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Whoever looks closely at professional education is bound to be struck by the fact that it really consists of two systems, so much insulated from one another and, on the surface, so different from one another, as to seem totally disjointed.¹

On the one hand, there are the professional schools of the contemporary research universities. They adhere to a core of systematic, preferably scientific professional knowledge which they teach in an orderly progression: first the relevant basic science, then the relevant applied science, and finally, a practicum in which students are supposed to learn to use research-based theory and technique to solve the everyday problems of professional practice. Medical school is the prototype, the idea to which other professional schools aspire in their search for academic rigor and status.

On the other hand, there are the studios of the visual arts and architecture, and the conservatory of music. Here students learn to make or perform. Everything revolves around the acquisition of artistry, through practice and coaching. Professional knowledge, in the sense of applied science and technique, occupies a marginal and usually controversial place, if it is present at all, at the edges of the curriculum. For the most part, these institutions are freestanding, outside the boundaries of the university. When they are present in the university, they are likely to be marginal, compartmentalized and of dubious status; the more prestigious the university, the more dubious the status.

Nevertheless, the professional schools have much to learn from the studio and the conservatory. There is a crisis of confidence in professional knowledge and, with it, a crisis of confidence in the normative model of professional education. Practitioners and educators are coming increasingly to value the kinds of artistry that the professional schools are least equipped to teach, and the time is ripe for a re-examination of our bifurcated systems of professional education.

In this article, I shall consider the architectural studio as an example of education for artistry: the learning predicament that is central to it, the communicative processes on which it depends, and some of the ways in which it can go wrong. I shall suggest how the professional schools might learn from it.

The Dilemma of Rigor or Relevance

In 1963 the journal Daedalus devoted an issue to the professions.² It opened with the phase, "Never have the professions been so triumphant in American life." Each article laid out the ways in which the author's profession had become indispensable to society. The problem, it seemed, was how to meet all the demands and cope with the multiplicity of information available. There were only two exceptions: the representative of divinity, who complained that his profession lacked influence, and the city planner, who observed that urban renewal seemed to have presented city planners with problems they did not understand. Otherwise the theme of the volume was the triumphant ascendency of the professions.

In 1972, when I began to teach at MIT, I held a meeting of professional educators from many fields: physics and engineering, architecture and planning, psychiatry, social work, and management. There the atmosphere was very different. In general, there was awareness of a crisis of confidence in professional knowledge. Between 1963 and 1973 the ethical status and the competence of many of the professions had been called into question. "Problems are our most important product." Professionals seemed to have discovered the salience of uncertain and problematic situations, of instability and uniqueness and value conflict.

But why should the discovery of these phenomena have been so troublesome when in fact many professionals do cope effectively with uncertain situations, do manage occasionally to display an art appropriate to unique cases, and even to resolve conflicts of values? I think the answer is that... [most professionals]... were committed to a view of professional knowledge which excluded the very competences by which some practitioners cope well with the indeterminate zones of their practice.
This idea of professional knowledge underlies Nathan Glazer’s well-known article on “The Schools of the Minor Professions.” Here, Glazer argued that there are really only two kinds of professions: the major and the minor. The major professions, he thought, were law and medicine (business and engineering were close seconds). All the rest—education, social work, city planning, architecture, public administration—were minor. Law and medicine were distinguished from all the others by their stable contexts of practice, their clear and fixed ends, and their basis in systematic professional knowledge. Glazer concluded that, although it is possible to develop a rigorous curriculum of professional education in medicine and law, it is hopeless to try to do so in other professions. Professional knowledge, Glazer seems to assume, consists in the application of science, or at any rate, systematic knowledge, to the instrumental problems of practice.

This theory of professional knowledge, this epistemology of practice, is not limited to Glazer. It is shared by many of those who write most intelligently about the professions today. For example, Edgar Schein, in a book on professional education supported by the Carnegie Commission, described the normative professional curriculum as one that teaches first the relevant basic science, then the relevant applied science, and finally a practicum in which students are supposed to learn to apply relevant science to the problems of practice. But this normative curriculum follows as the night the day from a view of professional knowledge as the application of science to instrumental problem-solving. This view I will call technical rationality. It has a long and glorious history. It is built into our educational institutions, the modern university and, more especially, the professional curriculum within the university. It is built into the institutionalized separation of research from practice. In fact, modern universities are not so much devoted to the production of new knowledge as to the production of a particular kind of knowledge, the new scientific knowledge whose application to practice is the job of the professional schools.

In the geography of professional practice, there is a very dry, high ground where you can practice the techniques and use the theories on which you got your Ph.D. Down below there is a swamp where the real problems live. The difficulty is to decide whether to stay on the high ground, where you can be rigorous but deal with problems of lesser importance, or go down into the swamp to work on problems you really care about but in a way you see as hopelessly unrigorous. It is the dilemma of rigor or relevance. You can’t have both, and the way in which people choose between them sets the course of their professional lives.

One consequence is that researchers who stick to the high ground become not only separate from practice but increasingly divergent from it. As a result, engineering scientists have very little to say to engineering designers; cognitive psychologists, very little to say to teachers; management scientists, to managers; policy scientists, to politicians and administrators.

The position of the professionals who stay on the high ground is difficult, because they must find ways to cut off pieces of problems that don’t fit their models.

Other professionals leave the high ground to go down into the swamp, where they function unrigorously according to the only definition of rigor they are able to give. The result is sometimes a retreat into a sense of inferiority in relation to the “harder” disciplines, or sometimes a perverse pride or even a mystique of art: “Nobody can understand what I’m doing.” And this response reinforces the divergence between research and practice.

I propose another possible response to the dilemma of rigor or relevance, a response that turns the problem on its head. It is based on the notion that rigorous professional knowledge does not consist only in the application of science to practice. There is also knowledge, or better yet, knowing in practice. People have in their doing a tacit kind of knowing. They know more than they can say and, in zones of uncertainty, uniqueness and conflict, they are sometimes able to reflect on what they know but cannot say. When I ask bicycle riders which way they turn the wheel in order to keep from falling, for example, many give the wrong answer, although they perform the right actions. Their knowing-in-action is incongruent with their descriptions of it.

It is this knowing-in-action, this capacity for intuitive and spontaneous performance, that comes into play in the uncertain, unique, and conflict-laden situations which are so troubling to the proponents of technical rationality. Here there is a kind of rigor both similar to and different from the rigor of technical rationality. But it is implicit and, in some measure, beyond awareness. It is very much in need of legitimation. I shall argue now that architecture is important not only to itself but to the other professions in precisely this regard.

Designing as Reflection-in-Action

Architecture is an anomalous profession. It crystallized as a profession before the doctrine of technical rationality had come into good currency. It is a bimodal profession. It is an art, not only because it is a craft of design but also because it concerns itself with the aesthetic dimension of human experience. But it is also an occupation devoted to the provision of physical structures for critically important social functions. Architecture lives both in the world of art and in the world of technological performance. And from this face comes not only its bimodality but also its anomalous and marginal character and its uneasy status in universities. Architecture is a stranger in the modern university, a throwback representing an epistemology of practice no longer dominant. Architecture experiences real tension because of the place it occupies. On the one hand, there is a strong pull to join with the rest of the university in adopting the model of technical rationality; on the other hand, there is the self-protecting mystique of design.
Architecture exemplifies a particular kind of inquiry, designing, which I conceive as a kind of making, a making of representations of things to be built. (We might also see other professions in this way; law, for example, as the making of legal decisions, or medicine as the making of diagnoses, but law and medicine tend to describe themselves in terms of analysis and technique.) Moreover, architecture is a making activity that deals with the unique case. In order to understand what architecture designers do, then, we need a special view of inquiry; one derived from reflection on the spontaneous knowing-in-action implicit in architectural making. I shall try to suggest the outlines of such a view by reference to an apparently simple example.

I ask you to imagine an architectural studio. It has been underway for a couple of months, and the students have been given a program for the design of a school. There is a design review in progress. The studio master, Quist, examines the drawings of a student, Petra. He places a piece of tracing paper over her drawing and begins to draw over it, and at the same time, to talk. His talking is neither an explanation of the drawing, nor a parallel activity. Rather, talking and drawing make up a single language. The drawing is understandable only through the talking, and the talking has no meaning without the drawing. I call this drawing and talking the language of designing.

In this dialogue, Quist sits down next to Petra and asks, “What are your big problems?”

P: I am having trouble getting past the diagrammatic phase. I’ve written down the problems on this list. I’ve tried to put the shape of the building into the contours of the land there, but the shape doesn’t fit into the slope.

Q: What other big problems?

P: I had six of these classroom units, but they were too small in scale to do much with, so I changed them to this much more significant layout (the L-shapes). It relates 1st to 2nd, 3rd to 4th, and 5th to 6th grades, which is more what I wanted to do, educationally anyway. [What I have here is a space which is more of a home base, I’ll have an outside/outside which can be used and an inside/inside which can be used. Then that opens into your resource library/language thing.]

Q: This is to scale?

P: Yes.

Q: Okay. Say we have introduced scale, but in the new setup what about north-south?

(He draws his orientation diagram showing preferred orientation.)

P: This is the road coming in here, and I figure the turning circle would be somewhere here.

Q: Now this would allow you one private orientation from here, and it would generate geometry in this direction. It would be parallel.

P: Yes, I thought of 20 feet.

Q: You should begin with a discipline, even if it is arbitrary, because the site is so screwy. You can always break it open later. Now in this direction, that being the gully and that the hill, that could then be the bridge, which might generate an upper level which could drop down two ways. (One way from the classrooms.) We get a total differentiation potential here from one end of the classroom to the far end of the other. There is the 15 feet max, right? So we could have as much as 5-foot intervals, which for a kid is maximum height, right? The section through here could be one of nooks, in here, and the differentiation between this unit and this would be at two levels. Now you would have given preference to that as a precinct which opens out into here and into here, and then of course, we’d have a wall. On the inside there could be a wall or steps to relate “in” downward. Well, that either happens here or here, and you’ll have to investigate which way it should or can go. If it happens this way, the gallery is northwards. But I think the gallery might be a kind of a garden, a sort of soft back area to these. The kindergarten might go over here, which might indicate that the administration (goes) over here—just sort of like what you have here. Then this works slightly with the contours; then you might carry the gallery level through and look down into here, which is nice.

Let the land generate some sub-ideas which could be very nice. Maybe the cafeteria needn’t be such a formal function, maybe it could come into here to get summer sun here and winter here.

P: Now this gallery is more a general pass-through that anyone can use.

Q: It’s a general pass-through that anyone has the liberty to use, but is not a corridor; it marks a level difference from here to here; it might have steps or a ramp up to it.

P: My concern is the circulation through this way. The gallery is generating something awfully cute, but how to pass through here (the library space)?

(More examples of Quist answering questions before they are asked.)

Q: So don’t think of the auditorium as a hard edged block there.

P: Where I was hung up was with the original shape. This here makes much more sense.

Q: Much more sense. So that what you have in gross terms is this (he points to his gallery). It is an artifice, the sort of thing Aalto would invent just to give it some order—he’s done that on occasion. So in a very minor way that is the major thing. . . .

A great deal might be said about these few minutes of dialogue. Here, let me mention only a few of the main features of Quist’s reflection-in-action.
Initially, he reframes the problem Petra had presented. The problem, he says, is not to “butt the shapes into the contours of the slope.” The site is “screwy”; it is not to be taken as a source of coherence. Rather, Petra must “impose a discipline, however arbitrary.” She can always “break it open later.” Quist demonstrates for her an experiment in imposing such a discipline onto the screwy site: here, a geometry of parallels taken from the L-shaped classrooms. His experiment is undertaken in the language of designing. He draws and talks his moves. He finds, first, that the new configuration “works slightly with the contours.” He finds, also, that he has created three vertical intervals, each of five feet—“maximum height for a kid”—out of which he can make nooks, which are “nice.” In these ways, he affirms his moves. But in the process, he also produces a phenomenon he did not expect: the gallery, which he now sees as “in a minor way the major thing.” The situation has talked back to him, and he has listened, accepting from this back-talk implications which he will follow in the rest of the design.

Quist has reflected critically on Petra’s framing of the problem. He has conducted an on-the-spot drawing experiment in reframing the problem. And, in the process, he has conducted a reflective conversation with the materials of the design situation.

Quist has not applied to the particular situation before him the general rules drawn from his past experience. On the other hand, it is clear that he does make use of his earlier experience of screwy sites. His experience is available to him, I think, in the form of a repertoire of particular situations, exemplars and images, in terms of which he is able to see the new situation. He constructs variations on themes with which he is familiar. Seeing the new situation as an element, or elements, of his repertoire, and doing in the new situation as he has done before, he is able to make use of his past experience without reducing the new situation to features that conform to a set of familiar rules.

He carried out a process of on-the-spot experimentation that is partly like and partly unlike a laboratory experiment. His moves function, at one and the same time, in several different modes of experimentation. He tests a re-framing of the problem, he seeks to confirm or disconfirm the hypothesis that the new geometry can be made to work with the contours of the slope, he seeks to affirm his moves by discovering that he can make of their results something that he likes (nooks), and he conducts an exploratory probe of the situation that reveals a new and critically important phenomenon. His experimentation is, in its way, appropriately rigorous.

Part of its rigor is due to the fact that Quist conducts an experiment in the virtual world of the tracing paper. In this virtual world, he is able to carry out the drawing experiments that lead to his discoveries. (If he had to experiment by shoveling dirt on the site, the process would be impossibly long and expensive!) He knows very well how to manipulate his virtual world. Drawing over Petra’s drawing, he makes a virtual configuration of buildings on the site that he can see and experience as though real. Of course, his virtual world has its limits. It does not capture wind velocities, snow loads, or work stoppages. But it captures a great deal, and it enables the designer to go back and try something again, to look a second time at what he has done before, to slow down or speed up the pace of experimentation, and to experiment at minimum risk.

It is also worth noting that Quist’s is a virtuoso performance. He has learned to string out long and complex webs of moves, consequences, implications and further moves. He is a very fluent speaker of the language of designing and a facile manipulator of his virtual world. He has adopted a stance toward his activity that permits him to commit himself to a course of action and, at the same time, to exhibit what Lisa Peattie has called “double vision.” In the back of his mind, even as he pursues his committed strategy, he reserves the right to see and do things differently.

The process of reflection-in-action—and especially, the particular version of it that I call reflective conversation with the materials of the situation—is an essential part of the artistry with which some practitioners sometimes cope with uncertainty, uniqueness, and value-conflict in all domains of professional practice. But architecture with its special tradition of practice and education, is one of the few occupations in which the process is manifest, honored, and maintained. Even here, I think, the process is still largely implicit. Architects appear to reflect very little on their own practice of reflection-in-action. Yet their practice, redescribed through reflection, might serve as a powerful exemplar for other professions.

**Conclusion**

Architecture is a profession rooted in the artistry of designing, a process I have characterized as a special form of reflection-in-action: reflective conversation with the materials of the design situation. In this sense, I suggest, architecture embodies a kind of artistry that is also sometimes practiced in other professions, especially in the indeterminate zones of practice. It is through variants on the process of reflection-in-action that competent practitioners sometimes deal well with uncertainty, uniqueness, and value-conflict.

Moreover, the artistry of architectural designing is not wholly mysterious. It is, at least in part, describable. Competent practitioners can learn to reflect on their own reflection-in-action, revealing to themselves and others something of the way in which they function as on-line researchers, practitioners of on-the-spot experimentation which can be rigorous or unrigorous in its own way. Indeed, in the design studio, competent studio masters do sometimes engage in such reflection.
The architectural studio should be of interest to other professional schools because it represents a tradition of education for arshyth, which other professions are learning increasingly to value. The paradox and predicament of learning to design have their parallels in the process by which other kinds of practitioners learn to become competent, though often outside the boundaries of the school. In other professions, too, neophytes sometimes learn to become competent through learning by doing (through practice, in the second ordinary sense of the term) coupled with criticism and coaching. There, too, the communicative processes of testing and listening, demonstrating and initiating, are centrally important.

Insofar as other professions seek to reform professional education by combining their normative curriculum with education for arshyth, they have much to learn from the traditions of studio education in architecture. And to the extent that architects, practitioners and studio masters choose to reflect on their own competent doing, they are potential leaders in that much-needed process of educational reform.

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NOTES

1. The material of this article is taken from my The Reflective Practitioner (Basic Books, 1983) and from a book on the education of the reflective practitioner, now in preparation which will be published by Jossey-Bass.


5. The case of Quist and Petra was recorded by Roger Simmonds as part of a study of architectural education in which he participated while he was a graduate student at MIT. His case study, of a studio, is included in Architectural Education Study, Vol. 2 (The Andrew Mellon Foundation and the Consortium of East Coast Schools of Architecture, 1981). This volume is distributed by the MIT Laboratory of Architecture and Planning.

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