



*Donald A. Schön*



Educating the  
Reflective Practitioner



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EDUCATING THE REFLECTIVE PRACTITIONER  
*Toward a New Design for Teaching and Learning in the Professions*  
by Donald A. Schön

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In the story of Dani and Michal in Chapter Six, "Dani" refers to Daniel Gat of the Department of Architecture at the Technion, in Haifa, Israel. "Michal" is Michal Sofer, now a practicing architect, who was a student of Professor Gat's at the time of this story. Professor Gat presented this case study in 1983 during an academic workshop at the Technion at which I was a guest participant. I am very grateful both to him and to Ms. Sofer.

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## The Dialogue Between Coach and Student

In the early phases of architectural education, many students who have taken the plunge begin to try to design even though they do not yet know what designing means and cannot recognize it when they see it. At first, their coaches cannot make things easier for them. They cannot tell them what designing is, because they have a limited ability to say what they know, because some essential features of designing escape clearly storable rules, and because much of what they *can* say is graspable by a student only as he begins to design. Even if coaches could produce good, clear, and compelling descriptions of designing, students, with their very different systems of understanding, would be likely to find them confusing and mysterious.

At this stage, communication between student and coach seems very nearly impossible. Yet in a matter of a few years or even months, students and coaches begin to talk with each other elliptically, using shorthand in word and gesture to convey ideas that to an outsider seem complex or obscure. They communicate easily, finishing each other's sentences or leaving sentences unfinished, confident that the listener has grasped their essential meaning.

To be sure, not everyone achieves this state of communicative grace. Some students never do understand what the coach is talking about—or they believe they understand when the coach is sure they do not—and some coaches never get through to their students. Many succeed, nevertheless, in crossing over an appar-

ently unbridgeable communication gap to a seeming convergence of meaning. How do they do it?

Student and coach bring to the experience of the studio a capacity for a particular kind of dialogue about the thing—designing—that they see at first in such divergent ways. Their dialogue has three essential features: it takes place in the context of the student's attempts to design; it makes use of actions as well as words; and it depends on reciprocal reflection-in-action.

The coach tries to discern what the student understands, what her peculiar difficulties are about, what she already knows how to do, mainly from the evidence of the student's initial efforts at design. In response, the coach can show or tell. He can demonstrate some part or aspect of the process he thinks the student needs to learn, offering it as a model to be imitated; and he can, with questions, instructions, advice, or criticism, describe some feature of designing. Coaches vary in their predilections for showing and telling. Some refuse to draw, out of fear that the student's imitation will be blind and mechanical. Others *only* draw, distrusting mere words to convey something as inherently visual as designing. Some, like Quist, combine the two strategies. Whatever he chooses to do, the coach experiments in communication, testing with each of his interventions both his diagnosis of a student's understandings and problems and the effectiveness of his own strategies of communication. In this sense, he reflects-in-action.

The student tries to decipher the coach's demonstrations and descriptions, testing the meanings she has constructed by applying them to her further designing—revealing in this way what she has made of things heard or seen. In this sense, the student reflects-in-action.

Reflection-in-action becomes reciprocal when the coach treats the student's further designing as an utterance, a carrier of meanings like "This is what I take you to mean" or "This is what I really meant to say," and responds to her interpretations with further showing or telling, which the student may, in turn, decipher anew and translate into new design performance. The process continues throughout the sequence of design projects that make up the studio, moving—though not necessarily in a straight

line—toward convergence of meaning and toward the student's increasing capacity to produce what she and her coach regard as competent designing.

In this process, several kinds of learning are interwoven. The student learns to recognize and appreciate the qualities of good design and competent designing, in the same process by which she also learns to produce those qualities. She learns the meanings of technical operations in the same process by which she learns to carry them out. And as she learns to design, she also learns to learn to design—that is, she learns the practice of the practicum.

Given this brief and idealized description of the dialogue of student and coach, I shall turn in the rest of this chapter to the component processes of telling and listening, demonstrating and imitating.

### Telling and Listening

A coach has many ways of "telling." He can give specific instructions, telling, for example, how to prepare a site plan, assign uses to slopes of different grades, or produce cross-sectional drawings, elevations, or plans. He can criticize a student's product or process, suggesting things the student needs to do, like "Work on the size of the middle area" or "Calibrate the dimensions of the grid." He can tell the student how to set priorities, as in "Work on the overall geometry of the buildings on the site; I wouldn't worry about the shapes of the roofs." He can propose experiments the student might consider trying, analyze or reformulate problems, and deliver reflections about the process he has demonstrated.

Whatever the coach may choose to say, it is important that he say it, for the most part, in the context of the student's *doing*. He must talk to the student while she is in the midst of a task (and perhaps stuck in it), or is about to begin a new task, or thinks back on a task she has just completed, or rehearses in imagination a task she may perform in the future.

There is no magical dividing line between the world of the studio and the world outside it. The student does not suddenly understand, when she steps into the studio, what in the outside

world she would have found obscure. But in the context of her attempts to design, both the coach's telling and her listening have a heightened potential for efficacy. When Petra is trying, with difficulty, to place administration, gym, and kindergarten on her screwy site, and Quist talks to her about her problem, she listens to him with operative attention—that is, with a special readiness to translate what she hears into action, as we might listen to someone giving us directions to an unfamiliar place when we are the ones who will have to drive. With this attitude of operative attention, Petra is likely to place special demands on Quist's advice, and he is likely to try to respond to her demands.

Instructions are always and inevitably incomplete. Unless we already know how to do the thing in question, there is always a gap between the instruction and the action it describes—a gap we are unlikely to detect except when we listen in the mode of operative attention. This instructional gap may be of several kinds.

The instruction may contain a description that is not specific enough or may not have the kind of specificity that matches the student's need to know. In order to follow Quist's "Draw and draw in order to calibrate the grid," for example, Petra must know how to test a particular choice of dimension for its effects on such factors as access to buildings, circulation, and fit with the contours of the slope. Quist might try to help her by adducing examples of these kinds of effects, which might or might not suit the particular difficulties she experiences as she tries to act on his advice. He cannot foresee all the difficulties she might possibly experience, and if he tried to do so, he would surely overwhelm her with information. He must try to produce descriptions suited to her present know-how and sense of the problem, aware, as he does so, that some things likely to cause her the greatest difficulty are just the ones he takes most for granted.

Instructions may be ambiguous; most instructions are. "Take the first left after the lights" could mean, in a particular context, "Take the dirt road, which is the first left" or "Take the first paved road on the left." Because the giver of directions knows what he means, it does not occur to him that "the first left" may be ambiguous. For the listener who tries to decipher the instruction in order to act on it, however, the ambiguity readily presents

itself as a problem to be solved—by inference or experiment or both. If the giver of instructions takes his task seriously, he must first reflect on the thing he already knows how to do, trying to make explicit to himself the procedures he follows more or less spontaneously, and then he must try to anticipate and clarify the ambiguities the listener may discover in his description. Because of ambiguities peculiar to the language of designing, as noted earlier, a design student, listening with operative attention, is likely to experience a special need for clarification.

Instructions may be strange, referring to things, procedures, or qualities unfamiliar to the listener or incongruent with meanings she already holds. So it is with Judith's understanding of such directives as "Think architecturally," "Draw to scale," "Base your work on an organizing metaphor." Either these commands hold no meaning at all for her, or she constructs a meaning for them that is entirely incongruent with the one her instructor intends.

When a student enacts an instruction, she reveals the meanings she has constructed for it, indicating how she may have filled a gap of specificity, ambiguity, or strangeness. Observing what she draws, the coach may realize that she thinks "drawing to scale" means using a ruler or that she does not know what it means to calibrate a grid. He may be surprised by the evidence of a gap previously unsuspected or a problem different from the one he had in mind. And he may invent, in response, what he ought to say or do next. Every attempt to produce an instruction is an experiment that tests both the coach's reflection on his own knowing-in-action and his understanding of the student's difficulty. Every attempt to act on an instruction reveals and tests the student's understanding of its meaning and, at the same time, the quality of the instruction itself. The student asks, in effect, Do I understand what he's talking about? Does it make sense to me? Can I do it? Have I got it right? And the coach, observing and reading the student's performance, asks similar questions about both his own instructions and the student's attempt to make sense of them.

In a different context—teaching the rudiments of reading—Leo Tolstoy described the reflection-in-action of a coach who tries

to craft instructions matched to the capacities and difficulties of particular students:

Every individual must, in order to acquire the art of reading in the shortest possible time, be taught quite apart from any other, and therefore there must be a separate method for each. That which forms an insuperable difficulty to one does not in the least keep back another, and vice versa. One pupil has a good memory, and it is easier for him to memorize the syllables than to comprehend the vowellessness of the consonants; another reflects calmly and will comprehend a most rational sound method; another has a fine instinct, and he grasps the law of word combination by reading whole words at a time.

The best teacher will be he who has at his tongue's end the explanation of what it is that is bothering the pupil. These explanations give the teacher the knowledge of the greatest possible number of methods, the ability of inventing new methods and, above all, not a blind adherence to one method but the conviction that all methods are one-sided, and that the best method would be the one which would answer best to all the possible difficulties incurred by a pupil, that is, not a method but an art and talent. . . .

. . . Every teacher must . . . by regarding every imperfection in the pupil's comprehension, not as a defect of the pupil but as a defect in his own instruction, endeavor to develop in himself the ability of discovering new methods [1861/1967, pp. 57-58].

Like Tolstoy's teacher of reading, a good design coach has at his disposal and is capable of inventing on the spot many strategies of instructing, questioning, and describing—all aimed at responding to the difficulties and potentials of a particular student who is trying to do something.

For example, the coach may frame a question that directs the student's attention to a new aspect of the design situation: "Why does the administration belong here?" "What if you opened up the space here?" His question may advance an idea the student has not yet entertained; he may ask, "How will you mark the difference in level?" for example, when the student has not yet noticed the irregularity of the slope.

He may give the student a very concrete operational instruction that contains an implicit, deeper meaning. Quist might ask Petra, for example, "Why don't you see what the gallery looks like in cross-section?" hoping she will notice that it is more than a vehicle for circulation. Similarly, a piano teacher might say, "You should change the fingering here," meaning "This should mark the end of one phrase and the beginning of another." In such cases the coach tries to get the student to perform a particular operation in order to become aware of its function in the situation—performing a technical operation, as Wittgenstein observed, in order to learn its meaning (1953).

The coach may pick up the exact words a student uses to describe her intention—developing them, however, in a direction different from the one she had in mind. Thus, Quist echoes Petra's description of the gallery: "It is a general pass-through that anyone has the liberty to pass through," but adds, "It is not a corridor."

He may try to find a concrete image, accessible to his student, that carries a complex network of associations. Thus, Quist speaks of "a garden, a soft back area [to these hard-edged forms]"; he talks, somewhat disparagingly, of "shaving the trees."

He may make a judgment about his student's need to know something now or her readiness to hear it. Quist notices that Petra is disposed to deal with individual building elements (to "work closely," as she puts it), and so he focuses on establishing the basic geometry of the buildings on the site. He sees that she hesitates to make apparently arbitrary choices that could invest her design with meaning from which a basic idea might follow, and so he tells her to impose a discipline, however arbitrary—"you can always break it open later." Seeing that she is not adept at stringing out a long and complex sequence of conditional moves

and consequences, he talks her through such a string of moves. Seeing that she is limited in the domains of norms by which she allows herself to be influenced, he talks about the formal implications of chosen geometries, the use-related idea of being one with the trees, the effects of orientation on the site, the meanings that may be attached to building elements, the uses compatible with different grades of slope. When Petra seems interested only in the purity of her hard-edged forms, Quist speaks of "softening them and breaking them up" by accommodation to norms derived from other domains.

Just as the coach can vary his strategy of description, depending on his present reading of a particular student, so he varies the manner in which he gives a description. He may treat one student with gentleness and indirection, barely hinting at issues that call for change; with another, he may be direct and challenging. In Quist's studio, some of the variations in students' responses to him may reflect the different sides of himself he chooses to present to them.

### Demonstrating and Imitating

In Quist's dialogue with Petra, after he has heard her "big problems," he demonstrates a version of the global process she has already tried (stutteringly, as he says) to carry out.

How shall we describe his intention? He wants her to understand his demonstration so that she can go on to do something like it. "You keep going on," he says, "you are going to make it." He has shown her a way of designing the geometry of the buildings on the site so that she can proceed to imitate it—not in its details but in its essential features. And she seems to accept the demonstration in the spirit of his intention, feeling that he has helped her see where she was stuck and given her an alternative approach that she will be able to develop for herself.

A coach demonstrates parts or aspects of designing in order to help his student grasp what he believes she needs to learn and, in doing so, attributes to her a capacity for imitation.

At first glance, there is nothing in this process of demonstration and imitation that merits extraordinary attention.

Children often learn to play by imitating other children and learn to function in an adult world by imitating the adults around them. We learn new physical skills, games, ways of working, practices of everyday life, in part by imitating others who are already good at these things. We may not like the *idea* of imitation (I shall have more to say about this later on), but we are continually doing it—and usually without feeling that we are doing anything remarkable. The obviousness of imitation dissolves, however, when we examine it more closely.

Consider a mother who sits facing her baby, clapping her hands. The baby begins to clap too, mimicking its mother. The mother begins to clap at a faster pace; the baby responds by clapping faster as well. The mother claps slowly again, this time beating out a steady rhythm. The baby does likewise. The mother speeds up the beat and makes the rhythm more complicated. The baby responds by producing a lot of little, fast claps. The mother begins to play pat-a-cake with the baby, first extending her two palms to touch the baby's two palms, then touching the baby's right palm with her right, the baby's left palm with her left. Confused at first, the baby soon responds by extending right hand to meet mother's right hand, left hand to meet her left.

Even so "simple" an example shows extraordinary complexity. The baby does as it has seen its mother do, reproducing her global gestures. But in order to do so, it must be able to produce and control, from internal cues of feeling, what it apprehends through visual observation of external cues. Somehow, it manages to coordinate inner and outer cues to produce actions that conform, in some essential respects, to the actions observed.

Even in this "simple" example, imitation presents itself as a process of selective construction. The features of the performance to be reproduced are not *given* with the demonstration. The baby selects and integrates in its own performance what it takes to be essential in the things it sees the mother do. Or perhaps we ought to say, there is already in its perception of its mother's action a construction of the essential and inessential things, which it then translates into its own performance.

When the baby claps, for example, it sits facing its mother; its mimicry does not include turning around to sit facing in the

same direction as the mother. The baby detects certain variations in the mother's clapping—slowing down, for example—and responds by reproducing them. When the mother claps a more complex rhythm, however, the baby produces a lot of little claps—which may represent what the baby hears or perhaps reflects its limited ability to produce the more complex rhythm it hears.

Imitative reconstruction of an observed action is a kind of problem solving—indicated especially, in our example, by the baby's gradual success in "getting" the alternating pat-a-cake motions. Problem solving may take the form of successive differentiations of a global gesture or of learning to string together component actions. The imitator has access to observation of the process (in this case, the clapping) and of the product (the sounds of the claps) and may regulate his selective construction by reference to either or both of these. When the process of imitation is interactive, as in our example, the demonstrator's reactions can also regulate the constructive process. When the baby claps, the mother smiles and nods, rewarding its performance.

The baby's imitative construction does not depend on its ability to make a verbal description of what it sees, hears, or does. The problem solving involved in imitation—doing as it has seen and heard its mother do—does not depend on an explicit verbal formulation of similarities perceived and enacted. The baby can produce an action similar to the action it has perceived without being able to say "similar with respect to what." Its constructive process is nonetheless a form of reflection-in-action—an on-the-spot inquiry in which the imitator constructs and tests, in its own action, the essential features of the action it has observed.

As an infant matures, its capacity for this sort of reflection-in-action develops. Its imitative reconstructions become increasingly complex, undoubtedly playing a major role in all the processes we associate with skill acquisition. In learning to ski, juggle, or draw, for example, observation and imitation of skillful performances are crucially important. In these sorts of examples, as in the baby's clapping, we have access to observations of both product and process and may give priority to either or both of these. I can see the movements of a skiing instructor as she goes into a parallel turn. I can also see (and hear) the actual turning

with which she completes the maneuver, skis held tightly together, facing slightly uphill, making a noise like sandpaper as the skis skid over the snow. I can watch an expert draftsman as he makes a freehand drawing of a fern. I can observe his gestures, see how he guides his pen over the paper, and see, finally, the finished drawing left by the traces of his pen.

Insofar as I pay attention to the product—the parallel turn or the drawing—I have something to *copy*. Here I am free of the need to reproduce an observed process of action; I work against the constraint of producing something like the original product, something I can perceive as similar to it—again before I can say “similar with respect to what.” As I set myself the problem of copying the product, I regulate my on-line experiments by my perceptions of similarities and differences between the original and my copy of it. I may be limited, of course, by my ability to perceive the product—a master performer might see it very differently—but the very act of copying may lead me to see the original in new ways.

Insofar as I attend to the *process* of action, trying to do as I have seen a skillful performer do, I reflect-in-action both on the original process I have observed and on my attempts to reproduce it. I ask, “What is he really doing?” and as I try to do as he has done, I ask, “What am I really doing?” I can break the whole gesture I have imitated into parts, trying to see what in each part makes my attempt at reproduction right or wrong. Because I can detect this “rightness” or “wrongness” more readily than I can state the norms that underlie my judgments, I can reflect on the criteria that underlie my perceptions of match or mismatch. I can experiment with different ways of correcting the errors I detect. I can examine the “joints” that connect parts of the performance I try to reproduce, recognize intermediate stages of the task of construction, differentiate aspects of my performance—noting, for example, what happens when my skis bite more sharply into the snow or my pen moves more slowly over the surface of the paper. Often in this process I discover new meanings in the operations I try to reproduce. Learning into the slope as I have seen an expert skier do, I may discover how this gives me a feeling of solid balance and purchase for the turn. Imitating the observed

performance, I put myself into a new situation of action and from its vantage point get a new view of and feeling for the performance I am trying to imitate.

I may coordinate the two strategies of imitation: reproducing a process and copying its product. I may use each as a test of the other, judging that I have finally got it right, for example, when I detect in my own action a fit to the process I have observed and in my own result a fit to the original product. At this point, I may try to do it again, now directing my effort at imitation to my own just-completed action. I progress from imitating the other to imitating myself.

### Combining Telling/Listening and Demonstrating/Imitating

In the design studio, as in other kinds of reflective practices, the coach's showing and telling are interwoven, as are the student's listening and imitating. Through their combination, students can learn what they cannot learn by imitation or following instructions alone. Each process can help to fill communication gaps inherent in the other.

Instructions are always incomplete, as we have seen, and are often read as ambiguous, strange, or incongruent with the listener's understandings. Similarly, every demonstration is ambiguous, always open to the question “Just what in this is to be imitated?” Whatever a coach may see as the essential features of his demonstration, students must construct their own versions of it, and these are often incongruent with the coach's intentions.

In addition, there are several ways in which a demonstration may present obstacles to imitation. It may be too refined, containing differences that escape the observer's attention. A cello teacher may demonstrate the touch of a bow on a string that makes the tone more brilliant, for example, and his student may hear and reproduce it as simply louder. The demonstration may go by too quickly for the student to detect what is going on. Its complexity may elude the student's grasp. For example, the demonstration may consist of a string of moves too long and subtly interconnected for the student to hold in mind, or it may consist of a coordination of many concurrent moves. It may vary over time in



a way that seems unpredictable to the novice although it reveals to the initiated an understanding of a complex system—like the sequence of moves by which a skilled mechanic probes an engine.

Verbal description can provide clues to the essential features of a demonstration, and demonstration can make clear the kind of performance denoted by a description that at first seems vague or obscure. A tennis coach might advise a student to hit the ball on the rise, for example, and a student might find this advice impenetrable until he observes how the coach approaches and attacks the ball. When the student tries to do this for himself, the coach observes him and says, "Get your racket back!" calling attention to a feature of the demonstration the student had missed.

The coach's or student's reflection on his own or the other's performance can yield a description that highlights subtle differences, distinguishes the joints in a long and rapid string of moves, or reveals the understanding that informs surface variations. The tennis coach Timothy Galloway asks his students to tell him where their rackets are when they hit the ball. Attending to the position of the racket at the precise moment of impact, the student learns what he is doing wrong, and his efforts to correct his errors become more reliable. Seymour Papert used to teach juggling by informing would-be jugglers that they are susceptible to a variety of typical mistakes, or "bugs"—throwing the ball too far forward, for example. Asking them from time to time to describe the "bug" they had just illustrated, he would give them a language with which to reflect on their own performance. He would name parts of the juggling process—distinguishing a "pass" from a "toss," for example—thus helping the student break into manageable parts what had at first appeared to be a seamless flow of movement.

Quist's drawing and talking—his language of designing—seems to help Petra make sense of his rather long and complex demonstration. And his occasional comments about designing, like "Work back and forth between unit and total," seem to help her attend to essential features. His descriptions indicate what Petra is meant to imitate, both in the particular task at hand and

in the generic process it illustrates. His demonstrations clarify descriptions that might otherwise strike her as vague or obscure.

We can identify the "moments" of the process in which Petra responds reflectively to Quist's demonstrations and descriptions:

Initially, she watches and listens and gives operative attention to his drawing and talking, asking herself what its essential elements are.

She does as she has seen him do, enacting the verbal description he has given. She constructs in her own performance what she has seen as essential in his, experiencing from the inside the patterns of action she had observed from the outside, and she produces a new product that may be compared with the one Quist has made.

She can now reflect on her own process, asking what rules, operations, and understandings she has enacted, comparing these with Quist's earlier descriptions. How, for example, has she "worked back and forth between unit and total"? She can reflect on her new product, comparing it with Quist's, asking herself whether she has "got it" and what she has got.

As she repeats this process, both the component actions and the reflections on action, she may at some point discover that she has internalized the performance. What began as an imitative reconstruction of Quist's action, she now experiences as something of her own, a new element of her own repertoire available for use, through seeing- and doing-as, in the next design situation.

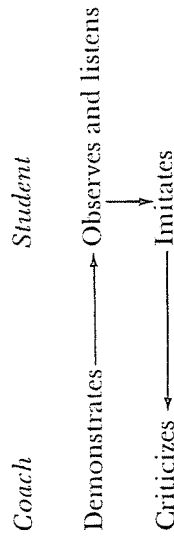
What Petra learns in this process depends on the content and quality of her reflection-in-action. She may pick up some of Quist's mechanical operations (for example, his way of representing how "summer sun comes in here"), his language, or his mannerisms. She may learn that a soft back garden area is nice or, on the contrary, that she must make appreciative judgments of her own. She may learn only to impose this particular geometry of parallels on this screwy slope or, instead, to step into any initially incoherent situation by imposing on it a coherence of her own devising. Whatever she learns, she will reveal in her further designing, creating a new object of possible reflection.

### The Ladder of Reflection

When telling/listening and demonstrating/imitating are combined, as they usually are, they offer a great variety of possible objects and modes of reflection that can be coordinated to fill the gaps inherent in each subprocess. Questioning, answering, advising, listening, demonstrating, observing, imitating, criticizing—all are chained together so that one intervention or response can trigger or build on another.

The chain of reciprocal actions and reflections that makes up the dialogue of student and coach can be analyzed in several ways.

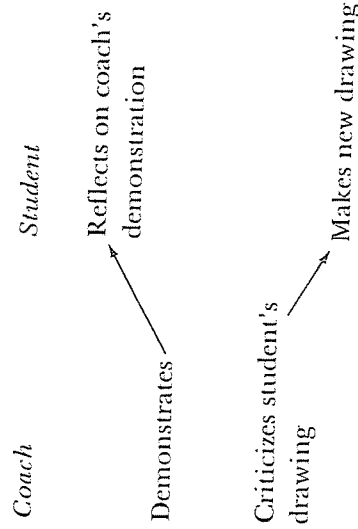
We can begin with a straightforward map of interventions and responses, for example:



Such a picture simply displays a sequence of actions, arrows indicating assumed causal links between elements of the sequence.

We can also introduce another dimension of analysis, a vertical dimension according to which higher levels of activity are “meta” to those below. To move “up,” in this sense, is to move from an activity to reflection *on* that activity; to move “down” is to move from reflection to an action that enacts reflection. The levels of action and reflection on action can be seen as the rungs of a ladder. Climbing up the ladder, one makes what has happened at the rung below into an object of reflection. For example, a coach may reflect on the message implicit in his own performance; a student may reflect on the problems inherent in her own drawings. Climbing down the ladder, one acts on the basis of a previous reflection. Having reflected on an earlier performance, the coach may offer a new demonstration, or the student may try a new drawing.

Diagonal moves along the ladder of reflection occur when one party's action triggers the other's reflection or when one party's reflection triggers the other's action. For example:



or

When things go wrong at one level of activity—when one party is stuck or does not understand or feels misunderstood—then it is possible, by climbing up a rung on the ladder of reflection, to communicate about the stalemate or misunderstanding the person has experienced at the level below.

We can think of the rungs of the ladder of reflection in the following way:

4. Reflection on reflection on description of designing.
3. Reflection on description of designing.
2. Description of designing.
  1. Designing.

At the base, designing is (as we have seen), in its own way, a process of reflection-in-action. One level up, reflection on designing takes the form of a description—for example, “I have aggregated these smaller shapes into the larger, L-shaped classrooms.” Description may be combined with appreciation: “It relates [grades] one to two . . . which is more what I wanted to do educationally anyway.” Description may be incorporated into advice or criticism: “I wouldn't worry at this point about the shapes of the roofs,” “Horrible—it just ruins the whole idea.” Description may refer to knowing-in-action implicit in design-

ing—for example, “You have tried to fit the shapes of the buildings to the contours of the slope, but the slope is screwy.”

Two levels up, in reflection on description, the coach might ask, for example, “What does she mean when she says, ‘Larger in scale, more satisfying?’” or “What does her ‘big problem’ say about her way of framing the design task at this point?” The student might ask, “What does he mean by describing the gallery as ‘in a minor way the major thing?’” She might put her reflections into a question or try out a new drawing that she sees as following Quist’s advice. Coach or student may reflect on the meaning the other has constructed for a description he or she has given. Quist might ask himself, for example, what Petra has got out of his whole demonstration, wondering whether she has grasped the idea of imposing a discipline that can be broken open later.

At the fourth level, finally, the parties to the dialogue might reflect on the dialogue itself. They might ask, privately or publicly, whether they have come any closer to a shared understanding of the problem or tested their understandings of each other’s meanings. If, on reflection, they are dissatisfied with their efforts at communication, they might experiment with new strategies or media: “Perhaps it is time to visit the site,” “Perhaps it would be helpful to try a different kind of drawing.”

Progress in learning need not take the form of climbing up the ladder of reflection. The work of reciprocal reflection-in-action inherent in telling and listening, demonstrating and imitating, may go very well without recourse to higher levels of reflection. But when coach and student are stuck, their ability to move up or down the ladder opens up new possibilities in the search for convergence of meaning.

Not least important, negotiation of the ladder of reflection offers possible responses to a student’s doubts about the value of her instructor’s message. A successful dialogue of student and coach need not end in the student’s compliance with the coach’s intentions. On the contrary, the more she understands what he means, the more she may discover that she does not want to learn what he has to teach. Conversely, when a student fails to understand through apparent incapacity or unwillingness to learn, the coach ought to consider the possibility that the “failure” is

attributable not to her shortcomings or even to his inadequate coaching but to her refusal to give up something she sees as valuable. Such discoveries are reliably made, however, only when student or coach can be reasonably sure of having constructed an accurate picture of the other’s meanings. Negotiating the ladder of reflection is a way of submitting such private constructions to public testing.

### Conclusion

Through what sort of process, then, can a student begin to educate herself in designing when, at the outset, she does not understand what designing means and can neither recognize nor produce it? What enables a coach to help her undertake such a process when, at the outset, he cannot communicate to her what she needs to learn?

Design studios are premised on a particular kind of learning by doing. The student is asked to start designing before she knows what designing means. If she accepts this challenge and the perceived risks it entails, entering, tacitly or explicitly, into a contract with the coach that carries with it a willing suspension of disbelief, she begins to have the sorts of experiences to which the coach’s language refers. She puts herself into a mode of operative attention, intensifying her demands on the coach’s descriptions and demonstrations and on her own listening and observation.

Her initial efforts at design provide the coach with evidence from which to infer her difficulties and understandings and a basis for the framing of questions, criticisms, and suggestions.

Within limits variable from person to person, the student comes to the studio with a capacity to follow instructions so as to carry out technical operations whose meaning she does not yet understand. Similarly, she comes to the studio equipped with a capacity for imitation, an ability to do as she sees another person doing, so as to reproduce elements of an activity whose meaning she does not yet understand. Executing such performances, she experiences them, feeling what they are like and discovering in them, by reflection, meanings she had not previously suspected.

When coach and student coordinate demonstrating and imitating, telling and listening, each component process fills gaps of meaning inherent in the other. The coach's demonstrations and self-descriptions, the student's efforts at performance and self-descriptions, the comparisons of process and product, provide material for reciprocal reflection-in-action. Learning and coaching to design become experiments in the work of designing and in communication about design.

When experimentation generates new problems, puzzles, and confusions, these, too, can become material for reciprocal reflection. Communicative dead ends can yield to movement up or down the ladder of reflection.

For both student and coach, effective search for convergence of meaning depends on learning to become proficient at the practice of the practicum—and this may seem to imply a vicious learning circle. The coach must learn ways of showing and telling matched to the peculiar qualities of the student before him, learn how to read her particular difficulties and potentials from her efforts at performance, and discover and test what she makes of his interventions. The student must learn operative listening, reflective imitation, reflection on her own knowing-in-action, and the coach's meanings.

Does it not seem that she must be capable of reflecting-in-action in order to learn to reflect-in-action? But the reflection-in-action essential to the practice of the practicum is not the same as the reflection-in-action essential to designing. Students bring to the studio, in greater or lesser degree, generic competences for communication, experimentation, and imitation on which they can build, in dialogue with the coach, in order to learn to do the cognitive work of learning to design.

It is not enough, however, for student and coach to have these competences; they must also choose to exercise them, adopting a kind of stance toward each other that we shall explore in the next chapter.

## Chapter Six

# How the Teaching and Learning Processes Can Go Wrong

In this chapter, I shall examine some of the contextual features on which the success of the dialogue of student and coach may depend: the stances adopted by the two parties toward their joint effort at communication, the theories-in-use they bring to their patterns of interaction, and the qualities of the behavioral world they create for each other. I shall show how these features are interrelated and how they can facilitate or hinder the work of reciprocal reflection-in-action.

### Stance

Some studio masters feel a need to protect their special artistry. Fearing that students may misunderstand, misuse, or misappropriate it, these instructors tend, sometimes unconsciously, under the guise of teaching, to actually withhold what they know. Some students feel threatened by the studio master's aura of expertise and respond to their learning predicament by becoming defensive. Under the guise of learning, they actually protect themselves against learning anything new.

When either party sees and feels about the studio situation in this way, he or she can spoil the search for convergence of meaning. That party's *stance* toward the interaction impedes the exercise and development of competences for reciprocal reflection-in-action. Indeed, one might think of "stance" as itself a kind of competence, since it involves not only attitudes and feelings but ways of perceiving and understanding. At the very least, we should