frightened by maternal teaching because in any showdown mother's way will win.

The human race, of course, does not remain two years old. Even in the generational act of handing on, there is design to the process. Spoken and written words have to protect the tradition from internal atrophy and external attack. We do not "hand on tradition"; rather, tradition is the handing on; we hand on whatever we can hand on of life. For the process to be humanly rich, we need to put our minds and mouths to giving shape and form to whatever it is we are trying to hand on.

Chapter 3

Teaching by Design

The first appropriate thing for a chapter with this title is to indicate its design. I explore in this chapter the way that human beings teach by design. The phrase has a double meaning. To teach by design can refer to a conscious human intention in contrast to the unintentional, or at least indirect, way to teach described in the previous chapter. To teach by design can also refer to the design or designs that the teacher uses. The person who sets out to teach someone something inevitably attempts to impose some design. What the teacher discovers in this attempt is that every human design is a redesign. The best that a teacher can do is work with student and environment to improve the present design.

My design in this chapter is to present some relevant distinctions of language that will help to deal with such ethically questionable phrases as "impose some design." I will cite some authors and the metaphors they use for describing what a person does who wishes to help others by teaching them. I try to provide examples, some brief and others extended, of people who teach others by design and what some of the designs are.

The material I have to work with in this chapter, and throughout the book, is words. I design, or rather redesign, language in the hope of evoking within the reader images and understanding. Words are fragile material for the design of meaning. When Wittgenstein chose examples of the design of meaning, he often turned for help to architectural blueprints or Western movies. This chapter does not have accompanying blueprints or videotape, but such referents are needed if my sentence designs are to convey the process of teaching by design.

In the previous chapter, I described teaching-learning as a single process. I did not prove that to be the case; I assumed the language of such a description in order to have a richer context in which to explore teaching. The value of such an assumption still has to be shown.
the movement of the teacher's mouth and the learning of a student is, at best, tenuous.

Even the best of teachers cannot fill this gap. Indeed, the best teachers do not try to fill the gap; they know when to stop. The insecure teacher wishes to be certain that his or her efforts produce results. "I will teach this; you will learn this; and we will leave no room for error, daydreaming, or surprise." Few things in life are sadder to watch than a well-intentioned, hard-working, totally dedicated "teacher" who does not have a glimmer of the paradox that the teacher's effort is not what brings about the student's learning.

This principle, which both Wittgenstein and Aquinas maintain, is part of a "mystical" strand in their thinking. And it is connected to a central strand in Eastern religion, which both exalts the place of "teacher" and simultaneously warns any would-be teacher to be humble in trying to play the part. That is what "mystical" means here: a recognition of mystery in the midst of the most common, everyday activities. The paradox of trying to be a teacher does not apply only to classroom instructors or religious gurus. Every human being is regularly in the position of trying to be a teacher, while a big obstacle to being a teacher is the "trying to be."

Modern treatises on teaching often pick up on part of this paradox but they usually collapse the tension. Carl Rogers writes, "When I try to teach, as I do sometimes, I am appalled by the results, which seem a little more than inconsequential, because sometimes the teaching appears to succeed. When this happens I find that the results are damaging." His solution, a typical one, is to abandon the term "teaching." He argues that since the "outcomes of teaching are either unimportant or hurtful," we should stop trying to teach; "I am only interested in being a learner."

I have suggested an alternative understanding of "to teach." The position that I advocate is: Find out what is teaching in a particular situation and then direct one's attention to redesigning these forces. What is the difference between these two positions? The abandonment of the term "teaching" leaves us with "learning" alone, usually meaning the reduction of educational discussions to psychological categories. In contrast, insisting on the relation of teach-learn presses us to attend to the relation of organism and environment, and to the political, economic, and institutional forces that influence the structure of teach-learn.

In Eastern religious literature the paradox is sometimes pushed too
much in the opposite direction; learning collapses into teaching. Psychological theories of learning would be a helpful restraint to placing all the attention on the teaching end. Similar to what was said of learning, if the issue is only looked at from the teaching side, the political, economic, and institutional contexts tend to fade.

In this traditional literature, the individual human teacher is both exalted and humbled without enough attention being paid to other forms of teaching. The guru's words may be self-deprecating, but the format of teaching is nonetheless a (male) guru giving out words. In the next chapter, I have some positive things to say about this kind of teaching, but it desperately needs a context in which women and men teach, and the design is both verbal and nonverbal.

The paradox in the guru/disciple relation is that the learner is encouraged to trust, to identify with, to practically become the teacher. For his part, the teacher is supposed to want nothing from the student—not even that he or she learn. When Trungpa Rinpoche is asked how a person can have the ultimate experience of “no-self,” he responds, “It could only come about through admiration for one’s teacher. You have to become one with the teacher and mix your mind with the teacher’s mind.” The outsider can see here a situation ripe for exploitation. What if the teacher is power-hungry or sexually disturbed? The answer to that query is: He is not a real teacher. True enough, which raises a further question of how the real teachers are discovered and “licensed” to teach.

In Western educational systems, we generally have a series of bureaucratic controls to weed out the bad prospects for (school)teacher. We do not expend as much effort in trying to find the best teachers, those who might find it difficult to work within the limits of our educational designs. Traditional religions of the East relied on an apprentice system and on the test of time to identify true teachers. No one has a statistical study concerning the success of such a system. From reading and personal experience, I would say that the most striking quality of these “real” teachers is an ironic sense of humor. The guru has disciples solemnly trying to mix their minds with the teacher, but the guru has a playful twinkle in his eye. Imitate me, if you must, but I am not really the teacher at all.

With this description, we come around again to Socrates, who surely believed in teaching but did not think he possessed the wisdom to be a teacher. That disclaimer may raise suspicions. When famous, successful, and powerful people say that they really don’t have much power, we suspect fraud. If they do not manifest some sense of ironic humor, we have reason to suspect that the delicate paradox of teacher/teaching is not being maintained.

Take, for example, the writings of Krishnamurti, a well-known guru of this century. He was relentless in his attacks on teachers. Teachers are not to be trusted; they are power-hungry and egotistical, seeking only to control their disciples. What Krishnamurti may have conveyed in person I do not know, but his books are long, humorless sermons that can only call attention to his opinions, while attacking dependency on all (other) teachers.

The best of educational reformers through the centuries did not reject teaching, even though they have been severe critics of teachers and the systems around these teachers. The test of educational reform is to offer a redesign of the process of teach-learn, in which the potential teacher finds a better way to work within the process. Such a redesign takes patience, skill, and cooperation with others. The last of these qualities may be the most difficult for many reformers. If he or she is trying to radically reform education, he or she has to teach other teachers how this new process works.

Design and Good Teachers

Take four examples of modern reformers who have struggled with teaching by design. The examples are from Russia, Italy, New Zealand, and Brazil: Leo Tolstoy, Maria Montessori, Sylvia Ashton-Warner, and Paulo Freire. Each of them expresses great ambivalence about “teachers” while being fascinated with teaching.

Leo Tolstoy is probably the most impatient of this group. Tolstoy did many things in life; writing War and Peace was no doubt more important than any theory of teaching he devised. However, he did get intensely interested in school reform for a short period of his life. He founded his own experimental school and tried his hand at teaching children. He is still regularly quoted by reformers inclined to remove restrictions on the child’s learning.

In the small body of educational writing that he left, Tolstoy says extremely radical things. For example, he writes, “There is only one criteria of pedagogy — freedom.” More important, however, he attends
with a novelist's eye to the details of adult-child interaction. He writes with a sophistication that includes knowledge of several European languages but also with an appreciation of Russian peasant simplicity.

Tolstoy was not so naive as to think that there is no design to what teachers should do with students. But he was truly shocked when he discovered that the children are sometimes the teachers. A passage from "Should We Teach Children or They Teach Us?" describing work with one child, captures the theme of Tolstoy's discovery:

As soon as I gave him complete freedom and stopped teaching him, he wrote a poetical work which had no equal in Russian literature. And therefore it is my conviction that we must not teach writing and composition in particular, to children in general and to peasant children especially. All that we can do is to teach them how to set about composition.

The last sentence is surprising, a seeming reversal of what precedes. As soon as Tolstoy "stopped teaching him," the child produced a work unequalled in Russian literature (perhaps some poetic license in that judgment). He goes on to generalize that "we must not teach writing and composition," artistic composition being the worst subject and peasant children the worst group to be violated with teaching. And yet, in the end, Tolstoy says we must teach: "Teach them how to set about composition." His distinction between "teach composition" and "teach how to set about composition" invites further reflection, which Tolstoy does not offer. We will have to engage the distinction later in asking how a teacher might design, or rather redesign, a student's composition.

A second famous educational reformer came from a period just after Tolstoy and is cited by many of the same people who cite him. Maria Montessori stayed with the work of changing education. Her reforms continue to exist in a large network of schools and, less successfully, in her educational writing. Like Tolstoy, Montessori appeals to a kind of peasant simplicity, especially among women. At the same time, there is need for exquisite design of the environment.

Montessori developed a method, the control of which, after Montessori's death, has led to some strong infighting. Is this a true Montessori school with a real Montessori teacher? But why cannot anyone, having read Montessori's books, set up his or her own school on the same principles? The method, it is argued by Montessorians, cannot be conveyed through the written word. The master of the method must show teachers how to design the environment and work with the design.

The success of Montessori schools in the United States might have surprised Montessori. She was skeptical of "teachers," by which she usually meant professional schoolteachers. She often contrasted the Italian peasant women who were receptive to her method and the professionally trained teachers in the United States who knew too much of the wrong thing:

In America experiments never succeeded because they looked for the best teachers, and a good teacher meant one who has studied all the things that do not help the child, and was full of ideas which were opposed to the child's freedom. The imposition of the teacher on the child can only hinder him.

Montessori writes with irony here; that is obvious enough but it still raises troubling questions. "The good teacher" or "the best teachers" are obviously not people opposed to the child's freedom. But if a good teacher is one who has "studied all the things that do not help the child," should a teacher simply stop studying? Should she be a bad teacher? In other words, does one abandon the terms "teacher" and "teaching" or study all the ways we might better describe the relation of teaching-learning?

The third example is a woman who is associated with Maria Montessori in educational writing but who had a different approach to classroom design and who wrote in a different style. Sylvia Ashton-Warner was a New Zealander who taught Maori children. One of her best-known books is a novel; the central character describes her successes and failures teaching in "the infant room." There is more emphasis on speech than in Montessori, who concentrates on physical design until the "explosion of literacy." Ashton-Warner's teacher keeps probing for the most emotionally charged words (which she discovers in her situation to be "ghost" and "kiss") that will lead to the sound of "erupting creativity."

The meaning of "teacher" remains puzzling for the woman called teacher. The word does not take on the negative connotations it often has in the hands of other reformers. Ashton-Warner's teacher treasures the vocation but is constantly puzzled as to how one is to carry out the vocation. She looks for a "light enough touch" so that "the teacher
is at last with the stream and not against it; the stream of children's inescapable creativeness.\textsuperscript{12}

She constantly goes back to the world "locked inside." Like Tolstoy and Montessori, she wishes to avoid "plastering on." The ultimate trust is in the children's creativity. Nevertheless, the term that is never far from her lips is "design." She looks at the volcanic eruptions of her infant room and sees: "What wonderful movement and mood. What lovely behavior of silksack clouds! An organic design. A growing, loving, changing design. The normal and healthful design. Unsentimental and merciless and shockingly beautiful."\textsuperscript{13}

Paulo Freire, a contemporary educator who worked mainly in Brazil, provides a grown-up version of the three previous pictures. Most of Freire's work was in adult literacy. The basis of the work is similar to the other three theorists: trust in the simple, peasant-like qualities of the learners and unleash their creative possibilities through careful design of the environment. Like Ashton-Warner, Freire sought out the most powerful (political as well as emotional) words for the particular group. Like Montessori, he found an explosion of literacy once that power center had been located.

As do the previous three writers, Freire had a certain ambivalence about "teachers." In the adult-education document referred to in chapter 1, the author says of Freire's work, "This identification is to be brought about by a free dialogue between a coordinator (obviously the designation 'teacher' is inappropriate) and a group designed to unravel the social significance of key words germane to the learners' everyday lives."\textsuperscript{14} The parenthetical reference to the inappropriateness of "teacher" is not at all obvious in Freire's writing. Instead, Freire speaks of the need to create a teacher-student and student-teacher.\textsuperscript{15} Like Socrates or Tolstoy, Freire attacked one idea of teacher, but he was intent on the precise design of a teaching-learning situation. A term such as "coordinator" may sometimes be useful but it is not a substitute for the teacher who designs.

Freire has been an inspiring genius of educational revolution. Probably his best-known distinction is between "banking" and "dialogue" forms of education.\textsuperscript{16} The contrast expresses a stark choice in repressive situations. Unfortunately, the contrast is easily turned into a cliché in cultures where talk is "free" and dialogue about "problem solving" is comfortably acceptable. "Dialogue" is one of the ultimate terms for a fully human life and for the best education. But it needs plenty of support in physical forms of teaching (human and nonhuman) and several forms of discourse that the term "dialogue" does not capture.

Dialogue can suggest an equality that is usually lacking in the teaching situation. The teacher (who is also a student) is not the same as the student (who is also a teacher) and cannot pretend to be. Equality of power may be what teaching leads toward but it is not where teaching starts. The one who is playing teacher has the responsibility for designing the environment to make dialogue more possible. Freire knows the paradox: the learner identifying with the teacher's learning; the teacher acting to break the link of dependence on the teacher.

The four great reformers cited here had a sense of the gap between the teacher's intention and the student's learning. The recognition that the teacher can neither take credit for success nor be burdened with guilt by failure can have opposite effects. Either the teacher is liberated to do the best that he or she knows, without having to worry about the results. Or else the teacher becomes depressed, lazy, and in search of a new job. What is the point of working hard if there is no connection between my movements and the learning that results? There is no simple answer to this question, which has to be pondered by all teachers, not just schoolteachers.

A Governing Metaphor for Teaching

The teacher cannot fill the gap between his or her intent to teach and the learning that occurs in the student. In the most physical kinds of teaching, the gap may seem indiscernible. Teacher and learner succeed together or fail together in riding a bike, swimming, tying a knot, or catching a ball. The teacher "lays on hands" and the teaching seems to flow from body to body.

Although I have insisted that these cases of teach-learn are fruitful for understanding all teaching, I think that the wrong lesson is often drawn from them. The act of physically shaping the material can be taken too literally. True, words can be shaped just as bodies are shaped. But as the teacher's words take on more importance in teaching, one has to be careful of what one attempts to shape with the words. The mind of the student cannot be shaped in the way that the child's hand can be physically shaped in teaching him or her to catch a ball.

The term "to shape" can be helpful to discussions of teaching. From
Comenius and Locke down to B. F. Skinner, this metaphor of shaping has had a privileged position. The most common images embodying "to shape" have been the shaping of water, wax, or slate. When crudely used, the image implies that the mind of the child is completely pliable material on which knowledge can be stamped or written. Skinner often uses "shape up," which conveys the most direct behavioral control of the student. Pigeons and people are shaped up to behave. 17

Most writers on education have allowed some give-and-take with the image of shape. For example, in George Dennison's Lives of Children, a book celebrating the freedom of the child, the author writes, "The work of the teacher is like that of the artist; it is the shaping of something that is 'given.'" That statement could be taken as Skinnerian except that Dennison adds, "And no serious artist would say in advance that he knows what will be given." 18 The implication here is that the lives of the children may have some similarity to wax or water, but human life is a much more complicated material to work in. The lives of even very young children already have a complex design woven into their histories and their makeup. All attempts to shape human life are reshappenings of past achievements.

When the learner willingly presents his or her body for reshaping, no moral dilemma is evident. For example, a 40-year-old man goes into a health center and says, "I want to shape up by losing twenty pounds and getting rid of this flab around the middle." The shaping up is a matter of learning some exercise techniques, discipline, and dietary helps. The man is shown how to live according to better standards of health, and after a while he can go on as he has been taught; he is now the teacher of himself.

When a 14-year-old boy presents himself in a classroom, he is not saying: my mind lacks certain items or qualities; shape up my mind. Two very important differences from the man in the gym have to be noted. First, the child's freedom is always in question. James Herndon said that the only thing you can be sure of when you see a child in a classroom is that he or she prefers that to jail. The statement exaggerates somewhat; most of the time one can presume a little more. If New York City has 100,000 truants each day and two truant officers, the child is not likely to be worried about going to jail for truancy; the 20,000 spaces in the city jails have prior reservations.

Coming to school for most children does express some degree of interest in learning something. Whether the child really wishes to learn anything being taught in the classrooms is another question. Even without compulsory school-attendance laws, the child is under considerable pressure to be at school (family, friends, the lack of a decent job, playing football).

Adults also experience social pressures on their freedom, but usually the person attending an adult-education class feels a greater sense of choice than do millions of young people in school. Even in the universities of the United States this is the case. Fifty years ago, the one in ten persons who attended college usually experienced it as a privilege rather than as a restraint of liberty. But the young person in college today cannot be assumed to be there by a completely free exercise of choice.

A second and more important difference between youngsters in school and the man in the gym is that classroom teaching is directed to the mind. One cannot easily take the image of shaping up the stomach muscles and transfer it to shaping up a mind. Even if a person were to say that he or she wished to have the mind shaped, the image would still be of doubtful validity. Does anyone know how to shape another's mind? Some people fear that such a process is possible and that, for example, advertisers are using devious techniques to shape peoples' minds. Further out in that direction are "religious cults" that are thought to be able to stamp beliefs on the mind.

Most acts of intended teaching exist somewhere between the man saying, "Tone the muscle," and the teenage captive of a cult saying, "Take my mind." That is, human teaching involves an embodied mind, a self-conscious organism. As a result, the shaping up of behavior involves mental awareness, response, and a willingness to go with the teaching. If the man really wants to change the shape of his mid-section, he will have to change his mental attitude. Conversely, the most highly rational learning involves external bodily movement. Drill, training, and discipline will be either preconditions or integral elements of intellectual accomplishments.

The shaping, therefore, is usually directed to the whole organism. For a human learner, the shaping is of the human organism in relation to its environment. This relation already has a shape so that one can only proceed by reshaping what is given. The reshaping is within the strict limits of the already shaped material at hand. A dance teacher has to work with a particular body in a particular setting. The foot of the ballet dancer, the shoe she is wearing, and the surface on which she is dancing constitute a complex relation. With teaching and constant
practice, the relation can be changed, though the change can only be within strict limits.

The title of this chapter goes a step beyond the image of shaping. With the term “design,” it attempts to capture both the express intent of the human teacher and the material limits of what can be taught. Design, I wish to suggest, is more precise in image than shape. Personal factors in the environment shape the landscape and the living organism, including the human body. A hard rain or a blistering sun may reshape the landscape; factors such as diet, cramped conditions, stress, or accident may change the human shape.

All of these factors shape the conditions of teaching. But change by design implies a concerted attempt of a human teacher with a human learner to work with given shapes. The dance teacher does have to work with the foot, the shoe, and the floor; but there is also the choreography of the dance. The violin teacher has to work with arm, chin, fingers, and musical instrument; but the design of the music incorporates and goes beyond those elements.

The metaphor of design and redesign is therefore more helpful for my purposes than is the metaphor of shaping. Whereas shaping has usually suggested an object that is worked upon, design and redesign have to do with an activity. The potential learner is doing something; to teach is to change what is being done.

The beginning point for teaching by design is a human in action. The action may be poorly designed for the purpose it has or it may be adequate. But practically always, an activity can be done better. The teacher by design studies the present design and proposes a redesign. Teachers are sometimes attacked with the cynical statement that “those who can, do; those who can’t, teach.” There is a profound truth hidden under the cynicism: A good teacher need not be able to practice the design; what he or she needs to do is understand a redesign.

For example, in baseball the best hitters are seldom good hitting instructors. A player, who is among the best hitters in the world, inevitably has a slump. The coach, who never hit well but has studied the design of the batter in batting, says, “You are turning your left shoulder a split second too early.” The batter tries the new stance and finds out whether it feels right. People who are very good at what they do are usually not averse to learning how to do it better.

Notice the sequence here; it is not teacher gives, student receives. The pattern is student acts, teacher studies design, teacher proposes redesign, student acts differently. This sequence can be repeated indefinitely. The proposed redesign may not fit this student in this place at this time. The student may be skeptical — probably should be skeptical — that the redesign will work. However, if it has a reasonable chance to succeed, the only way to proceed is to try it out.

All teaching-learning is by doing. What exactly is done varies according to the kind of learning at issue. The doing does not always involve a lot of bodily movement, but human action on the part of the learner is the condition of the learning. I quoted Aristotle in the first chapter that there is only one activity in teaching and it is in the learner. Across the whole range of human learning, Aristotle sees a continuity of principle: “Men become builders by building and lyre players by playing the lyre; so too we become just by doing just acts, and brave by doing brave acts.” How this principle applies to forms of teaching in which speech predominates will be discussed in the chapters that follow. The intimation of a solution lies here in instances where speech still functions as choreographing the body.

We learn to build by building, starting with the blocks in the infant crib. Later, the child may construct a house from pieces of plaster bought in a store or from branches of a tree for a secret tree house. There is design to such activities; it may be conveyed by instructions for store-bought houses or by a friend’s advice on building tree houses. If the toy or machine comes with printed “instructions,” the teaching is very limited. If a living teacher provides “instruction,” then the teaching still has a precise aim but there is opportunity for more redesign.

The term “instruction” has a central place in the history of teaching. Its directedness worries those who are concerned for the freedom of the learner. However, simply sliding away from clarity, precision, and directedness is not the way to liberation. Those who wish to learn need instruction; if the instruction is precisely directed at the elements of the skill involved, no limitation of freedom is implied. A vague choreography is not the way to teach dance; a musical score that does not indicate each part’s notes is not the way to teach music.

As someone masters a skill, he or she will find ways to go beyond the instruction or to work variations within the instruction. Instruction, nevertheless, remains a highly directive act; not “What would you like to do here?” but “Turn at this spot,” or “That’s an F sharp.” Teaching is not equivalent to instruction. As described in chapter 2, many cases of “show how” by human and nonhuman teachers are wordless. Later, we
will discuss uses of speech in teaching that are not bodily instruction; but even in these cases there is instruction of another kind.

The one who commands, "Do it now," has to be trusted. This relation of trust is a precondition of the act of teaching rather than an element of the teaching act itself. At the moment of instruction, there is often no time to think. Do I trust this person? Within a context of trust, the learner can concentrate on following the instructions in careful detail. 

The teacher's concentration is on speaking clearly and simply, with the instruction directed to that precise point at which the design of the situation becomes a redesign.

I asserted in chapter 2 that learning is the proof that teaching has occurred. The teaching-learning continuum does not require speech. However, human learning nearly always includes instructive moments; bodily instruction is where human learners are closest to nonhuman learners ("sit...now bark...good dog"). Instruction within a rich human context is not demeaning; the choreographed instruction for the body will lead into other uses of speech. With young children, crisp, clear instruction is a necessity. Even though the commands to a two-year-old sound similar to animal training ("sit...watch out...good boy"); they have their meaning within a context of human dialogue.

Take the case of a child learning to walk. Who teaches the child to do that? A plausible starting answer is that the entire human race does so. Walking on two legs is an extraordinary act; as every nonhuman animal knows, it is not quite natural, and the human's lower back often agrees with the other animals. A newborn child comes to this strange activity because other humans have designed the environment that way. If you wish to run with the humans you have to learn to walk.

Most parents have a vivid memory of the exact moment when the infant's ontogeny recapitulated thousands of years of human phylogeny; that is, the child took a first step. A physically safe atmosphere was guaranteed by a trusted parent and perhaps an encouraging entourage. The infant, who had been crawling and who has now stood with the aid of furniture, lets go. The only adult instruction may be, "Come to Mommy." Along with the design of outstretched arms, the words can be a bridge between the fear of falling and the accomplishment of walking. After the child has fallen a few times, a teacher may be able to give it a little more physical/oral instruction. Before there can be that redesign, the child has to get up and walk according to the design it responds to, a design that evolution and millions of human choices have prepared for today's child.

The appropriate design of this chapter is to finish with some extended examples. I will offer three of my own, but I first call attention to one of the best descriptions of teaching by design, found in an essay entitled, "Skiing as a Model of Instruction." The authors break down the complex act of skiing into "microworlds," by which they mean a task that can be performed successfully as a simple version of the whole activity. They identify three elements of a microworld that can be manipulated by the teacher: equipment, physical setting, and task specification.

The teaching of skiing has dramatically improved in recent decades as these elements have been recognized and manipulated. For example, short skis and safety bindings give the novice skier a better chance of succeeding. The instructor has to choose snow conditions that are appropriate for each stage of learning. A downhill slope that feeds into an uphill path helps the beginner to learn how to stop. And the skiing coach has to be precise in specifying the action. The authors distinguish between "executable" commands and just "observable" commands. The teacher has to know exactly what to command as action. It is useless to tell beginners, "Shift your weight," if they do not yet know where their weight is.

I think that the authors' description of teaching a person to ski is an invaluable piece of writing. And they are interested in generalizing from the example to other examples of teaching. They develop a theory of "increasingly complex microworlds" in which the learner faces difficult challenges but also experiences success. In my examples that follow I start with experiences that are more universal and less complex than skiing. Despite the increased popularity of skiing, it will probably never be encountered by most people. And I am not interested in developing a technical vocabulary in these examples, but instead keeping the description as close as possible to ordinary speech.

These descriptions have to be somewhat extended to convey the flavor of the details. The design exists only with detail. Each example has its own unique constellation of detail and requires a separate description. But as a line of T. S. Eliot has it, "Each case is unique; and similar to the others." Each act of teaching requires attention to all the details of the situation. It is in the particularity of human situations that we best glimpse a universal human condition.
The description of teaching by design should include crucial details but not all details. When we watch a great athlete, musician, carpenter, or painter at work, and we ask, "How do you do that?" we are asking for instructional detail. The accomplished person who says, "I don't know, I have never thought about explaining it," is of little help as a teacher. In contrast, what Donald Schön calls a "reflective practitioner" is able to pick out some crucial steps. We get impatient with the explanation because we know that there is much more. However, Schön warns us that we would not be able to absorb an exhaustive explanation of the process. So perhaps the teacher is providing more than we think he or she is doing in a sketched-out design.²¹

The three examples I have chosen are teaching a person to swim, to cook, and to use a computer. Each of these examples involves bodily movement in a context of human response. The instructive element is clear in each case, the physical movement becoming a lesser element in the learning as we go from example 1 to example 3.

To highlight the instructional element, I will describe teaching an adult. Children can be and are taught these three things. In the case of the child, the teaching-learning may be so smooth and effortless that the elements of teach-learn are difficult to pick out. With adults, there is likely to have developed an obstacle to the learning. A design is already fixed; the teacher’s design to teach requires a careful redesign.

I cited Aristotle as saying that the way to learn walking, talking, or virtue is to grow up in a walking, talking, or virtuous community. We are not amazed that children who grow up in a Greek-speaking community speak Greek; children who grow up in a Russian community learn to speak Russian. Similarly, the way to swim is to grow up in a swimming community; the way to cook is to grow up in a cooking community; the way to learn computing is to grow up in a computing community.

In the first two cases, to swim and to cook, that is just the way most people learn. However, a sizable number of adults have not learned these skills in that way. They are good cases for examining "to teach:" to show someone how to do something. The third case is even more clearly designed for case study, namely, a generation of grown-ups for whom computers did not exist when they were children, but who now live in a computerized world.

1. Teaching someone to swim. Swimming is a natural movement, at least as natural as walking. An infant who is introduced to a body of water early in life will take to it like a fish. The water does most of the teaching, the arms and legs responding to the water's design. The child does need a little instruction on breathing because a child, in fact, is not a fish. Human beings with the proper equipment can outdo fish at some of their own games. The humans' nature is art; they construct such things as motorboats. However, some humans who can move across the water faster than fish can have never learned to swim.

Millions of people grow up to adulthood without learning to swim. Given the near omnipresence of water, it seems likely that most of these people have a block to swimming. The fear of water is a cause of their not swimming while, in turn, the absence of the skill results in still more fear. For most adult nonswimmers, there is a clear design in the relation of their bodies to ocean, lake, or pool. When circumstances bring them into contact, the design is a lot of thrashing about without efficiency or satisfaction. Watching an experienced swimmer teaches nothing, except frustration.

How does a teacher teach an adult nonswimmer to swim? The first step is to reduce (not likely eliminate) the feeling of threat by some careful choices: the location of the water, the absence of spectators, the shallow depth of the water, the relaxed attitude of the teacher. The learning is a fairly simple set of physical exercises, most of which can be found in a book. The learner will never get that far without experiencing some beginning success and getting some feel for the whole process. That is what an effective teacher on the scene has to make possible and convey.

The nonswimming adult is puzzled at the phenomenon of floating. Such an individual, fearful of sinking, will lift his or her head to be sure of not sinking, which is a sure prescription for sinking. The teacher has to say, "Tilt your head back" and "Relax." Often when we tell someone to relax, it has the opposite effect; the person tenses up in an effort to relax. The nonswimming adult has never once relaxed in the water. One command to do so will not work, though the presence of a trusted teacher and the customing of oneself to an all-water environment can over time bring the beginning of relaxation. When that point is reached, then floating on one’s back or moving under water produces a moment of victory. A voice will come up out of the center of one’s being and say: the water is not the enemy. From that point, instead of fighting the water, one starts to learn from the water and how it interacts with the body.²⁴
After running the learner through a sequence of drills, the teacher's job becomes one of watching the design and suggesting redesign. The action is all in the learner; the learning is all in the practice. Small things will be discovered in the doing; they may be small, but relevant to this learner they can be crucial. Two people do not have the same arm movement, kick, or breathing. A good teacher spots some of these particularities and proposes adjustments. The learner is the final judge of whether any redesign is effective.

2. Teaching someone to cook. The act of cooking is perhaps as universal as the act of swimming. Anyone growing up to adulthood, one might expect, would learn to cook reasonably well. One learns to cook by growing up in a cooking community; that seems to apply to just about everyone. Cooking does move us a step beyond our animal capacity to swim. Cooking is a specifically human art that is unknown among other animals.

If a person gets to adulthood without learning even the rudiments of cooking, some kind of block must have developed early in life. Like the nonswimmer shying from water, the noncook shies from the kitchen as a place of fear and intimidation. In this case, the block to learning has been reinforced by a cultural assumption. At least until recently, much of the culture conveyed the impression to little boys that they need not cook because someone will cook for them. The culture has shifted rapidly on the point. The present generation of adult men may be an unusual case study in learning to cook. Men who were told a few decades ago that women do the cooking for men now find that this principle is under attack and, in many situations, does not hold. Tens of millions of men are ill-nourished because they do not cook, and eventually Roy Rogers and Wendy's blur into a boring chore.

As with the nonswimmer, much of the attention has to be directed to overcoming the initial block to cooking. Once the fear is dispelled, then learning to cook is largely a matter of following a few simple directions. If you can read, you can cook. But a lot of people cannot in fact read a cookbook because they have not been initiated into that language. For that initiation, one usually needs a trusted friend or family member who shows the learner exactly what to do, and temporarily acts as translator of the cookbook.

I have said that the attempt to teach by design always leads to a redesign of an existing relation between human organism and environment. Similar to the nonswimmer, the noncook may try to avoid the scene of the mysterious power, but he or she still has some kind of thrashing-about relation to cooking. The person may not recognize any existing relation; however, the usual strength to build on is the ability to recognize a well-cooked meal. The person who can do that much is already on the way. In addition, nearly everyone has experiences, at least from childhood, of licking a spoon, watching someone prepare ingredients, or having to scrub a pan.

The person intimidated by the thought of cooking needs to experience some immediate success, like the nonswimmer learning to float. Few people have the talent and the staying power to become great cooks; but everyone has the ability and should get the help to treat food with the appreciative preparation it deserves. For the learner of cooking, someone has to say, "Do this, do this, do this," and the result is a success.

The trick here, as usual, is to contemplate the whole pattern of potential cook, uncooked food, and particular situation. Reducing the threat level is crucial, perhaps by the baring of spectators; that prepares the way for direct commands. Artists of the kitchen, like other artists, are sometimes poor teachers because they cannot state the design in sufficient detail — or are impatient when asked to articulate it. The very good cook may inspire a desire to learn but it is often an inexpert cook who has the feel of what it is like to be bewildered by recipe language and confused by the stove.

The expert cook is liable to end an instruction by saying, "Add a small amount of tomato paste, a dash of thyme and some parboiled noodles. Make sure the oven is hot. Bake it until it looks done." The not-so-expert cook, who understands teaching, might end the same instruction, "Add a tablespoon (the big one) of tomato paste (the small can, not the sauce) and add a half teaspoon (the little one) of thyme (the small box on the spice shelf); add a cup of noodles that you have put in boiling water for five minutes; bake the mixture (that is, put it in the oven) with the temperature dial turned to 350 degrees; take it out after 45 minutes."

The trust between teacher and student will indicate whether these points, and others even more basic, would seem either helpful or condescending. In any case, every question ought to be askable by the learner without feeling stupid. A cardinal rule of teaching-learning is that no question asked in good faith is a stupid question. Once a basic confidence has been gained, the learner does much of the teaching, filling in
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some simple and effective drills that have to be practiced. However, one first needs entrance.

The steps parallel the other two cases, starting with a trusted friend who is often not a computer expert, but someone who knows how to do it and knows how to break the learning into manageable parts. The environment has to be one that reduces the threat level; no spectators, please. Every question has to be askable, even the most naive. The teacher has to show how, by providing a few crisp, clear commands of what to do first, second, third. How computers work is material for another time, a distraction for the person who wants to learn to use the machine.

The beginner wants to know what to do after putting in the plug. The teacher has to say, “Push this button, hold down this while pressing that, and this is exactly what will appear on the screen.” As with swimming and cooking, some experience of immediate success is indispensable. Untold hours of confusion and frustration may follow the first success as one perfects the learning. The teacher has to see that the design is grasped and that the learner can become the teacher. I think some of the best teachers in the country are the computer people at the end of the toll-free help lines who patiently guide the caller through each step of his or her problem.

In summary, these three extended examples, as well as other examples cited earlier in this chapter, exhibit the same structure. In each case, a human being is acting in a physical environment. To teach that person requires changing the existing design that relates the person’s activity and the environment. Much of the effort of both teacher and learner concerns physical behavior that humans share with nonhuman animals. The language in these examples is instruction in physical movement; the words are directly correlated to those movements.

Human beings, however, have learned to use language in ways that increase their ability to learn. Words can be abstracted from immediate relation to the body. The following three chapters describe other forms of speech used in teaching. But the underlying metaphor of design should not be forgotten: to teach is to show someone how to do something, how to choreograph a human body’s movement. No matter how abstruse and theoretical teaching becomes, it never severs its roots from the metaphor of design.