

## Chapter 11

### Can Education Become a Modern Profession?

Connection or antithesis between education and creation? what is it?

—E. M. Forster, *Commonplace Book*

Schools are being built today that proclaim, by their architecture and facilities, a new era in education. In fact, they look like some of the more trend-setting workplaces in Silicon Valley (which, in turn, are sometimes called ‘campuses’). Gone are the long corridors with door after door. Instead, there is usually an atrium with greenery, places to sit and talk, sometimes even a sort of cafe. Branches lead off to rooms arranged in clusters. There are electronic music studios and television production studios, and, of course, computers everywhere. If these are not yet connected by fiber optic cables, the ductwork at least is in place.

The professional staffs in such schools are usually much concerned to adopt a pedagogy in keeping with the postindustrial look of the building. Often they have been hand-picked with that in mind. But this is where the vision begins to fade. Where is the new pedagogy to come from? Where are the new discoveries or the new ways of thinking that would open up a new educational vista?

Almost inevitably, the search for a new pedagogy will settle upon what has been ‘new’ throughout the past century, the educational approach that first came to prominence under the label ‘progressive education.’ It may not be recognized as such, for the labels keep changing; but often they have not changed very much. For instance:

<b>New Label</b>	<b>Old Source</b>
Project-based learning	<i>The Project Method</i> (Kilpatrick, 1918)
Learner-centered education	<i>The Child-Centered School</i> (Rugg & Shumaker, 1928)

Constructivist learning      Although constructivism is nominally attributed to Piaget, whose ideas began to catch on in North America in the 1960s, the operative meaning of constructivist learning among school people is essentially the same as 'learning by doing,' which Butts (1947) attributed to the 'activities movement' of the 1930s.

If the ancestry of the current innovations is pointed out, there is a standard response, polished through use by successive generations of reformers: Progressive education, they argue, was ahead of its time and never did take hold widely. Its time has finally come. Although the school world at large may still not be ready for it, the people brought together to staff the new 21st century learning environment are apt to feel that they, at least, are ready. Well, of course they are. They have no doubt already been practicing project-based, learner-centered, constructivist pedagogy in their former venues. That is how they got selected for the new school. What excites them in their new situation is that they will be able to teach the way they already try to teach, but with less interference and with more support from like-minded colleagues.

I do not mean to discount these aspirations. Progressive education, when it works well, can be wonderful to behold. But surely something is wrong when the best that future-oriented educators can come up with is an approach that reformers were advocating back when the horseless carriage was first appearing on the streets. The horseless carriage has in the meantime evolved from an unreliable, unstable, sputtering contraption, offering questionable advantages over its horse-drawn predecessor, to a smoothly functioning conveyance that can go a hundred thousand kilometers before it needs servicing. Progressive education, by contrast, comes to us with its original deficiencies unremedied and with its advantages over old-fashioned didactic pedagogy still vigorously disputed on the basis of strong evidence (see, e.g., Hirsch, 1996).

The futuristic school I have described represents a very privileged situation in education. Most of the literature on school change is concerned with getting schools up to that point—not so much technologically as socially; getting up to the point where a school staff has the license and the resources to design its own program. Let

us suppose further that the school board is supportive, that the school has good connections with a university where education and computer science professors are ready to work with them in a collaborative way, and that the school has been granted at least a temporary respite from the more onerous kinds of testing and accountability. This would seem like heaven on earth to most school faculties. There is a further problem of how the accomplishments of this school are to be extended to the rest of the system and how they are to survive once special favors and resources are removed. All kinds of political and economic issues enter at that point, but I want to focus on the immediate task, on the effort to produce a superior educational program. It is the crux. If it fails, then all the technology and other resources and the favored status and the teacher empowerment will have been for naught, and the issues of sustainability and dissemination will be moot: there will be nothing much worth sustaining or disseminating.

As I have suggested, the school's effort to create a superior new program is almost sure to fail. I want to get to the bottom of why such failure is the norm and to explore what could be done about it and how a better theory of knowledge and mind could help. To get to the bottom, we need to exclude all those cases which are the perfectly legitimate concern of those who study the sociology and politics of school change—the cases where change was imposed from outside and was defeated by a demoralized but stubborn teaching force, the cases where change was the pet project of an ambitious school administrator anxious to move on in the world before the bubble burst, the cases where an enthusiastically welcomed innovation collapsed for want of infrastructure and training, the cases where everything seemed to be going along swimmingly until there was a school board election. We need to understand why reform fails at the crux, at the point of deciding what change to make, given even the most propitious conditions for arriving at and carrying out that decision.

This inquiry will take us through the remaining two chapters. The problem, writ large, is education's inability to construct new possibilities and work toward them with sustained creativity. In the contemporary jargon, it is education's inability to function as a knowledge-creating institution. This failure is not to be laid on the teachers, the researchers, the administrators, the politicians, or any other particular group. The failure is systemic. That much is a truism.

The nature of this systemic failure, however, is more profound than most analysts imagine. There are, I argue in this chapter, two cultures within the education profession. One is a traditional craft culture and the other is a research culture. There is commerce between them, but each is stultified by the division, a division that does not exist in the more progressive professions. The solution, I suggest, lies in the evolution of a hybrid culture. For such a culture to emerge, the existing craft and research cultures must come together to solve common problems that require the knowledge and talents of both cultures. A problem that seems to have potential for cultural fusion is *teaching for understanding*.

This chapter closes with a discussion of how teacher education, which currently serves to perpetuate and even increase the cultural separation, might be transformed by making teaching for understanding its center. In the final chapter I return to themes introduced earlier. I try to show that both the construction of new educational possibilities and the disciplined creativity required to work toward them are hampered by our folk theories of knowledge and mind. They provide a conceptual framework that is both too narrow for the creation of new educational possibilities and too coarse to make useful distinctions. In order to get educationists away from their useless battles over methods and so-called philosophies and to get the public away from its fixation on test scores, we need the vision of a new kind of educated person. To work toward such a vision we need to be able to articulate problems and make useful distinctions among proposed solutions. For all of that our conceptual equipment is inadequate.

Throughout these chapters I treat modernization as a desirable objective. I do this in full realization that to many avant-garde educationists, “modern” is not only old hat but evil. “Postmodern” is the thing. “Modern” means greenhouse gases, technical rationality, imperialism, homophobia, and anything else bad you might think of, whereas “postmodern” means the opposite of all these things. Modernity has been mainly analyzed by people who dislike it, and so it is not surprising that they should characterize it by its excesses and lunacies. I’m afraid I tend to do the same when I discuss postmodernism.

The one distinctive characteristic of modernity agreed upon by friends and foes alike is *dedication to progress*. Only the most naive and the most sophisticated believe that progress is inevitable,

inherent in the nature of things.<sup>1</sup> The normative modern view is that progress is something that can be pursued deliberately, through problem solving and creative effort, with a reasonable likelihood of success. Everyone now expects this, and the postmodernists and others who deny that there is progress are either being disingenuous or are applying extreme criteria. When AIDS appeared as a new, grave, and mysterious disease, a public cry went up for research. It was only the most knowledgeable medical scientists who warned that it might not be possible to find a cure or a vaccine. However they, along with everyone else, assumed that progress of some kind was possible, as indeed it proved to be.

When an educational crisis captures headlines, there is no public cry for research. There is not even a cry for it within the teaching profession. Whether it is declining test scores, evidence of widespread functional illiteracy, or a stunning demonstration of people's scientific ignorance, people assume that the knowledge necessary to deal with it *already exists*. This is the mark of a premodern profession, one that is not systematically generating progress. A modern profession is driven by awareness of what is not known. Each advance in knowledge raises problems that need to be solved in order to advance further.

The failure of education to modernize has not been for lack of trying. From scientific management in the early part of the 20th century to a Web page for every student at the end, school administrators have zealously pursued whatever looked like the coming thing. Every big new idea in the human sciences, and some big ideas from outside, have found their way into educational thought—behaviorism, psychoanalysis, information theory, game theory, hermeneutics, social constructionism, activity theory, symbolic interactionism, semiotics, situated cognition, sociobiology, memetics, and on and on. Sometimes these have been degraded or distorted, but not fatally so, as a rule. Education, as an academic discipline, enjoys a reasonably active and varied intellectual life. The trouble is that in order for any of this thinking to make its way into practice, it has to be passed through a conceptual machine that coverts it into a product, a procedure, or a slogan. Like the flour mill that removes the bran and the wheat germ, leaving only the starch, this conceptual machine removes all the thought. There have been repeated efforts to put education on a scientific basis by finding ways of translating research and theory into practice, but this too has

usually amounted to converting them into products, procedures, or slogans, eliminating core ideas in the process.

### **Failure to Connect Research and Invention**

In late summer nearly every year I get calls from journalists who are preparing feature articles on education to appear at the beginning of the school year. They never ask questions like “What’s new?” or “What advances have been made in education in the past year?” Those are the kinds of questions they would ask medical researchers or computer engineers but it would not occur to them to ask such things of educational researchers. Instead, they ask “What’s the evidence that reading is getting worse?” or “I’m doing a story on Method A versus Method B. Do I have it right that you’re in favor of Method B?” or “What does research show about whether computers improve learning?” To them education is a field that does not progress. It is a field that has problems and issues but it is not a field in which this year’s knowledge is expected to have advanced beyond last year’s. There are innovations, and they will do feature articles about those as well, complete with classroom photographs showing students having a swell time learning. But to find out about innovations, the reporters go to the schools. They will only call a university in the vain hope that they will be told of research that shows whether the innovation is good or bad.

For stories on innovations in medical treatment, reporters would not go to the local hospitals (although they might find some there). They would go to the research universities and their teaching hospitals. When educational research was new, when the *Journal of Experimental Education* was founded and there were visions of something comparable to the rise of experimental medicine, many universities and teachers colleges started their own schools. These were intended not only as training grounds for future teachers but as centers of leading-edge experimentation, on the model of teaching hospitals. Now most of those schools have disappeared. With a very few exceptions those that remain have evolved into subsidized private schools that are if anything more conservative and resistant to innovation than the average public school. The story of why educational research failed to realize its dreams has yet to be fully written and I am not going to attempt an off-the-cuff historical analysis. Suffice it to say that the journalists, naive as most of them are about educational matters, accurately sense that the education beat is something quite different from the medicine beat or the

science beat or the technology beat. It is more like covering religion—or fashion.

In a magazine of circa 1908 there appeared an ad for an automobile—the Reo, I believe it was. Among the claims made for it was that the steering wheel was “where it belongs”: in the middle. If automobile design were pursued the same way as educational policy, there would have followed years of research comparing the effects of different locations of the steering wheel. The likely result would be that one location would show up better according to certain criteria and another would show up better according to others. There would be methodological disputes—for instance, between those who place their confidence in quantitative measures and those who prefer more ethnographic approaches to steering wheel research. Eventually, perhaps, the weight of evidence might tip in favor of one location over others, but it would not be compelling enough to convince those strongly inclined toward a different view. To this day there would still be steering-wheel-on-the-right advocates, bitterly critical of those advocating steering-wheel-on-the-left, and a goodly number resolved that the steering wheel should be in the middle “where it belongs.”

The kind of research I am referring to is called “decision-oriented” research, indicating that it is supposed to help in deciding what to do. It has an important place in modern life. Should a new drug be approved for use? Should all passengers in an automobile be required to wear seat belts? Where should a toxic waste disposal site be located? These are decisions that one hopes will be aided by solid research, for the alternative is to let prejudice and politics have the field to themselves. New decision-oriented findings on health issues, such as the benefits and risks of hormone replacement therapy, regularly make headlines. But in progressive fields, decision-oriented research goes hand-in-hand with invention. My doctor tells me that he and his colleagues have started taking a more “aggressive” approach, as he puts it, to high cholesterol levels in people with no evidence of heart disease. One reason is decision-oriented research showing the risks associated with even moderately high levels of serum cholesterol. The other is the appearance of new drugs that are more effective and that have fewer side effects. Belief that the new drugs have these virtues is, of course, also based on decision-oriented research. But decision-oriented research did not produce those improved drugs. That came about through a process

of invention, grounded in more basic, explanation-seeking research. Decision-oriented research will not only show which of the new drugs is better under different conditions, however; it will also produce results that spur and guide the next round of invention. Invention, in turn, alters the decision problem, sometimes profoundly. The steering wheel problem was not finally decided by research. Through a series of inventions and design improvements in automobile steering and suspension systems, the problem of where to locate the steering wheel shifted from one of maintaining control over a wobbly set of wheels to one of situating the driver for purposes of vision and convenience—a problem that common sense could solve.

In education, research and invention do not boost each other the way they should. There is invention, of course. Creative teachers keep coming up with novel approaches to teaching problems. But these owe little to research and are seldom the object of research. Educational inventions also come from universities and research centers; these are more likely to draw on and sometimes even be part of more basic behavioral research. But only within the most limited areas do you find what Alfred North Whitehead called “disciplined progress.” Invention in education does not have the dependable, cumulative quality that it has in modern professions and modern industries. Most decision-oriented teaching research tests the effects of broadly defined variables, such as phonics versus whole-word methods of teaching reading, the use of questions inserted in texts, types of rewards and feedback, and attributes of teaching performance such as clarity. This kind of research sometimes yields useful findings but, as with the fictitious steering wheel research, they are seldom conclusive enough to resolve a controversy. More importantly, however, they do not contribute to innovation.<sup>2</sup>

What would automotive engineers have done if research had shown, for instance, that placing the steering wheel in the middle worked best for tall people but short people did better with a steering wheel on the side? Producing different automobiles for tall and short people would not be a likely option, and for more than economic reasons. Once such a process of differentiation started, where would it end? Different braking systems for introverts and extraverts? Right and left cranking engines for right and left handers? A fledgling industry would never get off the ground that way. Instead, sensible engineers would have investigated what kinds of troubles

people had with differently placed steering wheels and would have tried to redesign the car to eliminate those difficulties. Further research might show that in eliminating one difficulty they had created another, but that's the way problem solving often goes. They would then invent a way to eliminate that difficulty, and so on. That is how things are done in any field where there is a good working relation between research and invention.

### **The Two Cultures in Education**

Educational research's lack of practical relevance is an old complaint (Kaestle, 1993; Lagemann, 1997). Yet there have been advances in pedagogical science, if I may use that term. Especially in reading and in elementary mathematics, there are methods available that are markedly superior to those available a century ago. Indeed, there is scarcely any academic subject that could not be taught better today than it could have 40 years ago, when I was becoming a school teacher. Researchers complain that these advances are ignored, but that isn't quite the case. The case is worse than that.

Research does have an influence on practice. A small but significant part of the education establishment is dedicated to making that happen.<sup>3</sup> The delay may be 10 years, but the worst part is what happens to it in those 10 years. It undergoes a series of simplifications and corruptions so that by the time it finally reaches the classroom it is no longer an advance in knowledge. It is hardly knowledge at all. New concepts have been translated into familiar ones. New approaches have undergone the kinds of reduction I discussed in Chapter 8—reduction to subject matter, to activities, or self-expression. A decade of research on cognitive strategies gets reduced to a wall poster that could just as easily have been produced 50 years earlier on the basis of Dewey's *How We Think* (1933). A theory of multiple intelligences gets reduced to Mickey Mouse activities and the fond belief that everybody is smart in some way. Everything that reaches the schools has gone through several if not many stages of dumbing down.

The dumbing down is not calculated, of course. It is symptomatic. Some blame it on the top-down character of a social process that assigns teachers a lowly and dependent status as the recipients of knowledge rather than participants in its creation (Clandinin & Connelly, 1998). Others, less popularly, blame it on the poor preparation of teachers, which leaves them incapable of reading research first-hand. What all may agree is that it results from a

largely unsuccessful effort to connect research to the daily concerns of practitioners. But to me all of these are also symptoms of a yet more fundamental failure. It is the failure of education to develop into the kind of profession that continually transforms itself through knowledge creation and invention.

That is why the teachers in the spanking new technology-ridden school are stuck. They have set themselves the task of inventing something—call it a program or an educational approach. They may bring in supervisors, consultants, and university researchers to help them, but their task is one for which the education profession as a whole lacks capacity. It is the task of envisioning a new possibility and working toward it through what Whitehead described as “a process of disciplined attack on one difficulty after another.”

The ironic and pathetic situation in which the staff of our self-styled school of the future find themselves amounts to this: Theirs is a preindustrial craft dropped into a postindustrial setting. They really have little choice but to assimilate the new technology as best they can to their traditional practices. For teaching is indeed a traditional craft. It is learned through apprenticeship or, in its absence, emulation and trial-and-error. Like traditional agriculture, medicine, and metal work, its practices evolve slowly; in a stable world they may become nicely adapted to conditions, but they lack means for rapid change and purposeful innovation.

The traditional craft character of teaching is shown as much by its strengths as by its weaknesses. Any researcher who has tried to actually take over a classroom, as opposed to merely holding forth as a guest of the teacher, quickly appreciates that teachers have an art that they lack. Every skilled teacher has a way of managing a classroom which, under any reasonably favorable conditions, results in a peaceful, orderly, friendly, but down-to-business atmosphere. Skilled teachers are said to have eyes in the backs of their heads. They can attend to individual students in a personable way while simultaneously monitoring and tending to the rest of the class. And most of the time they can do this without undue effort or strain. Beyond this public level of activity, good teachers will have a caring relationship with each individual student that is mutually rewarding and supportive, yet which is unequivocally a teacher-student relationship rather than a buddy relationship or a parent-child relationship. This is truly impressive art, and the wonder is that it is so widely developed among teachers, given the poor means

available for transmission.<sup>4</sup> It is just the kind of art that traditional crafts and professions are good at developing, and which traditional mechanisms of apprenticeship are good at transmitting. This does not mean that it is a static art. Society changes. In recent times teachers have had to learn to do without corporal punishment and to accommodate to a rising egalitarianism. Such adaptations have not always been easy, but they fall within the range of adaptations that any traditional craft is able to make.

The weaknesses of the traditional craft show up in instruction. ('Instruction,' as I have remarked before, is not the right word but no better one is available. What I mean is all the things teachers do, whether of an overtly didactic nature or not, to achieve learning objectives.) Instruction does not progress. Instruction undergoes changes in response to fashion and politics but not as a result of problems having been solved. A fifteenth-century textbook, marking the dawn of arithmetic instruction, seems quaint to us because of the lack of mathematical notation, but the pedagogy is about the same as that of the currently most popular back-to-basics series (Swetz, 1987).<sup>5</sup> They didn't have a good way of teaching proportionality then, and we still don't.

In modern professions such as dentistry and engineering, progress is taken for granted. But it does not just happen. These professions are organized and conducted in ways that make it happen. They were not always that way. Dentistry and engineering were once slowly evolving traditional crafts just as education is today. Clearly, scientific knowledge has been essential to their progress, but there is more to it than that. They have not merely been the beneficiaries of scientific advances. These and other modern professions have become knowledge building communities. Although some members of the communities specialize as creators of new knowledge, the profession as a whole is geared to knowledge advancement, depends on it, and has a part in it. In order for education to become a modern profession, it must begin to organize itself around the creation of knowledge.

But here we encounter a serious obstacle. Unlike the health and engineering professions, education is a profession in which research and practice are separate cultures. There is a research culture in which the solutions to educational problems are sought through trying to understand processes, mainly cognitive and social ones. And then there is a culture of educational practice, in which moral

precepts and the accumulated lore of the profession dominate discourse. Although there is a good deal of traffic between the two cultures, they differ fundamentally enough that cooperation is difficult and fraught with misunderstandings.

It is no doubt true in other professions as well that the most advanced research is unintelligible to the least sophisticated practitioners. But in medicine, for instance, an unbroken continuity of interest and understanding can be traced from medical researchers to doctors in teaching hospitals to specialists to general practitioners and even to the kind of lay people who read things like the *Berkeley Health Letter* or the medical sections of news magazines. All belong to the same culture, which is a culture of scientific medicine that developed during the nineteenth century. Even though there are important concepts that people on the less sophisticated end of the continuum may never have heard of or may have grasped in a limited or distorted way, there is nevertheless a shared conceptual framework such that ideas of infection, immunity, risk factors, and the nature of various diseases provide a basis for meaningful cooperation across the spectrum.<sup>6</sup>

Throughout most of the 19th century, however, medicine in North America had a cultural split not unlike that of education in the 20th century. As summarized by Barbara Floyd in her introduction to a University of Toledo exhibition<sup>7</sup>:

Two parallel threads run through 19th century American medicine: one of evolving medical theory and expanding knowledge that eventually furthered the profession; and the other of the daily practice of medicine in the field. The evolutionary side, or "scientific medicine," was led by the great medical minds such as Benjamin Rush, but was nonetheless ineffective in treating patients. The other side was dominated by quacks who promoted bizarre treatments like water cures and electrical garments which, while also ineffective, were enthusiastically followed. These two paths often crossed one another and mixed theories and techniques. Scientific medicine took on aspects of quackery to gain patient acceptance, and quackery assumed aspects of scientific medicine to gain credibility.

The analogy to education in the 20th century is so striking that it is tempting to expand on it, but that would take us too far afield.<sup>8</sup> The more important point is this: Pedagogical science at the beginning of

the 20th century was about on a par with medical science at the beginning of the 19th. Its progress over the ensuing century was at least comparable to that of medicine in the previous century, arguably superior in important respects. Yet by the end of the 19th century medicine had largely resolved its cultural split and was well on its way to becoming a unified modern profession, whereas education is perhaps more divided than it was at the outset.

The gap between the research and practitioner cultures in education was most impressively brought home to me some years ago when a teachers' federation in my province commissioned a study of childhood education. In the archaic way that such things are done in Canada, the inquiry consisted of a panel of important persons who set up hearings at which all and sundry were allowed to make presentations. OISE's research director of the time asked me to go around to the hearings and put in a word for research. I prepared a mild five-minute presentation to that end, but I scarcely got through the first minute of it before the chairman interrupted and obliged me to spend the rest of my allotted time listening to him heap abuse on educational research, allowing no time for reply. In truth, however, I would not have known how to reply.

His complaints were all stated as things that school people had told him, and they ranged from the unreadability of educational research to its utter irrelevance to practice. Teaching, I was told, is an art and cannot be reduced to a science. Research says what is true of the average student, but teachers know there is no such thing. Its practical implications, when there are any, are things teachers already know. Generations of educational researchers, better prepared than I, have responded to these criticisms by trying to show that research does in fact have something worthwhile to contribute to educational practice. Their success has not been impressive.

What I now realize is that the importance of these chronic complaints about research does not lie in their substance but in what they reveal about the estrangement between research and practice in education. I do not mean that the complaints are without substance. There is plenty of irrelevancy and naivety and occasionally arrogant scientism to be found in educational research (the estrangement having been bad for research as well as teaching), and there are plenty of problems for which research provides little that is helpful. But in a healthy, modern profession such shortcomings would be seen as shared problems of the profession, not as reasons to dismiss

research.<sup>9</sup> There would not be this antagonism, this posturing of “us” against “them.” And in a modern profession there should be no issue of science versus art. It should be obvious that the two progress together.

The split between the two cultures is not a simple one of town versus gown. A large part of the faculty in schools of education—especially in those schools of education that carry the main burden of teacher preparation—belong to the craft culture rather than to the research culture. They are former teachers or administrators who obtained graduate degrees studying under people like themselves. In the course of their graduate study they may have acquired advanced ideas that set them apart from their former colleagues (they may have become postmodernists, for instance), but that does not make them members of the research culture. Some of them may seriously take up the role of bridging between the two cultures, a difficult but worthy task. But it does not bring the two cultures together. It does not create the continuity of interest and understanding that binds medical researchers, medical educators, practitioners, and knowledgeable clients together in a progressive endeavor.

Fundamentally, the two-cultures issue is not about human relations. It is about whether people are working in the same or different problem domains. Quite possibly educational researchers and teachers get along better and cooperate better with each other than do medical researchers and practitioners. The issue lies deeper than that. The work of a cancer researcher, experimenting with mouse cells in a laboratory, and the work of the attending physician in a hospital cancer ward have nothing evident in common. The work they do, the tools they do it with, and the people with whom they communicate are all different. To a time-traveler from the seventeenth century, it would indeed be incomprehensible that these two should belong to the same profession. The reason it seems plausible to us is that, even with the sketchiest knowledge of cell biology, we can appreciate that what goes on in the cell research laboratory and what goes on in the cancer ward are relevant to the same problem domain. It is not simply that they have the same topic of interest. What is found out in one alters, complicates, or contributes to the solution of problems faced in the other. Educational researchers and practitioners obviously share the same topic of interest. They may share many of the same motives and

ideals. But they do not yet share a problem domain. What it will require in order for them to do so is conceptual change, not just improved quality of social interaction.

### **Who Needs Research?**

One of the important phases in the evolution of modern medicine was a period that, according to Lewis Thomas (1983), ran from the middle of the 19th century up to the discovery of penicillin in 1928. It was a period when enough was understood about diseases that doctors realized the inadequacy of their treatments—realized, in short, that they did not have the knowledge required to solve most of the problems that patients brought to them. Medical practice became conservative, concentrating on the limited number of diseases that were treatable and, for the rest, merely trying to sustain patients while the patients' bodies did the work of fighting disease. But it was also a time when research thrived and many doctors engaged in it, because they realized that was the only way medicine could advance.

Education has not yet entered that phase, although the time is ripe for it. After three decades of cognitive learning research, enough is now known about the difficulties of learning various skills and disciplines that the pervasive inadequacy of present means for teaching them is clear. But we don't find teachers saying "I don't know how to teach such-and-such." They might say "I don't know such-and-such well enough to teach it," but that is a different matter. The presumption is that if you know something and are a competent teacher, then you can teach it. Teaching is where medicine was before the phase I refer to. Medicine was then also a traditional profession.

Traditional professions are marked by a certain complacency, which must not be confused with indifference to results or lack of feeling for the people whose welfare is in their hands. It is a complacency that centers around doing your job well. If you do your job well, according to the standards of your profession, then whatever failures occur are not your fault. At the level of the individual practitioner, that is a sound and virtually essential belief. The best you can do is the best you can do, and you must not lose heart when, having done your best, the patient dies or the student fails to learn. But if that same belief is generalized across the profession as a whole, it is a barrier to progress.

In education, an elaborate conceptual and bureaucratic system has evolved to spare not only the individual teacher but the system as

a whole any blame for failure. There is the infamous IQ. It is no longer much used to channel students, but it still serves to maintain professional complacency: As long as the smart kids are succeeding and only dumb kids fail, the education system is free of blame. Society or genetics or the two in combination are at fault. The channeling of students has now been taken over by a much more complex system of categories, mainly comprising what are called 'learning disabilities.' Students labeled with a learning disability, 'limited English proficiency,' or some other limiting condition may not be removed physically from the regular classroom, but they cease to count as failures of the classroom process. Often this is literally true; they are excluded from the test score averages by which schools and teachers are judged. Dossiers are compiled for every student and maintained throughout the student's school career, to be mined for explanations in case of failure. Alessi (1988) examined school psychologists' files on 5000 students diagnosed with one or another learning problem, and found not one single case in which the problem was attributed to inadequate teaching. From the outside this looks like a cover-up, similar to what might go on in a corrupt police department. But it is better understood as the inevitable tendency of a traditional profession (of which policing happens to be another example) to form a protective belt around the complacency that goes with doing a good job.

This complacency is vulnerable to catastrophic collapse, however. There are signs that this is happening today with teaching. When governments, the press, and parent groups start complaining about low standards and demanding accountability, there is hardly any way for teachers to interpret this except as an accusation that they are not in fact doing a good job. In a traditional profession there is no way to respond to such an accusation. The individual practitioner can say, "I am doing as good a job as my colleagues," but when the whole profession is under attack, there is no standard to fall back on. Then the day-to-day failures and shortfalls that all conscientious teachers are aware of rise up in their minds and make them start thinking that perhaps they are not doing a good job after all, and they start counting the months to early retirement.

Science threatens professional complacency, too, but not in so damaging a way. It does not say to the teacher, "You are not doing a good job." It says, "You do not know enough—nobody knows enough yet—to succeed in the task our profession has taken on."

That realization does not negate professional self-esteem, but it requires it to shift its ground. Professional standards for doing a good job still matter. The issue on which medical malpractice suits are supposed to be decided is whether the physician's performance was up to accepted professional standards.<sup>10</sup> But the standards move with the advancement of knowledge. A physician whose treatment of a patient conformed to the standards of 20 years ago would not only have a poor defense in court but would be in danger of losing his or her license to practice. In a modern profession 'doing a good job' is a moving standard that binds practice to scientific progress. Professional pride for a modern teacher would not rest on the stubborn belief that "I am doing a good job regardless of what the critics say." It would rest on the belief that "I am doing my part in a profession that is making progress on formidable and important problems."

In a modernized profession, teachers, being themselves deeply concerned with learning and understanding, would set a more meaningful standard for themselves than tritely 'keeping up with the field.' The idea of knowledge building, elaborated in Chapter 8, applies to teachers' knowledge as well as that of their students. Like their students, teachers should conceive of themselves as part of the culture that is advancing knowledge, not merely onlookers or gleaners. They should not merely be scanning the research literature for ideas and pointers that they can use. They should be actively constructing their own theoretical understanding, drawing on and reconstructing the knowledge represented in the literature and trying to improve and advance it. In short, they should live constructivism, not just preach it and teach according to their understanding of it.

### **Possibilities of a Hybrid Culture**

Proposals for what to do about the gulf between research and practice take two divergent paths, but along both paths there is insufficient recognition of the extent of the cultural divide. The more frequently traveled path is that of teacher education. William Gardner, who headed a group that produced what was eventually published as the *Knowledge Base for Beginning Teachers* (Reynolds, 1989) summed up the widespread conviction that teacher education needs to be infused with new knowledge. In his preface to the volume he argued that doing what is normal no longer suffices in teaching,

that there is a state of the art and that beginning teachers need to be brought abreast of it:

This knowledge base has been generated in research, broadly defined to include studies of teaching, group processes, adult learning, and studies of historical change; and in the tested practices of leading professionals, moral propositions, legal precedents, and more. A new and higher norm is now possible for teacher education, one which reflects the best that research and experience can offer. (Gardner, 1989, p. ix)

The objective here is to have teachers assimilate, as part of their professional development, the knowledge generated from research. Even assuming that this is done in a thoughtful way, stirring to the imagination, it does not make teachers part of the same culture as researchers. The knowledge is still something produced 'out there' in another world. Although assimilating new knowledge might make better teachers, it does not make a progressive profession. Furthermore, this approach fails to reckon with the extent to which teacher education itself is in the hands of people estranged from and distrustful of the research culture.

The other path would have researchers stop pretending to have the answers, listen more to teachers, respect their expertise, and join with them in collaboratively researching questions that really matter to the teachers (Hunt, 1992). At worst, this consists of alienated academics joining with disaffected teachers in an anti-institutional ménage. At best, it results in close and productive working relationships, in which teachers themselves become producers of knowledge (Wells, 1994). Even at best, however, this second approach is a form of surrender as far as the modernization of teaching is concerned. It is a way for researchers to function *within* the traditional craft structure of teaching. They may, in this way, bring new knowledge and ideas into the craft, but we are still looking at an evolutionary process of change to be measured in centuries rather than years.

The first approach may be thought of as an unlikely effort to close the cultural divide by bringing teachers into contact with research. The second approach closes the divide by assimilating research into the traditional craft culture. A modern profession of education would instead constitute a new culture, born out of a fusion of the other two, and exhibiting the hybrid vigor to be expected from such a mating.

This hybrid culture is not pure fantasy. Living examples of it may already be found. Virtually every leading-edge experimental project in teaching involves intense collaboration between researchers and practitioners. In the ones I have had contact with, there is plenty of mutual respect, but there is a good deal more. There is a sense of tackling something big, very challenging but immensely promising. It is a shared sense of mission that brings the two cultures together. Of course there are difficulties, and every successful project seems to require at least one person who puts heroic efforts into human relations. But there is a world of difference between what goes on in these dynamic projects and what goes on in many other professional development efforts, where social relations and personal feelings become so central that it is more like group psychotherapy than professional collaboration. I think it is fair to say that in the successful experimental projects a common culture emerges. Differences in expertise are not minimized; indeed, they are exploited to the fullest. But there is a continuity, such as I described in medicine, a path linking basic research, daily practice, and points in between, with information flowing both ways.

The projects I am referring to are mainly based at a relatively small number of universities with research-oriented education faculties, each project involving a small enough number of practitioners to allow intense collaboration. They cannot serve as a model for educational change because, in the reform jargon, they cannot 'scale up.' They are bound to remain small and to some extent aberrant. There are much larger projects, designed to scale up to thousands of schools. However worthwhile these efforts may be, they do not solve the two-cultures problem. Some are of the top-down variety, presenting a set of standards and methods which the schools implement. Others, which are more concerned with the social dynamics of change than its content, work within the traditional craft framework, facilitating the work of local groups (like the staff of the high-tech school I have been using as an example) to plan their own educational reform. Implicitly, they assume that the knowledge necessary for the improvement of practice already exists within practice.

Although the leading-edge projects cannot be expected to expand into large-scale reform movements, they contain the essence of what large-scale reform could aim at. But this essence is poorly understood—by almost everyone, I would say. I earlier described

teaching as a traditional craft that changes through an evolutionary process. Bringing science into union with educational practice does not mean replacing bottom-up evolution with top-down design—even if practitioners are made partners in the design process. The introduction of science should instead speed up the evolutionary process, leading it to home in more quickly on good designs.

Here I am drawing on Daniel Dennett's important work, *Darwin's Dangerous Idea* (1995). Dennett argues that evolution is itself a design process, and is fundamentally the same process as is involved in science and technology, except that in the latter cases ideas—'memes'—are the units rather than genes. Biological evolution cannot look ahead. Science and technology can look ahead a short distance; but most progress has to come about through the same bottom-up processes as biological evolution. I cannot summarize here Dennett's explanation of how evolution converges so readily on designs of elegance and complexity. Suffice it, for present purposes, to say that the necessary conditions are just the familiar Darwinian ones: variation, reproduction, and selection.

Evolution in education is hampered by deficiencies in all three of these conditions. Layers of bureaucracy function to suppress variation. Education in the United States has been perhaps the least constrained in this regard, and despite the continuing efforts of groups internal and external to the education system to stamp out pedagogical diversity, the U.S. remains education's tropical rainforest. But reproduction of variants is abysmal everywhere. The most brilliant pedagogical idea of all time could arise in one classroom and remain unknown to the teacher next door. If it did become known, however, its brilliance would likely go unrecognized—even by the teacher who hit upon it. For in cultural evolution there is more to selection than eliminating the less fit ideas—although that is essential, and education has little capacity for that, either. There is also recognizing good ideas and, if only to a limited horizon, seeing where they could lead and what they could generalize to.

The great and unrecognized role of researchers in the leading-edge projects I have been talking about is to aid in the evolution of ideas, only a few of which come directly from them or from their research. In the first place they create and defend experimental environments within schools where diversity can flourish with less

than the usual amount of interference—protected parts of the rainforest, if you will. They act as agents of reproduction, helping to spread ideas both within that environment and to other hospitable environments. But their most distinctive role is in selection. There are many reform projects that serve the first two roles, encouraging variations and facilitating their spread, but they fail in the all-important process of selection. There has got to be a way for good ideas to win out. The use of gross outcome measures, such as standardized achievement test scores, has some value in signalling that a system is doing something wrong or something right, but it is far too crude an instrument for selection at the level of the individual design ideas that must be compounded into a significant new structure. Intelligent selection requires, above all, seeing where a novel idea could lead, and that requires being close to the action, deeply involved in its problems, and at the same time having the large view, the background knowledge, and the leisure to reflect, which are all needed in order to make something general out of something particular.

I want to elaborate on the idea of “seeing where a novel idea could lead,” because to me it is the sine qua non of a progressive discipline, research program, or profession. Decision-oriented research, which has been the norm in education, is necessarily retrospective. It generalizes from what has already happened in order to predict the results of future choices, assuming that the past will repeat itself. This need not be a simplistic assumption. It may be conditional on a number of variables whose effects have been assessed, again with the expectation that those variables will continue to act in the way that they did in the past. It is reasonable to expect such continuity, provided nothing exceptional happens. But one of the exceptional things that can happen is progress. Although method A has typically produced better results than method B, method B may be improvable, may lead somewhere, whereas method A is all it will ever be. Decision-oriented research can say nothing about such possibilities, nor can the many kinds of descriptive and analytic research that are carried out in classrooms. It takes people who are actively engaged in the pursuit of progress. To return to the automobile as an example, early research would have shown the horse to be superior in most respects: faster, stronger, quieter, more dependable. But the automobile was

improvable whereas the horse was not. Engineers could see the potential and they devoted great energy to realizing it.

Here is a small example of assisted idea evolution, drawn from work I have been involved with, the design of Computer Supported Intentional Learning Environments or CSILE (Scardamalia & Bereiter, 1996b). CSILE uses a multimedia database that all the students in a network have access to. Their work on a topic or problem is stored as notes in the database, which other students can view, comment on, add to, or link. A common problem has been that notes proliferate without any organization, with the result that a lot of individually worthwhile findings and ideas appear but integration is lacking. What looks like it is going to be a major advance on this problem appears in the current version of CSILE software, which is called Knowledge Forum<sub>(R)</sub>. It is the addition of “views.” A “view” is a higher-order note that provides a conceptual framework for individual notes, locating them on a map, a picture, a concept net, or whatever. As new notes are generated, students can place these on one or more views, and even construct a view of other views. An outside expert can sometimes contribute more to an inquiry by constructing a view of what has been happening than by commenting on individual notes. When a group was working on explaining how airplanes fly, for instance, a university student of fluid dynamics contributed by producing a view that separated out explanations based on Bernoulli’s principle from ones related to Newton’s third law (which the participants were unaware of) (van Aalst, 1997).

This idea of a “view”<sup>11</sup> can be traced back over about five years to an innovation originally created by some school children. With the equipment in use at that time, disk storage space was a problem. Toward the end of the year the disk was getting dangerously full, and so the teacher instructed students to delete all nonessential graphics notes (graphics being the big hog of disk space). One student had produced a particularly fine picture of a kitchen. Not wishing to delete it, she got together with her friends to devise a way to incorporate it into their current project, which was about fossil fuels. Their solution was to use the picture as an organizer for an inquiry into all the uses of fossil fuels that can be found in a kitchen. Notes were linked to the kitchen scene, and other notes linked to those. You could click on the refrigerator and get a view of the inside of the refrigerator, click on the bowl of jello and get a note explaining how fossil fuels were used in the plastic wrap covering the bowl.

It would seem from this account as if the children did all the inventing and the researchers did nothing but make the invention a feature of their software. But there are at least four additional contributions for which the researchers can claim some credit:

1. Somebody had to notice and appreciate the kids' invention.
2. The kids were only solving an immediate problem; somebody had to recognize that the idea could be applied more widely.
3. There is no indication that the kids were thinking about the educational value of the innovation; somebody had to recognize its relevance to knowledge integration.
4. The knowledge integration achieved in the fossil fuels case was of a superficial kind. All that held the various items about uses of fossil fuels together was that they pertained to the same place. Somebody had to see how views could be made to serve more principled kinds of knowledge integration.

In the hybrid culture I have been talking about, teachers would have a part in all four of these contributions, but they would also recognize the value of a division of labor, which has researchers bringing more time and more specialized knowledge to the job of exploiting the potential of idea mutations. When researchers and teachers work together, even under the best conditions of mutual respect and commitment, there is an inevitable division of interests. The teachers, by virtue of their responsibilities, have to be interested in the here-and-now solution of problems and attainment of goals. The researchers are bound to be interested in knowledge of more universal application. Indeed, where this is not so, the supposed researcher is not really a researcher or else has stepped out of that role in order to be of service.<sup>12</sup> This division of interests persists in the hybrid culture, but there is a blending of interests that goes beyond the sort of broadening that one expects to result from any fruitful meeting of minds. There is a shared conviction among the researchers and the teachers that solving the here-and-now problem or achieving the here-and-now goal will result in something of general significance. There is thus a sense of a common mission that is in harmony with and that advances the interests of all the participants. As with medical research, it is recognized that the patient may die but the science advances. That is, the here-and-now effort may not succeed, but what is learned from its failure, coupled with other learning, may advance the field of education. Because of

this, the teachers can enjoy a certain objectivity that is denied to those who are isolated in their traditional craft.

There are many worthwhile collaborations between education professors and teachers that do not lead to a progressive hybrid culture. No matter how egalitarian these relationships may be at a personal level, from the standpoint of the work being done it is a relation of servant to master. In the classic case, the professor conducts the research and the teacher enters into it as a subject or as a subordinate collaborator. In the more widely approved contemporary case, the professor assumes the servant role. Sometimes it is an exalted kind of service, that of a guru, or it may be the most mundane of fact-gathering services. But in any case it takes researchers out of their roles as advancers of knowledge, and so the culture of research-based knowledge creation is not brought into the practitioner community, even if some of the creators of knowledge are present in person. They are, we might say, reduced to the status of experts—experts in the limited sense of specialists who are brought in to do a particular job but who are not part of the enterprise within which the job is done.

To generalize, two conditions need to be met before there is much chance at all of a fusing of the research and practitioner cultures:

1. There needs to be a shared vision, but it should not be merely a vision of local improvement, nor should it be merely a statement of values or guiding principles. It has to be a vision of possibilities not yet fully discernible. That may sound too airy for some tastes, but I submit that it is the kind of vision that guides every creative enterprise.

2. This vision must create a *need* for research that is keenly felt by the practitioners as well as the researchers. Again, this is something to be found in all progressive enterprises. There is nothing eggheaded about it, nor is it a call for practitioners to bow down before researchers. I am part of a large telelearning research network that includes academics, educators in public and private sectors, and people in various learning media businesses.<sup>13</sup> I have been struck by the fact that it is the business people who keep pressing for research, whereas educators tend to feel that they already have the answers. This has got to change if education is to join the modern world.

### **Teaching for Understanding as a Test Case**

In order to move this discussion to a more concrete level, we need to settle on an example of a sharable vision. There are worthy visions that are already generally shared by researchers and practitioners—most notably social visions, such as equity, and visions of educational process, going by names such as “constructivism.” These may unite researchers and practitioners in trying to make something work or in battling a common enemy, but they do not generally create a keenly felt need for research. It is not that research is perceived as irrelevant; sometimes it plays an important role, especially in persuasion. But you do not find practitioners feeling stuck for want of knowledge. You do not find people looking to research to help them separate good from bad, progress from backsliding. People do not look to research to lead them toward a clearer vision.

Teaching for understanding is a sharable vision that can meet the two criteria stated above. Nearly all practitioners and researchers are in favor of it, although they may differ in how they conceive of it and what priority they would assign to it. But, as I will try to show, it represents a vision of possibilities not yet fully discernible and there is a need for research that will be appreciated by everyone who gets seriously into the pursuit of it.

I intend to dwell on this example through the remainder of this chapter and the next. These chapters will be misread, however, if they are seen as mainly an argument in favor of teaching for understanding. Other writers have argued that well enough already. Rather, I am using teaching for understanding as representative, as a test case. Teaching for understanding is a constitutive problem of education, one that has shaped the profession from the beginning. Yet it is one on which there has been no sustained progress—despite sustained progress in the disciplines that education draws on for its subject matter. We understand the natural world far better than Aristotle did, but it is not clear that we know much more about promoting understanding of it than he did. Teaching for understanding is not the be all and end all of education. None of its advocates, including me, suggests any such thing. But if education cannot make progress in teaching for understanding it is a failed profession; a conceptual framework that cannot usefully illuminate teaching for understanding is a failed conceptual framework. That is the sense in which teaching for understanding is a test case.

### **The Present State of Teaching for Understanding**

Teaching for understanding is given high billing in curriculum guidelines and policy documents, but that does not make it a priority in the actual conduct of schooling.<sup>14</sup> In the elementary school

mathematics market research that I have seen, understanding did not merely rank low among the priorities teachers identified, it did not even arise with sufficient frequency to make it on to the list!

To me the strongest evidence that understanding doesn't count for much in practice is the lack of response to findings about misconceptions. Starting in the early 1980s, research began to pour out documenting pervasive and deep misconceptions in virtually every school subject, misconceptions that persist despite instruction. The findings stimulated further research into the nature of these misconceptions and, more generally, into the nature of understanding in various disciplines. That research continues to advance and now probably constitutes the largest body of research in cognition and instruction. Findings have percolated down into practitioner journals, so that it is probably safe to assume that at least most curriculum specialists in school systems are aware of them. They have aroused interest and have had some influence, even on textbooks. But if teaching for understanding really were a high priority, these findings should have provoked a crisis. There should have been rending of garments and tearing of hair when teachers learned that their teaching was failing in its main purpose and that the tests they had been using had been keeping this fact hidden. I have not heard of anything remotely like that taking place.

Yet I would not conclude from this that teachers do not really care about understanding. To do so would imply a quite improbable degree of hypocrisy. The teachers I encounter do care about understanding, but the culture they have absorbed from teacher education and from experience provides them little help in getting hold of it. This is where a more powerful theory of knowledge and mind can make a difference. I have argued from the beginning that folk theory lacks what it takes to deal with problems of understanding. This is nowhere more evident than in teachers' efforts to get their heads around teaching for it.

### **Why Teaching for Understanding is Elusive**

Among practitioners, educational ideas can usually be firmly grasped only when they are translated into things to do. That is generally the case with practical arts, and so it is no particular aspersion on teachers to say this. But teaching for understanding cannot be grasped in that way, and this makes it not quite real as an educational principle. The struggle that many teachers have gone through in achieving a working understanding of knowledge

building (as discussed in Chapter 8) is largely a struggle to overcome this very natural tendency to proceduralize. From an instructional standpoint, knowledge building is one approach to teaching for understanding. There are others, as discussed in Chapter 4, which include Socratic teaching (Collins & Steven, 1983), conceptual change teaching (Anderson & Roth, 1989), and large variety of inquiry approaches to mathematics and science. These approaches make varying demands on teacher's pedagogical skill and subject-matter expertise, but they are alike in that they cannot be grasped as procedures.

Of course, teaching for understanding involves doing things. What is done can be described at some level of abstraction and examples can be presented. All of the cited instructional innovators have gone to some lengths in trying to show what teachers can do. But examples are only useful to those who understand what they are examples of and procedural principles require a correspondingly principled understanding of objectives and problems. Without these, teaching for understanding gets reduced to the familiar routines of contemporary schooling: 'hands-on' learning, 'projects,' lecture and recitation, 'thematic units,' and group therapy. Any of these might play a part in teaching for understanding, but when the goal of understanding is not firmly held, the routines become ends in themselves. I have discussed all this before: how the purpose of 'hands-on' learning becomes manipulating concrete things; the purpose of 'projects' becomes the poster or multimedia document that is the product of the work; the purpose of discussion becomes the airing of experiences, memories, and feelings; and thematic units become so incoherent as to have no discernible purpose at all.

For most educational objectives, reductionism works to an extent and for the most apt students. Understanding is particularly vulnerable, however. Reduction to activities typically means that problems of understanding are not addressed at all. Reduction to subject matter puts all the burden on the teacher's ability to explain—explain in a compelling enough way that understanding follows. Reduction to self-expression may engage students in efforts to understand, but not to understand what is supposedly being taught. Teaching for understanding is not likely to advance in schools until the educational process is reshaped so that problems of understanding become the focus for students and teachers alike. That would be a revolution, a genuine paradigm shift.

In the experimental programs that I referred to earlier, of which our CSILE/Knowledge Building Project is one, teachers and students do become intensely engaged with problems of understanding. When this happens, teachers discover that they have a lot to learn from research. Research reveals to them things about students' understanding that they did not realize but that they can often verify from observation. They can observe, for instance, the tendency of students to explain things in terms of substances rather than in terms of processes or relations (Chi, Slotta, & deLeeuw, 1994). They can see the often ingenious ways in which students reconcile scientific propositions with their pre-existing beliefs (Vosniadou & Brewer, 1987). And, of course, the literature on misconceptions almost always makes them aware that they have misconceptions, too, which they have been unwittingly perpetuating. Once they become engaged in probing and trying to do something about students' understanding, they have things to contribute to research in turn. The kind of dialogue that develops between teachers and researchers begins to have the character of real science: It is concerned with improvement of knowledge rather than final understanding, and there is no end to the possibilities for improvement. Progress is made, but one of its results is that problems keep being redefined at deeper levels. Students become part of the dialogue as well, and valued contributors to it (Scardamalia & Bereiter, 1996a, 1996b), as do any administrators who care to become involved. What is happening can no longer be adequately described as curriculum development, innovative teaching, or teacher development: Education itself, as a process and as a profession, is undergoing transformation into something more characteristic of the Knowledge Age.

### **Educating Teachers for Understanding**

In North America, efforts to modernize teaching have mainly taken the form of moving teacher training out of special colleges and into the universities (although this often meant turning teachers' colleges into universities). The effect on the profession has been mixed. On one hand, the move to universities has fostered educational research which, despite much skepticism from other parts of academia, has demonstrated a capacity for disciplined progress. Experimental education now provides a basis for the improvement of practice that is probably comparable to that provided by experimental medicine a century and a half ago. On the other hand, the move to universities meant that teacher *training* had

to become teacher *education*. Nowadays the word 'training' cannot be used anywhere near the word 'teacher' without giving offense (a sorry indicator of the insecure status of the profession). As how-to-do it training lost respectability, however, it never became clear what should take its place.

My teacher in the first four grades of elementary school, a product of Union Grove Normal School in Wisconsin, knew how to teach reading. The method she had been trained in was not very good according to present knowledge,<sup>15</sup> but she was highly accomplished in carrying it out and she made it work. Among cohort after cohort of socioeconomically unpromising students, there emerged no nonreaders. My dimmest classmate, whose response to being asked how much a five-pound chicken weighed was "I don't know and I don't care," nevertheless read fluently. Today's teacher education graduates are unlikely to have been *trained* in any method of teaching reading. They will have learned about and discussed the controversies in reading instruction and, depending on their instructors' ideologies, will have learned which is the right side and which is the evil side or that it doesn't matter. They may have received a smattering of information about what reading research has discovered, but this smattering is likely to have been connected more to the controversies than to the problem of how to ensure that every child learns to read.

Progress surely does not lie in reverting to the Union Grove Normal School model, however. That model may have been superior for developing certain basic teaching competencies, and so we should not ignore it altogether; but it was not a model for progress. It was a model deeply rooted in the craft tradition. Curiously, many current efforts at improving teacher education involve a return to that craft tradition. In their crudest form, they restore the idea of apprenticeship. Because the faculty members of university education departments can no longer fulfill the role of masters to apprentices, that role is being turned over to school teachers, who receive honorific appointments as adjunct professors or whatever and take on the responsibility of transmitting how-to-do-it knowledge to the new generation of teachers. In more sophisticated versions, the return to the craft tradition involves teacher collectives to share knowledge and ideas. Electronic networks are being harnessed for this purpose. Regardless of the medium, however, the presumption is that the knowledge necessary for the improvement of practice

already inheres in practice. That is the defining characteristic of a traditional craft. The emergence of a dynamic profession must take place over the dead body of that idea.

University-based schools of education ought to be promising sites for creating the hybrid culture that fuses the existing cultures of research and practice. In such schools the two cultures rub shoulders, sometimes collaborating in the same programs. And there are likely to be examples of hybrid cultures in the university to serve as models—health sciences, for instance, or electrical engineering or agriculture. And there may be other places in the university, such as the business school or the school of social work, where there is a cultural divide similar to that in education, offering the possibility of collaboration on shared problems.

In every school of education worth its salt, there are schemes and programs aimed at closing the gap between research and practice, and there is no shortage of limited successes. But I have never seen or heard of anything that could be called a hybrid culture, a culture in which the student teachers actually experience themselves as part of a profession that is advancing through the continual generation of new knowledge and see a continuity between their interests as teachers and the interests of those who devote their careers to understanding learning, thinking, and knowledge.

Teacher education has a bad reputation based almost entirely, it seems, on the reports of dissatisfied graduates (often spouses of the critics). Those dissatisfactions may be well justified but they are not helpful in identifying what is wrong or what needs to be done. Student teachers that I have encountered tend to be overwhelmed by the multiplicity of responsibilities that teaching entails. They may have chosen teaching with the idea that it consisted of planning and teaching nice lessons or being a friend and mentor to young people. Then they learn that they must also be a social worker, a health officer, a disciplinarian, a psychologist, and a legal custodian; that they must be incessantly concerned with the rights and sensibilities of minorities, the downtrodden, and the impaired; that they must assign grades to students on the basis of evidence that will stand up in court; and that their teaching and the academic achievement of their students must meet the expectations of a society that has little appreciation of what they are trying to do. All that and more dawns on them as they come to see teaching through the eyes of those who do it. No teacher education program could possibly provide them

with everything they feel they need. They become impatient of whatever does not translate directly into helping them cope, and that includes practically everything of an academic nature. It certainly includes everything in the nature of theoretical inquiry.

But the helping professions generally impose wide-ranging responsibilities on their practitioners. So does management. Teaching may be extreme in this regard, but it is not unique. The difference is that teaching, at least as it appears to the beginner, lacks a center. It is a conglomeration. To people outside the profession it seems obvious what the center should be: It should be teaching, and they chastize educationists for losing sight of that fact. But, as it is typically presented to those inside the profession, teaching *is* the conglomeraton. It is a diffuse responsibility for the present and future well-being of students (not unlike parenthood in this regard). Conservative reform efforts invariably aim to get teaching focused on a more narrowly defined objective, namely, students' academic achievement, usually as measured by standardized tests. They are on the right track to this extent: There does need to be a focus. But if teacher education is to bring about a fusion of the research and practitioner cultures, it needs to be a focus that reveals a continuing need for new knowledge.

Teaching for understanding, as I argued earlier, has this virtue, and so it is worth considering as the focus—not just *a* focus, but as *the* focus around which other aspects of teacher education are arrayed. It has the two properties that I proposed earlier were essential for producing a hybrid culture in education. It represents a vision that points beyond what is presently attainable or fully discernible and it carries with it an obvious need for research. The research culture is already intensely involved in work on the nature of understanding, how it comes about, and how it can go astray—both in general and within particular knowledge domains. If teacher education could take teaching for understanding as its focus there would be an immediate basis for the two cultures' coming together in pursuit of a shared vision.

Many teacher education courses can already be found that deal extensively with problems of understanding. This is especially true of courses in mathematics and science education, but it can be true of almost any education course where the instructor is knowledgeable in cognitive research and has not succumbed to the fashion of turning the course into a course on issues. Making teaching for

understanding the core of teacher education would involve several changes in addition to promoting the sorts of attention it already receives in the better sorts of 'methods' courses. At the top level, it would mean organizing all aspects of the teacher education program so as to make the ability to teach for understanding definitive of teacher competence. There is much more than that to being a good teacher, but prospective teachers should appreciate that there cannot be less. If they cannot effectively foster understanding, they have no more business in a classroom than dentists have any business going into practice if they cannot drill out a cavity. The criterion for selecting expert teachers as mentors would be not only that they are good at teaching for understanding but that they are actively engaged with problems of understanding. Engagement with such problems ought also to be a criterion for selection of education faculty.

Finally, prospective teachers should not merely study *about* teaching for understanding, they should have intensive *training* in teaching for understanding. The term immediately conjures up images of trainees presenting stilted 'model' lessons or lectures. If that sort of thing entered at all, it would be in a minor way. (In these constructivist times it ought to go without saying that teaching for understanding is not some kind of performance; but I am amazed at the extent to which educationists promoting constructivism persist in believing that it can be captured by aiming a camcorder at a teacher.) A better idea of what such training might consist of is represented in graduate courses Marlene Scardamalia teaches. To begin with, the graduate students engage in the same inquiries that children are pursuing—trying to understand vision, for instance, or the physics of flight. The adults then start to show the same freshness of thinking, curiosity, and problem solving zeal that children show. While they are working on understanding phenomena like vision and flight, the education students in Marlene's courses have electronic access to the work of elementary school students trying to understand the same things. These provide the basis for a second level of knowledge building in which the students try to make sense of their own and others' efforts to understand, considering things both from a cognitive/pedagogical standpoint and from a subject-matter standpoint (what it is about vision or flight that is hard to understand). The result is much meatier discussion. Genuine insights emerge. And most importantly you can see signs among the

education students of what is Marlene's main objective, getting them as she puts it "hooked on understanding understanding." As explained in a paper we authored jointly,

In our experience, the teachers who remain continually fascinated and involved [in knowledge building] are ones who have a dual interest. They are interested in advancing their understanding of history, geology, biology, cultural anthropology, and so forth; and each year they experience some advances themselves as they work with students on problems in those areas. But they are also interested in understanding understanding. The students' efforts (and their own as well) to explain phenomena, to grasp theories, and to overcome naive conceptions, are an endless source of insights into that distinctively human phenomenon, the pursuit of understanding.

An interest in understanding understanding does not seem to be a feature of most people's curiosity. It is an acquired interest, and one that teacher education programs ought to be passionately dedicated to developing. Without it, we find, teachers tend to remain detached from students' knowledge building efforts and to reduce knowledge building activities to merely another set of schoolwork routines. (Scardamalia & Bereiter, in press).

In a preservice program, training would go farther than this. It would engage trainees in doing something about school students' problems of understanding, both at the individual and the group level. But getting future teachers "hooked on understanding understanding" ought to be the first priority. It is the only way I can see to begin making understanding the actual point of teaching. It not only has direct relevance to teaching practice, it introduces them to the idea of a progressive profession in which they have role in the creation of progress.

The practitioners I referred to earlier, those involved in projects that are trying to advance education's capacity to teach for understanding, are engaged in creating progress in just this way. They have come to recognize teaching for understanding as a constitutive problem, they know that they as well as the researchers have something to contribute in advancing on it, and they draw much of their motivation from feeling that progress is being made. The question now is whether this kind of involvement in the creation

of progress can be infused into preservice teacher education, so that it becomes a normal part of socialization into the profession rather than an extraordinary experience. It needs to be salient among the reasons why people go into teaching; it should be central among the things they study as teachers in training; and it should be a problem that unites teachers and researchers in an effort to make headway.

This proposal may not sound at all radical to people little in touch with teacher education, and from many people within teacher education it might draw the rejoinder, “We already do that.” But since I am using teaching for understanding as a test case to see what it would take to modernize education, it is worth examining just what if anything is radical about this proposal. To do this, we need something for comparison. Fairly representative is the statement of program goals for the undergraduate teacher education program at Wichita State University.<sup>16</sup> It is a bit more detailed than most and is not as trendy as some, but it indicates the kinds of goals that characterize teacher education generally. The goals are divided into three sets, the last of which, “Manager Goals,” need not concern us here. The first, “Professionalism Goals,” consists of the following:

The graduate will:

1. Display the behaviors of a reflective professional practitioner who seeks opportunities to grow professionally.
2. Foster collegial relationships with others (e.g., school personnel, parents, and agencies in the larger community) as an advocate for students' learning and well being.
3. Understand and apply legal and ethical concepts related to professional conduct.
4. Compile and maintain important educational information in order to share with the school and community.

Although these are laudable and realistic, they are solidly in the craft tradition, with no indication that the teacher belongs to a larger professional community that includes researchers, philosophers, policy makers, and so on, and no indication that the field progresses

in ways that would require a teacher to keep up—much less any suggestion that teachers are expected to contribute to this progress.

The second set, “Instructor Goals,” is the one where we might look for something about teaching for understanding.

In planning and implementing instruction, the graduate will:

1. Understand and apply major developmental principles and theories.
2. Assess prior knowledge, skills, attitudes, and beliefs of diverse student populations.
3. Use appropriate instructional techniques for a variety of learning styles, modalities, and intelligences.
4. Use a knowledge of historical, philosophical, social, and cultural factors.
5. Integrate curriculum effectively.
6. Select, use and evaluate a variety of appropriate instructional approaches, formats, materials, and technologies.
7. Assess student progress using formal and informal assessment strategies to ensure (a) the continuous intellectual, emotional, social, and physical development of the learner, and (b) the achievement of specified outcomes.
8. Demonstrate knowledge of the central concepts, tools of inquiry, and structures of the disciplines she or he teaches and makes these aspects of subject matter meaningful to students.

Only the last of these goals could be construed as a call for teaching for understanding, and it is a faint call. These goals all indicate things teachers are supposed to *do* when they teach, but they do not indicate what teachers are supposed to strive for, what they are supposed to bring about. There is no focus, no suggestion of a point to teaching. “Understand and apply major developmental principles

and theories”— but to what end? “Assess prior knowledge, skills, attitudes, and beliefs of diverse student populations”—and then do what about them?

If someone at Wichita State had urged that the “Professionalism Goals” should include something about teachers being part of a larger professional community that includes researchers and that the “Instructor Goals” should include teaching for understanding, there would not likely have been much opposition, and so they might well have been included. But it is obvious that their addition would not have signaled any major change. Indeed, they would probably have been accommodated by revisions to the second professionalism goal and the eighth instructor goal of such a minor nature as hardly to be noticed.

A convincing effort to modernize teacher education would not start with goals for teachers. To do that is already to accept the viewpoint of the traditional craft culture. The effort should start at the highest realistic level, which in the case of a college of education would be the mission of the college as a whole. It is at this level that the decision would have to be made whether the faculty was to commit itself to the transformation of education into a modern profession. If so, they would need to consider seriously what their contributions could be, where they saw potential for “disciplined progress,” given their resources and limitations and what other institutions were doing.

Not everyone would support such a mission. Some would bridle at the word “modern” and would reject the idea of disciplined progress as positivistic and technocratic. Others would see the idea of a collective mission itself as contrary to academic freedom and the pursuit of scholarly excellence. Others would reject the mission as arrogant and disrespectful of teachers’ competence and ways of knowing. Add to these the numbers who would oppose anything that sounds disruptive or taxing, and you have the likelihood that a majority of education faculties would reject the proposal.

Let us suppose, however, that a college of education did accept it and that they chose to focus their efforts on the problems of teaching for understanding in various fields. They would need a plan to organize their efforts, at which point they could profitably begin to think of how to involve student teachers. Student teachers, along with graduate students and affiliated practicing teachers, could be valuable collaborators. Furthermore, getting student teachers deeply

involved would be vital for the larger goal of transforming the profession. To achieve such involvement, there would have to be changes in the structure and content of courses and practica, changes in the relations between teacher education and research, changes in the kind of participation expected from associated teachers and schools. The fusing of the research and practitioner cultures would have begun.

### **Conclusion**

In order for education to become a modern profession it must be able to generate knowledge—knowledge that sustains progress in the tasks that constitute it as a profession. Educational research has, in the last few decades, begun to acquire that capability, but there is a deep cultural split between it and educational practice. A similar split existed in medicine during the 19th century, but it gradually closed as practitioners became increasingly aware of the nature of unsolved problems, came to see the advancement of science as vital to their practice, and eventually came to see themselves as part of an advancing scientific discipline. Nothing like that has happened yet in education.

The cultural split in education is not one to be closed merely by communication or improved social relations. The recurrent efforts to ‘translate research into practice’ miss the point, as do the complementary efforts to turn teachers into researchers. Although both of these have merit, the point they miss is that teachers experience no urgent need for the kind of knowledge research could provide. In this, education contrasts sharply with modern professions like the health sciences and engineering. But it is not the teachers’ fault that they see no need; beating the drum for the importance of research could only be expected to recruit the most impressionable teachers. And it is not the researchers’ fault, either—at least not the fault of those who are seriously trying to solve problems of educational practice. The fault seems to lie in the fact that researchers and practitioners work in unconnected problem spaces, even when the problems they are working on have the same name.

The beginnings of a union between the two cultures can be seen in those experimental projects where researchers and practitioners join together in tackling unsolved problems that are of central importance to teaching. Teaching for understanding denotes a range of unsolved problems that are at the very heart of the educational

enterprise. Teachers are generally not aware of the unsolved problems, however. When teaching for understanding fails they are apt to attribute it to deficiencies in the students or in themselves rather than to the fact that no one has yet figured out how to produce the kind of understanding that is at issue. Discovering that a problem is unsolved but that there are possibilities of making headway on it is exhilarating and is likely to stimulate the inventive capacities of the teacher as well as putting research in a new light.

If a new hybrid culture is to arise in education, teacher education offers about the only hope for bringing it into being. It cannot be expected to spread from the experimental projects I just referred to, because they are too rare and too talent-intensive. Teacher education is typically criticized in ways that imply failure to initiate students into secrets of the traditional craft. In response, teacher education programs have been moving increasingly toward apprenticeship and mentorship by experienced teachers. Commendable as that trend may be in other respects, it works against fusion of the research and practitioner cultures. To achieve such fusion, student teachers must be brought into contact with the growing edge of knowledge in their field and made to feel part of the community that is making it grow. You may recall that I said the same thing about school students in discussing their relation to the subject matter of instruction (Chapter 9). Modern teachers need to be simultaneously active in two knowledge building communities. One is the knowledge building community they share with their students. Its object is building an understanding of the whole world. The other is a knowledge building community they share with researchers and other practitioners. Its object is building a working knowledge of teaching and learning. Lying beyond the scope of what I have discussed here, but offering itself as an enticing possibility, is merging those two knowledge building communities into a larger and more complexly dynamic one (Scardamalia & Bereiter, 1996a).

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<sup>1</sup> Lasch (1991) criticized the naive believe in progress, which he likened to a religion; Dennett (1995) has provided a sophisticated argument to the effect that both biological and cultural evolution progress toward good designs.

<sup>2</sup> The estrangement of research from invention was dramatized by a research movement that began in the 1960s and that still has adherents. Struck by the failure of decision-oriented research to identify teaching variables that had a strong and consistent effect on learning, Lee J. Cronbach suggested that the fault might lie in looking for variables that affect all students the same way.

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Perhaps Method A works better for a certain kind of student and Method B works better for another. Averaged over all students, the choice of methods will appear to make no difference, but when evaluated in a way that distinguishes the two kinds of students a strong aptitude-treatment interaction or 'ATI,' as it came to be called, would appear—revealing that method does make a difference, but that the difference depends on the kind of learner. The logic of Cronbach's argument seemed so compelling that it took over a decade of failure before most educational researchers came to acknowledge that ATIs were no easier to find than variables that affect everyone the same way. More interesting in retrospect, however, is what educational researchers imagined should be the result of finding an ATI. It should be to divide students according to type and use Method A for one group and Method B for the other. Of course, there would have to be further subdivisions in accordance with other ATIs, so it should not be hard to see that this approach could never work in the real world. Cronbach (1975) said as much himself, although his caution seems never to have sunk in to ATI enthusiasts.

<sup>3</sup> Professional associations, government agencies, curriculum specialists, and teachers' unions all play a part, supplemented now by a number of Web sites of uncertain provenance.

<sup>4</sup> Teachers of course vary in their managerial and human relations expertise, and it is relevant to the point I am making that one respect in which many teachers are found wanting is in organizing classroom routines so as to maximize instructional time (Leinhart, Wideman, & Hammond, 1987).

<sup>5</sup> Even the hokey word problem made its appearance in that early Venetian textbook: If the Pope's messenger leaves Rome for Venice at such-and-such time and travels at such-and-such rate, while the Doge's messenger leaves Venice...

<sup>6</sup> The existence of a common medical culture is demonstrated as much by medicine's alleged faults as by its virtues. For instance, the resistance to acupuncture and herbal medicine reflects a shared conviction that treatments should be scientifically explainable. The escalation of extreme measures reflects a shared commitment to forestall death at all costs. The often high-handed treatment of low-status patients reflects the fact that membership in the medical culture is open to only a select portion of the public.

<sup>7</sup> <<http://www.cl.utoledo.edu/canaday/quackery/quack1.html>>

<sup>8</sup> The parallels emerge strikingly in Rothstein, 1985.

<sup>9</sup> The alleged unreadability of educational research is one of the more telling indicators of the cultural divide. Compared to other social science research, educational research is not particularly jargon-laden or inscrutable. The problem is more one of cultural norms. In educational writing, as in all other professional writing, writers must begin by gaining the confidence of the reader. For educational researchers, this is done in the usual academic way—by citing literature and making pronouncements that demonstrate familiarity with the frontier of knowledge on one's topic. In the teacher literature, however, confidence is gained by demonstrating that one is a caring person who speaks from experience, and the typical way of doing this is through a narrative lead. The result is that neither group writes in such a way as to gain the confidence of the other.

<sup>10</sup> The fact that juries in the United States no longer feel restrained by this principle reflects the emergence of a new norm that is tangential to the point I am trying to make. The new norm is based on the premise that somebody is to

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blame and must make reparations for every misfortune that befalls a person. That norm is applied to teachers as well, and they are justifiably aggrieved by it. It may be only a matter of time before they too have to take out malpractice insurance.

<sup>11</sup> Other community database systems also have what are called “views,” but these are merely different ways of sorting notes—by author, date, etc. Knowledge Forum™ (the second generation version of CSILE) has this feature too, as part of a “note reader,” but that is quite separate from what we call “views.”

<sup>12</sup> There are educational researchers who disdain universal conclusions, believing them to be an illusion of positivism. But even when the researcher’s report is a story, the very publication of that story in a research journal implies that it has general significance, that there is something to be learned from it.

<sup>13</sup> This is the Canadian Telelearning Network of Centres of Excellence (URL: [www.telelearn.ca](http://www.telelearn.ca)).

<sup>14</sup> The 1998 K-8 science curriculum guidelines issued by the Ontario Ministry of Education and Training, for instance, make frequent reference to understanding, but inspection of specific objectives reveals an almost exclusive emphasis on descriptive and taxonomic knowledge with hardly anything that would pose a challenge to understanding.

<sup>15</sup> For those interested in the interminable controversies about phonics, I make it known that her method did not, as far as I can recall, involve any phonics whatsoever. It was the whole-word method, anchored to the uninspiring Dick and Jane readers. What was special about her method was its emphasis on very rapid oral reading. It was extremely stressful. By the end of second grade, every boy in my class stuttered—from trying to match the pace set by the verbally more fluent girls, I would suppose. But we all learned to read and some of us, at least, learned to like it.

<sup>16</sup> How did I happen to pick Wichita State? Its goal statement <http://www.twsu.edu/~coewww/undergraduate/goals.htm> was the first one to come up from a Web search using the search string, “teacher education curriculum goals program equity professional philosophy university objectives values.”