to conclude that they are not like machines at all. One famous experiment with rats showed that their behavior changed markedly for the worse in almost every respect when they were crowded into a small space. Other experiments with rats showed that their performance on tasks could be strongly affected by how their human handlers felt about them; rats who had been described to their handlers as smart performed better than *identical* rats described to their handlers as dumb. Do machines get nervous and break down when we put a lot of them in one room? Do they work better if we talk nicely to them? Some might say that we could someday design computers that would do that. I doubt it very much. But even if we could, the fact that we might make certain machines a little more like animals does not prove in the least that organisms are, or even are like, machines.

This notion, now very popular in leading universities, that organisms, including human beings, are nothing but machines, is for me one of the most mistaken, foolish, harmful, and dangerous of all the many bad ideas at large in the world today. If an idea can be evil, this one surely is.

Enough of this corrupted view of science and of human beings. Let us look instead at some good science, specifically the work of the American biologist Millicent Washburn Shinn, whose book *The Biography of a Baby* was published by Houghton Mifflin in 1900, and very briefly put back into print by Arno Press a few years ago. The baby was her niece Ruth, who comes to life so vividly in the book that it is hard to believe that she is not a baby or little child somewhere right now, instead of, if she still lives, a woman in her eighties. About how and why she wrote her book, Millicent Shinn said:

> Most studies of children deal with later childhood, the school years, and these are almost always statistical in their method, taking the individual child very little into account. My own study has been of babyhood, and its method has been biographical, that of watching one baby's development, day by day, and recording it.
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> I am often asked if the results one gets in this way are not misleading, since

each child might differ greatly from others. One must, of course, use great caution in drawing general conclusions from a single child, but in many things all babies are alike, and one learns to perceive pretty well which are the things. Babyhood is mainly taken up with the development of the large, general racial powers; individual differences are less important than in later childhood. And the biographical method of child study has the inestimable advantage of showing the process of evolution going on, the actual unfolding of one stage out of another, and the steps by which the changes come about. No amount of comparative statistics could give this. If I should find out that a thousand babies learned to stand at an average age of forty-six weeks and two days, I should not know as much that is important about standing, as a stage in human progress, as I should after watching a single baby carefully through the whole process of achieving balance on his little soles.

Perhaps I should say a word here as to the way in which I came to make a baby biography, for I am often asked how one should go to work at it. It was not done in my case for any scientific purpose, for I did not feel competent to make observations of scientific value. But I had for years desired an opportunity to see the wonderful unfolding of human powers out of the limp helplessness of the newborn baby; to watch this fascinating drama of evolution daily, minutely, and with an effort to understand as far as I could, for my own pleasure and information....

There is one question that I have been asked a hundred times about baby biography: “Doesn’t it do the children some harm? Doesn’t it make them nervous? Doesn’t it make them self-conscious?” At first this seemed to me an odd misapprehension—as if people supposed observing children meant doing something to them. But I have no doubt it could be so foolishly managed as to harm the child. There are thousands of parents who tell anecdotes about children before their faces every day in the year, and if such a parent turns child student it is hard to say what he may not do in the way of dissecting a child’s mind openly, questioning the little one about himself, and experimenting with his thoughts and feelings. *But such observing is as worthless scientifically as it is bad for the child: the whole value of an observation is gone as soon as the phenomena observed lose simplicity and spontaneity* [emphasis added]. It should be unnecessary to say that no competent observer tampers with the child in any way....If I sit by the window and catch with my pencil my niece’s prattle as she plays about below—and if [she] afterward turns out spoiled, the mischief must be credited to some other agency than the silent notebook.

In 1980 there was published a book which Millicent Shinn would have rejoiced to read, as I have—*Gnys at Wrk*, by Glenda Bissex (Cambridge: Harvard University Press, 1980). At the start of the Preface, she writes:

This is an account of one child learning to read and write, from the beginning of literacy at age five up to age eleven.

When I began taking notes about my infant son’s development, I did not know I was gathering “data” for “research"; I was a mother with a propensity for writing things down. Because of my experience in Courtney Casden’s Child Language course at Harvard, I was particularly interested in my son’s language development; and as an English teacher just retrained in reading, I wanted to observe his learning to read. When Paul started spelling, I was amazed and fascinated. Only somewhat later did I learn of Charles Read’s research on children’s invented spelling. Excited by his work, I started seeing my notes as “data.” ...

What I hope this study offers, rather than generalizations to be “applied” to

the important question of whether intelligence, as we understand it in people, *can* be ascribed to a machine,

> we should not be surprised to find them as confused and stubborn as men in their convictions about mind-matter, consciousness, free will, and the like. For all such questions are pointed at explaining the complicated interactions between parts of the self-model. A man's or a machine's strength of conviction about such things tells us nothing about the man or about the machine except what it tells us about his model of himself.

What is most terrible and terrifying about this cool, detached, witty voice—for Minsky is clearly not only brilliant but interesting and amusing—is the contempt it expresses for the deepest feelings we humans have about ourselves. His argument is a perfect example of what Laing, in *The Politics of Experience*, called "the invalidation of experience." In the words quoted above Minsky tells us that our strongest and most vivid experiences of ourselves are not real and not true, and tell us nothing about ourselves and others except our own delusions, and that in any case he and his colleagues will soon make machines that will "feel about themselves" exactly as we do. His message could be summed up, You cannot learn anything about yourself from your own experience, but must believe whatever we experts tell you.

In *The Facts of Life* Laing quotes a distraught woman as asking the head of her philosophy department, "If I do not feel I exist, why should I not kill myself?" By "exist" she meant, of course, exist as something *other and more than* a machine. Her question was dismissed as trivial. But it is the farthest thing in the world from trivial. If we do not feel that we exist and that our existence is somehow important, why indeed should we not kill ourselves—and everyone else, and all unborn generations as well—which we seem to be getting ready to do.

To return for the last time to the article about brain research, there is a photograph in it of one of the subjects, a seated woman, wearing a scalp recording helmet; behind her, adjusting it, a white-coated scientist; in the foreground, another scientist, taking notes. The subject is bathed in a red light, the note-taking scientist in a blue one. The effect is frightening, like a scene from a horror science-fiction movie. To this the lab people might protest, "Oh, come on, now, we don't actually work under those red and blue lights. The magazine just threw them in to make an exciting picture." Sure, fine. But why did the magazine want such a picture? And since it is false, a lie, why did the lab people allow it? Because it makes science look like a powerful and forbidding mystery, not for the likes of you and me. Because it tells us that only people with expensive and incomprehensible machines can discover the truth, about human beings or anything else, and that we must believe whatever they tell us. Because it turns science from an activity to be done into a commodity to be bought. Because it prevents ordinary human beings from being the scientists, the askers of questions and seekers and makers of answers that we naturally and rightfully are, and makes us instead into science consumers and science worshipers.

This may not seem to have much to do with children and how they learn, and how we may learn how they learn. But in fact it has everything in the world to do with it. It is only in the presence of loving, respectful, trusting adults like Millicent Shinn or Glenda Bissex that children will learn all they are capable of learning, or reveal to us what they are learning. The tinkerers, dissectors, and manipulators will only drive children into artificial behavior, if not actual deception, evasion, and retreat. It is not so much a matter of technique as of spirit. The difference between fond and delighted parents playing "This Little Piggy Went to Market" with their laughing baby's toes and two anxious home-based would-be clinicians giving "tactile stimulation" to those same toes, so that the child will one day be smarter than other children and thus get into the best colleges, may not on the face of it seem to be very much. But in fact it is the difference between night and day. Of two ways of looking at children now growing in fashion—seeing them as monsters of evil who must be beaten into submission, or as little two-legged walking computers whom

we can program into geniuses, it is hard to know which is worse, and will do more harm. I write this book to oppose them both.

GAMES & EXPERIMENTS

August 9, 1960

I am sitting on a friend's terrace. Close by is Lisa, sixteen months old, a bright and bold child. She has invented a very varied pseudo-speech which she uses all the time. Some sounds she says over and over again, as if she meant something by them. She likes to touch and handle things, and is surprisingly dexterous; she can fit screws and similar small objects into the holes meant for them. Can it be that little children are less clumsy than we have always supposed?

One of Lisa's favorite games is to take my ball point pen out of my pocket, take the top off, and then put it on again. This takes some skill. She never tires of the game; if she sees me with the pen in my pocket, she lets me know right away that she wants it. There is no putting her off. She is stubborn, and if I pretend—which is a lie—not to know what she wants, she makes a scene. The trick, when I know I will need to use my pen, is to have an extra one hidden in a pocket.

The other day she was playing on the piano, hitting out more or less at random with both hands, pleased to be working the machine, and making such an interesting noise. Curious to see whether she would imitate me, I bounced up and down the keyboard with my index finger. She watched, then did the same.

August 11, 1960

Yesterday I had the portable electric typewriter on the terrace. The older children were looking at it and using it. Lisa was busy eating an ice cream cone and, for a while at least, was not interested. When the cone was gone, however, she came to see what the others were doing, and soon asked, by sounds and signs, to be picked up and given a chance. So I sat her on my lap in front of the machine. Having seen me poke at the keys, one finger at a time, she did the same, and seemed pleased by what happened—something flew through the air and made a sharp click, and there was a general impression of activity and motion, and mysterious things going on inside the machine, things that she was making happen.

Now and then she would hit more than one key at a time, and keys would get stuck. I would then turn off the machine and straighten them out. After seeing me turn the rotary On-Off switch a few times, she tried to turn it herself, but her fingers weren't strong enough. When this happened, she reached down, took my right hand, brought it up to the switch, and made me work it. Soon we had a good game going. I would turn off the typewriter; she would try for a while to turn it back on; then she would take my hand and make me do it.

She also liked the carriage-return lever. Each time I returned the carriage for a new line, she would take hold of the lever and give it one more push. Only rarely did she get excited and begin to slam and bang on the keys. Once she showed me that she wanted me to put the typewriter on the ground. I did so, but soon saw that this was a mistake; she wanted to climb on and even into it, to see what was really going on inside. After a bit of an argument and tussle I got it back up on the table. We were busy with all this for about forty minutes. Perhaps the attention span of infants is not as short as we think.

Today, with her elder brother more or less in charge, Lisa was in more of a banging mood, and often slapped the keyboard with her hands. Each time she did this, we turned the machine off and carefully unscrambled the stuck keys. Since this slowed up the action,

I thought it might in time show her that it was not a good idea to slap the keyboard. But it was also interesting for her to watch us unstick the keys. After this had happened a number of times, I suggested to her brother that next time she piled the keys up we turn off the machine and just wait to see what she would do. We did so. She poked a key or two, but nothing happened. Then, seeming to notice that the machine was not making its usual busy hum, she reached up herself and pulled back the stuck keys.

Something else happened here that I forgot to write about at the time. I spoke of turning off the machine when Lisa jammed the keys. In order to do this I had to stand close to the typewriter, to be able to reach the On-Off switch. But Lisa did not like me hovering over her as she worked, and I did not like it either—I wanted her to be free to give all her attention to the machine. I solved this particular problem by plugging the typewriter into a long extension cord that had an On-Off switch in it. With this I could stand well behind Lisa, completely out of her sight, yet still turn off the machine instantly whenever the keys jammed. Then I would come forward, free up the keys, and then turn the machine back on.

But Lisa was not fooled by this arrangement for very long. For a while she may have been willing to take it as a mysterious coincidence that when the keys jammed the machine went off. But it didn't take her very long to figure out that / must have something to do with the machine stopping when the keys jammed, and going on again when they were free. Before very long, every time I turned off the machine—I should add that my On-Off switch was very quiet—she would turn around and look at me with a puzzled expression. I kept up the illusion that I had nothing to do with the machine going off; that is, I did not show her the extension cord switch. If I had it to do again I think I would have shown her the switch, though that too had its risks—she was a very fierce and stubborn little child, and might have become angry with me for turning the machine on and off. As I have since learned very well, little children strongly dislike being given more help than they ask I for.

It amuses me now to read how astonished I was then to realize how intelligent small children were, how patient, skillful, and resourceful, how thoroughly capable of doing many things that experts assured us they could not do. It is not news any more that babies are smart; sometimes it seems as if half the psychologists in the country are bending over babies' cribs and "discovering" there what loving and observant mothers have always known. But in 1960 this was private knowledge, not public.

July 24, 1961

This morning Lisa bent down to pick up a balloon, and as she did a puff of wind coming through the door blew the balloon across the floor. She watched it go. When it stopped, she moved close to it, and blew at it, as if to make it go farther. This surprised me. Can such young children make a connection between the ability of the wind to move objects, and their own ability to move them by blowing on them? Apparently they can.

This seems to me a good example of the kind of abstract thinking that many people tell us children cannot do until they are at least nine or ten.

One game almost all babies seem to like is to have you blow across their hands or fingers, moving your head from side to side so that the airstream moves back and forth. They smile; then after a while they begin to investigate where this mysterious stuff is coming from, and try to poke a finger into your mouth. They find it interesting that you can get a similar effect by fanning them with a fan, or piece of cardboard.

Later, Lisa walked round and round the balloon, singing, more or less, her own version of "Ring-around-a-rosie." As she sang it, she began to change it, until before long it had become an entirely different song. Much of what she says, sings, and does is like this; it starts out as one thing and gradually turns into another. A musician might call it variations on a theme.

Many other little children I have known love to tell endless stories and sing endless songs. Sometimes the song is about what they did or would like to do. A mother told me that her four-year-old boy, whose seven-year-old sister was in school, began one day, alone in his room, to chant a song about, "I wish I had a sister, who didn't have to go to school, and would do everything I say...." Often the song is nonsensical, words and nonsense syllables; sometimes sense and nonsense are mixed. Many children like to play a game with a grownup in which each takes turns adding something to the song. It is not as easy as it sounds. Trying to make up words and music at the same time is a strain on the imagination, and what comes out is usually no better than what the child does, and, as a rule, very much like it.

These are good games, and we might do well to encourage them, pay attention to them, take part in them, both at home and in school.

Children first going to school do a lot of singing, to be sure; but they all sing the same songs, taught and led by the teacher, and the aim is to get them "right," not to make up something new. Some children like this and get good at it; for others, it just becomes one more of those things that you have to do in school—compulsory fun, as so much of early school is. Many of these children become non-singers, a needless waste. The work of Carl Orff and others who have used his method of instruction suggests that when children are given many opportunities to improvise, to make up their own chants, rhythms, and tunes, their musical and verbal growth can be very rapid.

> I have since come to feel very strongly, partly from my experience in music and my own work on the cello (about which I wrote in *Never Too Late*) partly from the little I know of music history, that improvisation lies at the very heart of all music making and should be a central part of every kind of music instruction. Much of my own time on the cello I spend improvising in different ways, and if I were teaching cello or any kind of instrument to children or adults, I would urge them to spend some of their time doing the same: either trying to play by ear tunes they know, or thinking up tunes in their mind and trying to play them, or simply moving their hands around the fingerboards or keyboards, with no conscious plan, just hearing whatever notes come out.
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> In other words, there can be varying amounts of conscious control in improvising. At one extreme, we try to make our muscles play the tunes, other people's or our own, that we hear in our minds. At the other, we let our hands move on their own, and listen to and think about what they bring to us. It is when our muscles, hands, and fingers can improvise with the least conscious control that we are most truly improvising and have the most natural and effortless control of our instruments.
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> Little children do this when they are singing their charming endless made-up songs. They are not first hearing a tune in their minds and then trying to sing it. They are simply singing, and letting whatever comes out, come out. We ought to encourage them in this, and do more of it ourselves.

July 25, 1961

Cries from the living room announce a new collision between Lisa and the institution of private property. She is interested in everything she sees, wants to examine it, handle it, test it, take it apart if she can. Naturally, she has no sense of what is valuable, or fragile, or dangerous. Having seen me plug in the electric typewriter, she was eager to plug it in herself, and fiercely resented being told that she was not to fool around with electric

began to play soccer, and I think without knowing that he did it, made this same kind of explosive noise with his mouth every time he kicked the ball. It may be worth noting that he was not very big or athletic, and could not kick the ball very hard; had he been able to, he would not have needed the explosion-noise.

For all her fierceness, pride, and stubborn independence, Lisa is at heart kind and obliging. One game she likes to play is the "you-can't" game. Sometimes it begins with me outside the screen door, she inside. She says, "Can't come in." I begin to pull gently on the door. She pulls as hard as she can from the other side. After a while, as if exhausted, I let go, and the door shuts with a small bang. She gives me a triumphant look, and again says, "You can't come in." Again I try the door, again she resists, until I let the door shut again. This may happen five or six times. But always, at the end, she lets me in, saying very sweetly, "Come in, John."

The other morning, hearing her talking to her sister, I went into their room. She gave me a flirty look and said, "Go away." "Why?" I asked. She said, "Because." "Because what?" She said, "You have to." "But I don't want to." She said, "You need to," this being even more emphatic than having to. I said again that I didn't want to. Then an odd thing happened. She said, "You can't." She had slipped into a pattern of answers that she ordinarily uses in different circumstances. At about this time I left the room. A moment later I came back, and the game began again. This time, after we had played a few times, she said, "Don't go way." Children don't mind letting us adults win the game, as long as we let them score a few points. But so many of us, like some football coaches, seem never to be content with merely winning; we have to run up the big score.

August 2, 1961

The other day we went to Carlsbad Caverns, a strange and beautiful place. To get there, we rode many hours in the car. On the way, we played games. The radio was on, and with Lisa watching, I began to clap my hands in time to the music. She did the same. Then I began to clap one palm against the other fist. She watched a while, then made both her hands into fists, clapped together a bit, looked again, saw this wasn't right, and soon did what I was doing. From this grew a whole series of games. I clapped hand against head; so did she. I clapped hand against stomach; so did she. I made my games more complicated. I clapped head with one hand and stomach with another; or clapped head with one hand while holding that elbow with the other, and so on. It was most interesting to see how she copied what I was doing. Each time she began by doing something fairly quickly. As she did it, she checked what she was doing against what I was doing. Then she made a change in what she was doing, checked again, and so went on until she was satisfied that what we were both doing was the same. Watching her do this, I was struck by two things. First, she did not feel that she had to get everything right before she started to do anything. She was willing—no, more than willing, eager—to begin by doing *something*, and then think about fixing it up. Secondly, she was not satisfied with incorrect imitations, but kept on looking and comparing until she was satisfied that she was correct—which she almost always was.

An older child, playing this game, might well play it differently, and in doing so, get his imitation right the first time. He could do his imitating in his mind, checking to see whether he had it right before doing it with his body. Or, he could put my action into words, and then suit his action to the words. But very small children, at least this one, do not seem to work that way, can't carry out an act in their imagination and correct it there. They have to imitate, compare, and correct, all at the concrete or physical level, and continue until they get it right.

In one way—one of many, in fact—Lisa is strikingly different from the unsuccessful ten-year-olds I have known in school. She wants to get things right, and will stick at them until she does; they just want to get things over with and out of the way. Very young children seem to have what could be called an Instinct of Workmanship. We tend not to

see it, because they are unskillful and their materials crude. But watch the loving care with which a little child smooths off a sand cake, or pats and shapes a mud pie. They want to make it as well as they can, not to please someone else but to satisfy themselves.

August 3, 1961

Watching Lisa, I am reminded often of Bill Hull's story about the first-grader who burst into tears upon hearing that the word "once" was spelled O-N-C-E. What puzzles me is why six-year-olds should be so much more bothered by this kind of confusion and paradox than this baby. She hears things all day long that make no sense, but she doesn't appear to mind. She lives and moves in uncertainty as naturally and easily as a fish moves in water. When, and why, do children begin to crave certainty?

Children don't seem to be born fearful. Oh, there are a few things they seem to fear instinctively—loud noises and loss of support—though there are many babies who love to be tossed into the air and caught, or otherwise tumbled about. It looks very much as if children catch most of their fears from their elders.

Lisa, for example, never used to be afraid of bugs. When she saw any kind of crawling or flying thing, she wanted to pick it up and look at it. One day a twelve-year-old friend of her older sister came to visit. Lisa was in the room with the two older girls, when the visitor saw a spider in a corner. She began to scream hysterically, and kept on until they got her out of the room and killed the spider. Since then, Lisa has been afraid of all bugs —flies, moths, worms, anything. She has learned her lesson. She doesn't scream or carry on, only draws away from them and doesn't want to have anything to do with them. A part of her curiosity about the world and her trust in it has been shut off. Who can tell when it will turn on again?

Most of the fear that children catch is of a more subtle kind. They catch it bit by bit, in very small doses. The other day Lisa was playing with the electric portable typewriter. She can turn it on and off, and can work the carriage return. While typing away, she suddenly got the urge to bring both hands down on the keys. A bunch of keys flew up and stuck. She leaned over the keyboard to pull them back. I feared that as she tried to get the keys back she might touch a key on the keyboard, which would make another key come up and give her fingers a sharp rap. Also, I feared that in tugging back the keys she might bend some of them out of line. So I showed her again how to turn the machine off, and then carefully untangled the stuck keys.

> By now we have portable electric typewriters with ball-type elements. With these there is no danger of stuck keys, though an exploring child might damage the ball if she tugged at it too hard, or get a painful rap if she got a finger under the ball and then touched a key. Such typewriters are fairly expensive, but several families might pool their money to buy one, sharing it among themselves. Typewriters with what are called daisy-wheel printers would be even better—but these are even more expensive. Best of all, as Seymour Papert points out in *Mindstorms*, are the word processors on which people can actually edit their own writing (as I am doing now), but these are the most expensive of all—though here, as in many things having to do with electronics, prices seem to be coming down. Anyway, better to save up or pool money and spend it on a few good tools than waste it on closets full of junky toys.

Lisa did an interesting bit of exploration. On each side of the keyboard there is a shift key, and on the left side a shift lock. She saw that when you push the shift key down, it comes back up, but when you push the shift lock down, it stays down, and the shift key with it. Then the problem is how to get them back up. Tugging does no good. After a while she found that if she pushed the shift key down it unlocked the shift lock, and both keys came up. Then she looked for a key on the right side that would do the same thing.

The margin release did nothing that she could observe, and the tabulator key, much to her surprise, made the whole carriage slide over, and rang the bell into the bargain. After some more experimenting, she soon had the whole shift key and lock system figured out.

All this time I was standing to one side, about ten feet away. I wanted to see what she was doing; also I wanted to be able to shut the machine off if she should bang on all the keys again, or do anything else that might hurt her or the machine. I felt that I was watchful rather than anxious, but she must have sensed some quality of anxiety in my watchfulness, for as she worked with the machine she kept doing something she had never done when she was younger—looking up at me with an expression on her face that clearly seemed to ask, "Is this all right?"

Children, particularly little ones, are very sensitive to emotion. They not only catch everything we feel, they blow it up to larger-than-life size. Lisa begins to cry if any of her older brothers or sisters seem to be having a serious argument or fight. Even when they roughhouse in fun, she tries to pull them apart, pleading, "Stop! Stop!" Often, in other families, I have seen children unhappy for a long time because of an argument between their parents, which the parents had done their best to conceal. It need not even be parents. Once I was visiting some friends, whose children I knew very well and was very fond of. The mother and I got into an argument about politics. While the argument was warm, it was not unfriendly; we are generally on the same side of the fence. But even as much warmth as there was in the argument was too much for the children. They began to circle around and move in, in a conciliatory fashion, as if by giving us something else to think about they might take our minds off the quarrel, and get everything cheerful and happy again.

It is simply not true, or at least not always true, that little children have no empathy, cannot feel what others feel. They are, no doubt, often cruel to each other; but if they are near another child who is badly hurt or very unhappy, they soon become very distressed. It is a very rare child who is capable of the kind of sustained, deliberate cruelty so often shown by adults.

Often their cruelty may be experimental. Once I saw two two-year-old boys playing side by side on the floor. They were pushing cars and trucks around, and having a pleasant time. At one point one of them picked up the fairly heavy metal truck he was playing with, and looked at the other with a speculative expression. I had a faint hunch that something bad was about to happen, but I didn't feel I could say anything, because the child's father, my host, whom I did not know well, was watching with me, and said nothing. But sure enough, in a moment or so the little boy with the truck, looking very calm, picked it up and smacked the other boy in the head with it. The other little boy looked up amazed, and then burst into roars of pain and dismay. The first little boy looked at him, puzzled, and increasingly distressed (though his father for some reason made no move to punish or reprove him). All these roars and tears seemed to be more results than he had bargained for. He did not cry himself, but he was clearly frightened and unhappy.

One of my earliest recollections—actually by now I remember the telling of it rather than the event itself—was of playing in the park with a friend my own age—about three, perhaps four—who out of a clear blue sky hit me in the head with his toy shovel. We had been playing peacefully; I never understood, then or later, why he hit me. Perhaps it was this same overpowering urge to see what would happen.

August 4, 1961

Lisa remembers and likes to use phrases that carry some emotional weight. Within the past few weeks I have heard her say, for the first time, "No fair!" "I'm making a mess!" "Don't make me mad!" and "Quit it!" All of these are said at times of stress and excitement. When she finds herself in such situations, such phrases come naturally.

Her talk and games are connected. The other day, as we were riding to town in the car, she in back, I in front, I turned around to look at her. She looked mischievously at me,

then said, firmly, “Turn around.” I had never heard her say it before. I turned around. A moment later, I looked back at her again. She said, “Turn around,” and the game began. It went on for some time.

Sometimes the game is reversed. The other morning she told me to watch her, and began to walk round and round one of the living room chairs, her eye on me. I guessed that she wanted me to say something about what she was doing, so I did. Either the guess was right, or she was just as pleased with it as with whatever she might have wanted. She went on doing, first this, then that, all the while watching me and listening to what I was saying. Indeed, quite often it seems that, just as she says things to see what people will do, she does things to hear what people will say.

August 6, 1961

Not long ago Lisa was patting my cheek, I forget why. I puffed the cheek full of air, and waited. It was a tempting target. She gave it a light slap, and I let the air burst forth from between my lips with a satisfactory noise. She was delighted, and asked me to do it again. Soon the whole family was playing this game with her. After a while, she invited us to play the game in reverse. She puffed out her already chubby cheek, but when we patted it there wasn’t enough air pent up to make any sound. But this didn’t seem to bother her; she enjoyed the game anyway.

For some time she has enjoyed games in which she imitated her elders. Now she is beginning to invent games in which we are supposed to imitate her. Like so many good games, this one began by accident. She was making a face, which she likes to do, when she caught my eye. With nothing in mind, I imitated the face. She made a different face. I imitated that one. Right away she saw that I was going to try to do whatever she did, and away we went.

Another time, her older brothers were playing, on the living room floor, a game called leg-wrestling. After watching this a while, she insisted on being allowed to play. We did some mock leg-wrestles with her, sometimes pulling her over, sometimes making it look as if she had pulled us over—accompanied by many grunts and groans. Soon she began doing various stunts, which she asked us to copy, flopping down on her knees, turning round and round on hands and knees, looking backward between her legs (a favorite with all little children), and so on. One morning she led me on a little walk through the pine woods that surround the house. Sometimes she ran, sometimes she walked, sometimes she kicked one foot in the air as she walked. All the while she watched me to see if I was imitating, and imitating properly.

> Since that time much has been said and written about autistic children, children who seem to have withdrawn into a private world of their own, who don’t have or want any contact with the outside world at all. Arguments rage about how best to treat them. The conventional wisdom still seems to be that for severely autistic children not much can be done; they can perhaps be trained to take physical care of themselves and meet minimal social requirements, but not much else. But there have been some astonishing “cures.” Barry Kaufman, in his book *Son Rise*, describes one that he and his wife effected with their apparently hopelessly autistic little boy. The point I want to make here is that they began their cure, and first began to establish some faint communication with their terribly withdrawn child, by making a point, for hours at a time if need be, *of imitating everything he did*. This was the door or path by which they led him or persuaded him to come back into the everyday world.
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> No one can ever know exactly why this cure worked. But it *feels* right to me. If I felt that the world was so unpredictable and threatening and myself so powerless that I could not risk myself in that world, but had to make a tiny,