

Why Educational Reform Needs a New Theory of Mind

Incogito nullo cupido. (We cannot desire what we do not know.)

—Latin proverb

Nothing is possible, except to extend the area of sanity little by little.

—George Orwell

The century-long failure of wave after wave of educational reform is now such common knowledge that those of us who persist in trying to design better ways to educate appear to many of our colleagues as if we are engaged in idle academic amusement. Serious reformers are elbow-deep in politics. There is no question that education is political and that any reform that stands a chance must have a power base. Education also seems to be so constituted that change either from inside or outside the profession is unusually difficult to bring about. But there is a prior question: Is the proposed reform a good idea? Not, is it any good at all, for even the flakiest innovations usually have some good in them. Is it good enough to justify the price—a price that must be measured not only in money but in all the effort and disruption and personal loss that go to make up what Eric Hofer aptly called “the ordeal of change”? And is it good enough to meet the need? That is a question of such stupifying complexity that it is almost never raised.

Although the term ‘reform’ is used to cover all kinds of changes, it will help to sharpen our focus if we distinguish reform from transformation. Transformation is what I was talking about in the preceding chapter: transforming education into a modern, progressive profession. Medicine underwent such a transformation in the the 19th century. Twentieth-century efforts to provide universal health care and recent efforts to restrain its escalating costs are reforms, having only indirect effects if any on the nature of the medical profession. Reforms can be imposed from outside, and sometimes have to be, whereas transformation can only come from within.

Education has experienced reform but not transformation. Universal access to education is by far the most important reform of

recent educational history, and it is well advanced in countries where universal health care is still far off. But teaching is still the same traditional craft it has been for centuries. Indeed, if you look at the Jesuits' *Ratio Studiorum*, which dates from 1599, you may get the impression that the craft has gone downhill since.

Despite the use of phrases like 'breaking the mold,' practically everything going on in education today has to be counted as reform rather than transformation. Almost all the reforms are aimed at improving the quality of education. The stimulus often comes from unfavorable reports of achievement test results or complaints from employers or parents. But, with one major exception, the reformers' approach to improving educational quality is quite indirect. It may consist of change at an administrative level, such as firing the school superintendent, turning the school over to a private firm, or instituting site-based management. Alternatively or at the same time, reform may involve try-harder strategies such as accountability schemes or programs like the Georgia HOPE initiative, which rewards good student performance with free college tuition and textbook allowances. Irrespective of the wisdom of particular reform schemes, we must acknowledge that better management and increased motivation could improve the quality of education, but what actually happens at the classroom level is not itself part of the reform agenda.

The one notable exception, of course, is back-to-basics reforms, which frequently specify not only what is to be taught but how (and which may even go on to specify what not to teach and how not to teach). As contrasted with the other reforms, which are administrative, this is *instructional* reform. This is the kind of reform I want to focus on here, because it is primary. The administrative reforms can affect the quality of education only to the extent that they somehow induce instructional reforms, and one of the criticisms of accountability schemes, for instance, is that they induce instructional reforms of a detrimental kind. Many instructional reforms of limited kinds are taking place all the time in education. Most of these originate within the profession and they range from sober curriculum changes to sheer quackery. Back-to-basics movements are often a massive revolt against the cumulative effects of these piecemeal reforms.

The question I now raise is, How successful can instructional reform be without transformation? Surely it can have some success.

We are not hopelessly in the dark. But I shall argue two points: First, instructional reforms are not neutral with respect to transforming education. They either nudge it in the direction of modernization—increasing its capacity to solve problems and address new goals—or they further solidify its traditional craft character. ‘Back to’ movements are thus detrimental to the long-range future of education, and this is as true of movements ‘back to’ child-centered education or constructivism as it is of ‘back-to-basics’ movements. Second, reformers are likely to fail in even their immediate objectives if they do not become more deeply engaged with the unsolved problems of pedagogy.

‘Best Practices’ Are No Help If You Don’t Understand Them

The term ‘best practice’ is often heard in educational reform talk these days. It is a conservative approach to improvement. It is about making optimum use of the knowledge already implicit in practice rather than flying off on the wings of some theory or radical notion. I cannot think of any well-supported reform movement that is not grounded in this idea. Sometimes the reform is aimed at a specific ‘best practice,’ such as cooperative learning. Other times it is aimed at creating a process, such as a teacher network, devoted to identifying, spreading, and refining best practices. Even the reforms that deal only in accountability and standards must, to make sense, presume that the knowledge of how to meet the standards already exists. Although that is a questionable assumption, it is reasonable to assume that knowledge of how to do better always exists somewhere. But that does not mean that the knowledge of how to use that knowledge exists where it is needed.

In the business world, ‘best practice’ is turning into a creative discipline in its own right (O’Dell, Essaides, & Grayson, 1998). A medical center imitates the registration practices of a major hotel chain. An airline speeds up its maintenance procedures by studying the practices of auto racing pit crews. However, such creative copying requires, according to O’Dell (1994):

Knowledge of your own process and problems to see the underlying characteristics and spot analogies across other industries.

Ability to look for common themes without having them spoon-fed to you.

Information about outstanding companies in other industries.
This information needs to be organized by process and not only by industry.

Language that is common to all. One of the barriers to sharing across industries is finding a common language that describes processes regardless of industry. For example, the medical center had to equate its admissions process with hotel registration in order to see the analogy and potential transfer.

These are conceptual requirements, and education fails on all of them. Knowledge of processes and problems is so shallow that educators have difficulty seeing useful analogies between one school subject and another or between one kind of student and another, let alone analogies that reach outside the classroom. That has always been one of the frustrations for me in teaching university courses for teachers. Teachers of different subjects and grade levels find little in common except problems of classroom management. The common themes they can recognize are either at a vacuously high level of generality (learner-centered versus teacher-centered) or else they are political. The information flow on which 'best practice' depends is, as everyone in education recognizes, terribly deficient. And the common language, once the jargon is translated, is just the language of folk psychology and folk epistemology.

These conceptual deficiencies are all evident at this writing in a growing movement to adopt phonics as a 'best practice' in teaching reading. There is, of course, vehement opposition to the claim that teaching phonics is a desirable practice (Goodman, 1998). Tempting as it is to get into that argument here, it would take us away from the point I want to pursue, which is the need for a better conceptual structure for educational reform. We must not ignore, however, the fanaticism that has been so prominent in debates about reading. Fanatics have often been not at the fringes but at the center of reading reform movements. Conceptual equipment is surely in very bad shape when sensible people cannot tell the lunatics from the wise counselors.¹

¹ A few examples of lunacy: At a meeting of the Reading Reform Foundation there is no demur when a member proclaims that no one can become a good reader who is not taught phonics. At a scholarly conference, after a presentation of research on the importance of teaching letter-sound correspondences, an official of the International Reading Association declares "We can't really go along with that; we believe in comprehension." A leader

Conceptual inadequacies become immediately apparent if we ask what this ‘best practice’ is that is proving so controversial. Calling it ‘phonics’ isn’t enough, because when cornered every reading teacher can claim to be teaching phonics already and every publisher can make a similar claim for their reading program. So the legislators and school board officials who are trying to lay down the law add terms like “systematic” or “research-based” or “intensive.” But these terms are equally open to everyone’s claims. When the David and Lucille Packard Foundation undertook to back a reading improvement effort in Sacramento, California, they went so far as to specify the textbook series that had to be adopted.² The outrage that followed on the part of the unchosen was staggering. There were strong suggestions that what the foundation had done was not only unethical but that it marked the beginnings of a police state. But what else was the foundation to do? They had studied the research and had identified what they took to be ‘best practice.’³ If they tried to mandate it in general terms there was little chance that it would happen. Virtually anything could be claimed to fit the mandate. The necessary concepts were missing. Packard had the choice of being too general or being too specific. There should have been a middle range of concepts capable of making significant distinctions among the wide range of approaches that might be called ‘phonics.’

Those middle-level concepts are essential for any worthwhile debate about educational methods. They are the concepts by which a putative ‘best practice’ can be characterized with sufficient clarity that people know what they are talking about. Without them you get wars of words, with fanatics leading the charges. In many areas of education the middle-level concepts are altogether absent. It so happens, however, that beginning reading has been the object of sufficiently intense and varied research that a rich fund of concepts

of the Whole Language movement reportedly expresses in a speech the wish that a stake be driven through the heart of the author of a book presenting reasons why Whole Language should incorporate teaching of phonemic awareness and phonics (Levine, 1994). More recently, this same leader has been characterizing the move toward phonics as part of a vast right-wing plot.

² See the Packard Foundation’s 1997 annual report.

³ I happen to know about this because I am one of the authors of the program Packard chose—SRA/Open Court Reading. But my point here is not that they made the right choice, only that they were pursuing a reasonable and indeed highly ethical course.

does exist (see Adams, 1990). But they are unknown to the multitude of practitioners, reformers, and ideologues. As a result, it is fair to say that the participants on both sides of the long-running phonics debate don't know what they are talking about.

Calfee and Drum, in a 1986 review, described what for the previous decade or more had been the standard approach to phonics—what they called the “decoding curriculum, a skill-based, ‘bottom-up,’ drill-and-practice program” (1986, p. 812). They characterized it as follows:

Divide the letter-sound correspondences into specific objectives (e.g., *f*, *ff*, *gh*, and *ph* make the sound /f/). Teach the child these objectives, often through seatwork. Avoid rules—they are untrustworthy.... (1986, p. 812)

When people talk about going “back to phonics,” this is what they are talking about going back to. Teachers who remember teaching phonics probably remember something like this. Opponents of phonics object to the pointless drills that occupy hours better devoted to actual reading and writing.

What Calfee and Drum described, however, is something that knowledgeable advocates of phonics find equally appalling. This anomalous practice, aptly labeled by one critic as “Mickey Mouse phonics,” was something devised by textbook publishers in the late 60s and early 70s as a quick fix in response to public pressure. It was quick and easy because it could simply be added on to the existing Dick-and-Jane type programs without requiring basic revision. It was not based on any research or theory. It was simply a marketing ploy. Yet, because it is what people remember, it is what the contemporary phonics debate is about. In the absence of concepts, people naturally argue about cases, and Mickey Mouse phonics constitutes the known case.

Phonics, to anyone who understands the point of it, is a transitional skill that enables kids to get started reading independently. Everything is focused on that objective. Even on the first day, children are using phonics to derive meaningful words from print, and in a few weeks they are reading interesting stories. Workbook exercises can play only a peripheral role, because the principal task is teaching children to blend letter sounds together well enough to serve in word recognition, and such teaching requires

the children to speak and the teacher to listen and respond.⁴ Once children are able to read normal texts independently, which may take a few weeks or 18 months at the outside, phonics instruction has served its purpose and can be ended, whereas Mickey Mouse phonics, having no objective, typically drags on for six years.

Mainstream publishers naturally hope that the same quick fix can get them through the current surge of public pressure for the teaching of phonics. There is good reason to suppose they will have their wish. The current resurgence is backed by an accumulation of research showing the superiority of sound-it-out type phonics to the Mickey Mouse variety, but it is unlikely to have much effect because *neither the opponents of phonics nor most of its advocates can tell the difference*. If my gloomy prediction is right, Mickey Mouse phonics will return as an add-on. It will be boring and pointless as before and an easy target for its temporarily defeated opponents. A reaction against it will set in. Publishers will remove it, and we will have seen one more swing of the pendulum, with no progress to show for it.

Yet in this case there could be progress instead of pendulum swings. There is no reason why Whole Language approaches have to be thrown out in order to bring in phonics. The Whole Language movement has made some notable contributions, especially in finding ways to involve children seriously in creative writing and in discussing what they have read. Letting children invent their own spellings, the most controversial part of Whole Language, actually builds on children's efforts to connect sounds and letters. None of this is the least bit incompatible with teaching phonics. And there is no reason why the adoption of phonics has to be a backward swing of the pendulum. A great deal has been learned about what it takes for children to decode print, and this knowledge can lead to improvements in method that may not be obvious to the naive onlooker but that can shorten the time and increase the success rate of beginning reading instruction. But you cannot simply add phonics to Whole Language. That will give you Mickey Mouse phonics. Whole Language teaching at its best creates a literate culture in the

⁴ The responsive listener could in principle be a computer, although at present there is no reading instruction software that provides that. The available software is thus limited to Mickey Mouse phonics.

classroom—that is, a culture in which reading, discussing, and producing good literature are central to the life of the community. Teaching children how to read is no more out of place in such a culture than teaching them how to use a word processor, but it needs to be done in ways that keep core literary values at the center. That requires sophisticated and creative program design.

There is nothing novel about this suggestion. A “balanced approach” is one of the watchwords of the more enlightened reforms (Pressley, 1998). But how do you get people to realize that this does not mean compromise or merely adding A to B? To understand the difference between a phonics-based program that preserves Whole Language values and something that merely looks like phonics added on to something that merely looks like Whole Language requires that decision-makers and practitioners get into pedagogical analysis to a depth that they do not even know exists. But if they do not do that, the pursuit of ‘best practice’ is a travesty.

What’s the Problem?

Among educational problems, beginning reading instruction is exceptional in a number of ways. Most notably, its failures are visible (or should I say audible?) and acute, which may explain why it has generated so much emotion on one hand and so much research on the other. But there are many other important educational problems that seldom appear on reform agendas. In fact they receive little attention at all except by the minority of researchers and practitioners who are sensitive to them. The reason is not that people dismiss them as unimportant, it is that the educational failures associated with them are not conspicuous enough to set off alarm bells. As a result, they tend not to be regarded as problems at all but simply as worthy parts of the curriculum. Yet how to teach them is in every case deeply problematic. People serious about teaching them ought to be looking for every piece of knowledge available, yet the reformers’ radar seems to sweep past them with hardly a blip on the screen.

Here, mainly by way of review, are some of the instructional problems that remain untouched by reform efforts:

1. Number sense. Widely recognized as the foundation of mathematical competence, it now appears regularly in curriculum standards. But no one ever says what it is, and the curriculum guidelines always reduce it to activities or subject matter that misses the point.

2. Fractions, proportions, ratios, decimals, and percents. These poorly understood terms mark off an area of colossal and sustained failure, unalleviated by the switch from slices of pie to slices of pizza.
3. Scientific misconceptions. Informed educators know about these and can recognize them, but they don't address them as a problem, show little concern about the failure of available remedies, and are distracted by controversy over what to call them.
4. Functional literacy. Study after study shows that large numbers of school graduates cannot cope adequately with real-life reading tasks. The educators' response is to criticize the studies (which is often justified, but diversionary nevertheless) or to adopt reductionist solutions: introduce realistic reading exercises (reading bus schedules and such) or teach comprehension strategies as subject matter. The notion that *everybody* ought to be reading better than they do cannot really be entertained, because current pedagogy offers no suggestion of how this might be accomplished or even what it would mean.
5. Literature. Although literature teaching has suffered from every kind of reductionism, many teachers have enough personal sense of what the experiencing of literature should be like that they are continually dismayed at their limited success in bringing it about. But there is little they can turn to except tradition and the inspirationalism of language arts journals.
6. World knowledge. This refers to the miscellaneous knowledge of geography, history, and current events that provides a background for further learning and thinking (see Chapter 9). Getting students to acquire a lot rather than a little is highly problematic, but the prevailing response is simply to produce lists and expect teachers to teach them.
7. Thinking skills. That the teaching of thinking should be regarded as a straightforward matter—a collection of procedures that can be taught through rules, modeling, and practice—is perhaps the most extreme example of failure to recognize an instructional problem.

Doctors freely admit there are diseases they don't know how to cure, and the public response is not to repudiate doctors but to appropriate money for research. No one ever admits that they don't know how to teach fractions, even though generation after

generation of students fails to learn them. And so the public response is to blame the teachers, and the response of the teachers is to blame someone else. Ignorance never gets the blame.

Reformers can reply that, although there are of course unsolved problems in education, as in any field, we do know enough to make substantial improvements. Hirsch (1996) has presented this case forcefully, attributing the failure to act on available knowledge to the academic pretensions of education professors. “Research-based” has started to become a watchword of reform-minded politicians and officials (Carnine, 19xx). Some parts of the education establishment have reacted hysterically, seeing “research-based” as merely a code word for phonics and rote learning (Taylor, 1998). They are partly right, but not for the reasons their inflamed imaginations suggest. It is true that advocates of research-based methods are in favor of teaching kids phonics and getting them to memorize number facts to a high level of automaticity. These are as close to settled issues as educational research is ever likely to come. The danger is in generalizing from these instances to the full range of instructional issues. That is a mistake that both the advocates and the opponents of “research-based” reform make.

“Of course there are unsolved problems,” says the practical reformer. “There always are. But we can’t wait around. We have to act on the best knowledge we have.” No one can quarrel with that. What I am attacking is the attitude that goes with it. In the last chapter I wrote about the complacency that marks traditional professions, a complacency that rests on “doing a good job.” A similar complacency seems to characterize reformers, whether they are fanatics who believe they have the answer or pragmatists who make do with whatever research and common sense suggest. The invariable accompaniments of this attitude are:

1. Absence of need to understand.
2. Reductionism—especially the reduction of everything to subject matter or activities.
3. Absence of forward momentum.

I have remarked on all of these previously. It isn’t that people are generally averse to understanding, although the more ideologically zealous may be. It is that practitioners and policy-makers never find themselves stuck for lack of understanding. That bespeaks something deeply wrong with the system. Try fixing your automobile or your Internet setup and unless you are a specialist you will almost surely

come to a halt where your understanding can carry you no further. But set out to fix education and you will encounter no such roadblock.

Reductionism permeates the education system. I have talked about teachers reducing everything to subject matter, activities, or self-expression. But often the reduction occurs before anything reaches the teacher. The textbooks that come into the teacher's hands have been shaped by a selection process that reduces everything to subject matter. State and local textbook selections are dominated by checklists which specify content, with no regard to whether the textbook affords any promise whatsoever that the students will learn the content. Curriculum guidelines will state airy objectives and then immediately reduce them to activities. The activities may be presented as examples, but inasmuch as there is no basis for generalizing from examples, the suggestions can only be taken as requirements. Get-tough reforms introduce an even more lethal form of reductionism. Education is reduced to training students to perform well on tests.

By lack of forward momentum I do not mean that there is never any improvement. A lot of what happens in education can be counted as steps in the right direction. But there is no sense of one step leading to another. Each step has a finality about it, even if it is recognized as only a partial solution to the problem that motivated it. When there is forward momentum in a discipline, profession, or technology, one can look back at the steps that led to the present state and infer a direction for the next step. It affords a kind of running jump into the future, as anyone will recognize who has done a piece of research or development in a progressive field. But in education the best guess is that, whatever the direction of the preceding step, the next step will be in a different direction (frequently the reverse of its predecessor).⁵

Underlying all three of these symptoms is what I take to be the fundamental malady: disengagement from the constitutive problems of instruction. The kinds of instructional problems I reviewed above

⁵ In progressive disciplines the next step is not always a running jump from what has gone before. When there is a marked change in direction, this will be called a 'paradigm shift.' Educationists have taken up this term and applied it so liberally that paradigm shifts are a monthly occurrence. You may infer from this either that education is the most progressive field in the world or that it is not progressive at all.

are treated as somebody else's business. This removes the need to understand and it encourages reductionism, a simplistic translation of high-level goals into familiar routines.

How Folk Theory Impedes Educational Innovation

Innovation. It is supposed to be the driving force in the new economy. Government agencies are scrambling over one another in their zeal to promote it. There are people who believe that education, like religion, should be shielded from innovation; but let us ignore them in this discussion and concentrate on the more progressive elements, both inside and outside the profession, who regard innovation as at least potentially a good thing.

The first and often decisive barrier to innovation is the response, "We already do that." Those of us involved in educational design encounter it constantly, any time we try to move above the level of specific procedures and offer some principled approach to an educational problem. I used to think that this barrier could be overcome by discovering clearer ways of explaining what was new. I have since come to believe that the problem lies deeper and cannot be solved on a case-by-case basis. The problem is conceptual, but it is such a massive conceptual problem that it has produced a strong emotional resistance to any departure from familiar categories or habits of thought.

Educational thought, as carried out by practitioners and lay people alike, is in its various aspects moral, subjective, and procedural, but in no significant way theoretical.⁶ When a reading pundit declared that teaching phonics is an act of violence against children, he was speaking to the moral aspect of educational thought, which at the elementary level runs heavily toward protecting children from harm. For such a statement to be anything more than sanctimonious claptrap, however, it would be necessary to back it up with a theoretical explanation of the cognitive and emotional effects of phonics instruction. For there is nothing overtly injurious about phonics. Overtly, the behaviors required of children are not unlike those that might be observed in a singing lesson, so if

⁶ It is also, of course, political and economic, and these aspects often become salient in judging an innovation; but at this point I am talking about *recognizing* innovations in classroom practice. These must typically be recognized on some other basis first, after which their political and economic implications may come under consideration.

harm is being done it must be at a deeper level. But in the public discourse carried on about educational issues, *there is no deeper level*. That is why a statement like the above, which I make out to be sheer lunacy, can carry weight in a policy discussion equivalent to that of statements about measured effects on test performance. In phonics debates as elsewhere, however, the most common and destructive response is “We already do that.” It, too, is a claim that needs to be backed up at a theoretical level, for at a procedural level people who make the claim can no doubt show that they are doing things that would fall into the category of teaching phonics. The issue is whether they are actually teaching children to recognize unfamiliar words by means of their spellings. Although that may sound like a fairly clear-cut issue, it calls for a level of analysis that is simply absent from practitioner and lay discourse.

I keep coming back to phonics as a case in point because the concepts needed to understand it and to make progress are not very deep. And the conceptual failures are dramatic. Let us turn aside from the lunatics and fanatics and consider what now seems to be the majority, people who have soberly concluded that teaching phonics is a good idea. Suppose that you come to them with an innovation that you claim constitutes an advance in the teaching of phonics. How will people judge whether your claim is plausible or even whether what you propose is an innovation at all? At a procedural level, what you propose is not going to look much different. There are games and exercises that involve the sounds of words, but those are already commonplace. And you have made some changes in the teacher’s patter, but so what? Finally, all people can do is ask for evidence that your supposed innovation produces better results. If so, they may be prepared to adopt it, but with no idea of why or in fact what they are adopting. To give your innovation some identity, you might coin a name for it. Suppose you decide to call it ‘integrative phonics.’ That would be a mistake. ‘Integrative’ is a term associated with Whole Language and project-based learning, the sort of approach that people adopting phonics are eager to reject. That one word, with its train of associations, is liable to obliterate everything you try to say. The power of labels in the marketplace of educational ideas is overwhelming. When there are no concepts, emotive labeling fills the void, and it is a tremendous void.

Suppose, however, that you choose a label that catches on. Maybe 'coherent phonics' would do the trick. Your window of opportunity for advancing the ideas that this label represents will be too small to put a foot through. As soon as the label catches on, everyone who is trying to make money off phonics will call whatever they are doing 'coherent phonics.' No one will be able to tell the difference, because they never understood what you were talking about in the first place. The same will be true if, instead of 'coherent phonics,' you come forth with 'coherent number sense,' 'coherent proportionality,' 'coherent science,' 'coherent literacy,' 'coherent history,' 'coherent thinking,' or just 'coherent knowledge.' Unless your innovation looks conspicuously different on the surface—unless, for instance, it involves exotic technology—practitioners and decision-makers will not be able to recognize what is new about it or to distinguish it from anything else that is being called by the same name.

If we switch from "We already do that" to "Wow! This is what the 21st century is really about!" we view the same dismal scene from the other side. Walk into any well-equipped classroom and you are likely to find students engaged in an activity that has been tediously commonplace for generations—copying information from authoritative sources, organizing it under topical headings, decorating it nicely, and presenting it as a finished 'project.' The only difference is that now they are copying information from the Internet rather than a book, organizing it by means of a word processor or media authoring application, and decorating it with computer graphics, animations, movies, or whatever the technology allows. This is innovation of a sort, and it may even be beneficial—although that remains to be demonstrated. What is discouraging is that only innovations of such instant visibility are recognized. As technology enables ever more spectacular innovations of this superficial kind, it reduces even further the ability of educators to recognize innovations of any deeper sort.

The Concepts We Need and Why We Don't Have Them

Philip Agre has remarked on "the tendency of people who define themselves against something to simply invert whatever it is they oppose, rather than actually having a new idea."⁷ That has been the

⁷ In "RRE]notes and recommendations," Red Rock Eater News Service, November 15, 1998.

character of much educational reform in the 20th century. Liberal reforms have all been defined in contrast to the stereotype of the teacher at the front of the room lecturing and quizzing. Conservative reforms, reacting against what they perceive to be the abandonment of teaching in the liberal reforms, give us back the teacher as lecturer and quiz-master. California has provided the most dramatic example of such unprogressive flip-flops. In the early 1990's they virtually outlawed direct teaching of reading and mathematics; then they did an abrupt switch, producing guidelines that virtually outlawed everything except direct teaching. There were people in California who attempted to use the switch as an opportunity to introduce some new ideas, but they were overwhelmed by the reactionaries who, unable to make discriminations, categorized all new ideas as belonging to the liberal pedagogy they were determined (with fair justification) to overthrow.

Reformers should not be expected to produce new ideas, but they should be able to recognize them and to distinguish them both from the supposed bad ideas they are attempting to eradicate and the supposed good ideas that are simply the reverse of the bad ideas. To do this, they need concepts that allow them to think constructively about issues like the following:

- Why something is worth learning—apart from its conjectured long-term utility in the job market and apart from its traditional backing; why, in other words, a student might feel disposed to learn it.
- What different learning objectives actually mean. What is number sense and what does acquiring it consist of? Similarly for mathematical problem solving ability, understanding a historical period or event, mastering algebra, learning graphical design, understanding Dante, being able to write a decent paragraph.
- What is teachable and what isn't, why a certain thing is easy or difficult to learn, in what ways the learning of it can go awry.
- What is the normal course of developing competence in particular domains and what are optimal and suboptimal developmental paths; what distinguishes expertise in the domain and what learning leads to it or away from it.

Answering questions like these requires getting deeply into subject matter and into the cognitive developmental and instructional research in the various domains. There are not

standard answers that fit all subjects. We cannot expect reformers to have answers or even to be in a position to evaluate them. What they should understand is that these are the issues on which the value of any instructional reform must rest and that knowledge does exist that can be brought to bear on them. They should be aware that knowledge is progressing and that the best reform will not be simply the reverse of the preceding reform. Professional educators ought to know more than that. In their preservice education they ought to have had courses that immersed them in these issues as they arise, not only in the particular subject they are preparing to teach but in all the other major domains of education. Practitioners could then serve as intermediaries between policy-makers and researchers.

What we have instead is instructional reform carried out by people who not only know nothing about instruction beyond what common sense and the mass media provide them but do not know that there is anything to know. This ignorance of ignorance is not limited to politicians and representatives of the public. I have run into scientists and psychologists who study the development of scientific understanding but who do not realize that there is anything beyond the obvious to be understood about the teaching of science; the same for mathematicians and psychologists of mathematics.

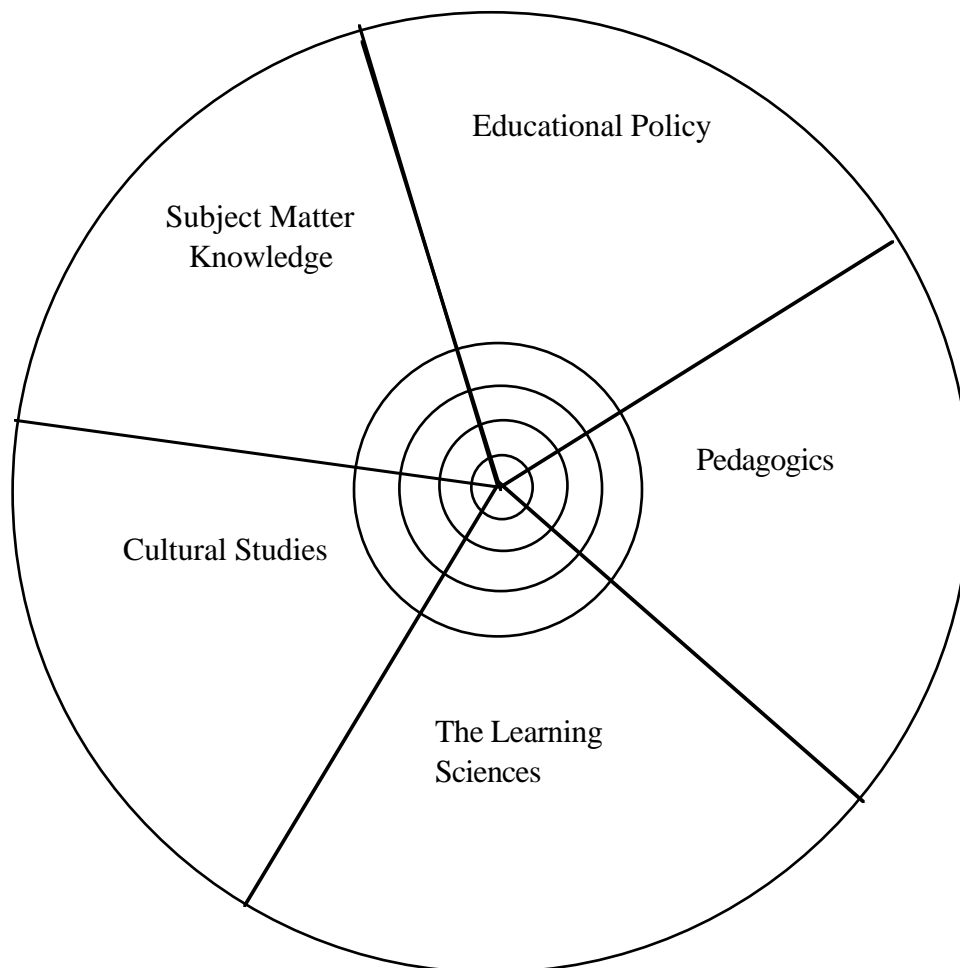
Obviously I have not tried in this book to set out the pedagogical knowledge, the ignorance of which I have been lamenting. That would require a larger book, with multiple authorship, for it would need to delve expertly into the problems of teaching and learning peculiar to different domains, as well as more general insights into these problems. It would be an important book, especially for teacher education. There have been various attempts along these lines, but none, I believe, that has given the task the massive effort it deserves. My chapters 8 and 9 have touched on various aspects of pedagogical knowledge, but my main concern has been with concepts of a more central nature—concepts of knowledge and mind. What I want to do now is show how they are important in the practical work of educational reform.

For perspective, I have adapted a schema used by E. O. Wilson in his book, *Consilience* (1998). Wilson was representing the domains that relate to environmental policy. I am using the same kind of diagram to represent the domains that converge on classroom instruction. His diagram had four sections instead of five, but what

he said about their intersection conveys the point I want to make about education:

As we cross the circles inward to the point at which the quadrants meet, we find ourselves in an increasingly unstable and disorienting region. The ring closest to the intersection, where most real-world problems exist, is the one in which fundamental analysis is most needed. Yet virtually no maps exist. Few concepts and words serve to guide us. (Wilson, 1998, p. 10)

An implication of Wilson's schema is that, although concepts may be well developed and well understood within each separate domain, as you move into the region of convergence the problem is not that people have differing concepts but that they share concepts that are poorly developed. In education, I suggest, this "unstable and disorienting region" is occupied by folk theories of knowledge and mind. Although the inadequacies of this folk knowledge may not be evident in the work going on within each of the sectors, it gravely affects the movement of knowledge between sectors. Knowledge moving between sectors must, so to speak, pass through this "unstable and disorienting region," where it becomes degraded. On the surface it typically emerges as mere folk platitudes, such as "Every child is different" or "You can't teach what you don't know." Beneath the surface, however, the degraded knowledge propagates as unarticulated assumptions, and in that form it is really damaging.



In the preceding chapters I have tried to articulate and criticize some of these hidden effects of folk theory. Here I will summarize them, with suggestions as to how they impede or subvert instructional reform.

1. Knowledge is narrowly conceived as the contents of a mental filing cabinet. This leads on one hand to devaluing knowledge as an educational objective and on the other hand to hapless efforts to itemize and test it.

2. There is no idea of teachability. Tacitly, it is assumed that if you can measure (or perhaps only name) something then it must be possible to teach it. The result is the imagined teaching of imaginary skills.

3. There is excessive and unfounded belief in transfer of learning. In the extreme, where word magic takes over, it is assumed that what is learned will automatically transfer to everything else that is known by the same name. Word magic and excessive belief in

transfer are essential to folk educational thought, because without them it is difficult to justify most school teaching.

4. There is no idea of quantity. The tacit belief, applied to both educational content and procedures, is that if some is good more is better. Quantity as an objective is either scornfully repudiated or else is replaced by long lists of items to be learned and tested.

5. There is a shortage of concepts for the analysis of teaching methods. Means are lacking for distinguishing one method from another, and ideological critique takes the place of analysis of means and ends.

6. Reductive practices go unrecognized and are sometimes elevated to pedagogical principles: Reduction to activities becomes 'project-based learning,' reduction to self-expression becomes 'learner-centered education,' and reduction to subject matter becomes 'core knowledge' or 'building a firm foundation.'

7. Science is deeply misunderstood. School science becomes either purposeless activity—the mere exercise of research skills—or the mastery of a body of truths or else a branch of social studies. Improvability as a defining characteristic of scientific knowledge does not even enter the educational picture.

8. Understanding, conceived of as a mental state, becomes something that can be pursued only indirectly, whereas the direct pursuit of understanding is characteristic of real scholarship and science.

9. Knowledge creation is reduced to learning and belief. Terms like 'knowledge work,' 'constructivism,' and 'inquiry' thus lose their meaning. School learning comes to be seen as an impediment to the kinds of productive work that drive a knowledge-based economy.

10. There is no way to formulate a generally acceptable idea of the core job of schooling. With an impoverished conception of knowledge, knowledge development cannot be accepted as the core job. But any other definition is either too global or too narrow.

What I have tried to summarize here are the inadequate concepts that occupy the region where the various sectors bearing on instructional reform come together. These concepts impede the movement of knowledge from one sector to another or degrade it below a useful level. For instance, insightful educators recognize that storable knowledge (the stuff in the mental filing cabinet) and specific skills represent the two visible tips of a very large iceberg, and they are concerned with the whole iceberg. But they have

no cogent way to talk about the invisible part. What they say comes out as romantic froth. They spout nonsense about 'process versus product,' surely one of the most ill-advised rhetorical gambits in the perennial educational debate. They espouse catchwords like 'constructivism' and they solemnly aver that children's minds are not empty buckets waiting to be filled. It is no wonder that politicians and business people grow impatient and launch back-to-basics reforms, which are aimed at focusing education on the very limited range of learnings—the two tips of the iceberg—that can be specified in reasonably clear terms, pursued in a no-nonsense manner, and that lend themselves to measurement of results. Other examples could be generated from other segments of the above pie diagram. Subject matter experts embody vast amounts of the implicit knowledge that constitutes the invisible part of the iceberg, but what comes across from them as educational wisdom tends to be either cut-and-dried content or else more romantic froth. Sociocultural researchers are learning a great deal about how knowledge is constituted and communicated in working groups, but when it passes through the inner circle it comes back out as learning-by-doing, apprenticeship, and informal talk—in other words, what everyone already knows. Learning scientists have produced penetrating critiques of textbooks in every major area of the school curriculum, but what reaches the policy makers cannot be translated into standards that publishers could act on or that could be enforced; so instead the policy makers send out content lists or standards based on conventional tests.

Although some progress can be made by piecemeal attack on the 10 faulty conceptions listed above, stable improvement is going to be very hard to achieve as long as the underlying folk theory remains unchanged. Throughout I have been arguing for only two basic changes:

1. The idea of mental content should be reduced to the status of a metaphor, useful for some purposes and not for others, but never to be taken literally. In order to suspend use of the metaphor where it is proving inadequate, we must find ways to construct mentalistic accounts that do not refer to things residing, being searched for, or undergoing changes in the mind.
2. Abstract knowledge objects, such as theories, numbers, and designs, should be accepted as objects in the real world, with which people may develop relationships, much as they do with

animate and inanimate material things. Understanding and mastery may then be treated as characteristics of such relationships, and the advancement of knowledge as the creating and improvement of abstract knowledge objects. Producing these changes remains a tall order. It is not a matter of *convincing* people of propositions like the above. People have to *see* learning, teaching, thought, and knowledge in ways that are consistent with these propositions, just as, to become a Copernican, you have to *see* the terrain outside your window as part of a globe. Furthermore, they have to become proficient at thinking within this altered framework. As I proposed in Chapter 3, it amounts to moving out of the two-dimensional world of folk theory and into a three-dimensional world in which there are not only physical reality and mental states but also conceptual artifacts, rather than only the first two. Compared to folk theory's Flatland, this three-dimensional (Popperian) world greatly increases the complexity of relationships one must learn to deal with.

Conceptual change has to start where it can. It is not likely to start among the policy makers, although some of them are business people who have a more modern conception of knowledge than does the typical educator. It is not likely to start among teachers, because by reason of their daily work they are more tightly bound to a things-in-the-head conception of knowledge than most other people. It is not likely to start with subject-matter specialists because folk theory of mind does not normally figure in their work except on the occasions when they are called on to provide educational counsel. That leaves learning scientists and students of culture, my academic colleagues. Many of them, in different ways, are moving beyond folk theories of knowledge and mind. I am trying to help that process along. But ultimately, taming that "unstable and disorienting" region of concepts where the different kinds of education-related thought meet is going to require cooperative effort.

Crafting a Vision

One of the areas in which cooperation is most obviously called for and where conceptualization has been most limiting is in the formulation of goals. A goal is a conceptualized outcome. If it is conceptualized at a high enough level, it becomes a vision or an ideal. If the conceptual framework is strong and complete enough, there will be ways to connect the vision with lower-level goals that can actually be achieved. Otherwise, the vision tends to be of only

inspirational value and the actual business of reform may not advance toward it at all.

The educational reforms that have stirred the hearts of educators over the past century have been of a liberalizing kind. From a distance they look like the same reform, surfacing under different names: progressive education, child-centered education, learning by discovery, open education, whole language, constructivism, situated learning. In contrast, the reforms that have gained strong public support have been of a reactionary nature—usually, in fact, reacting against the liberalizing reforms espoused by the educators. This contrast has led many educators to see the conflict as having deep political and philosophical roots—as a conflict in world views, no less. There is just enough truth in this to keep alive in ed schools a strain of aggrieved social criticism, culminating in what is called “critical pedagogy”⁸. But it serves to obscure a more mundane yet

⁸ I find it infortunate that the term ‘critical pedagogy’ has been adopted by people whose critique is mainly of the school as an institution rather than of pedagogical practice. According to Barry Kanpol (1998), “Critical Pedagogy is the challenging of any or all forms of alienation, oppression and subordination—no matter from what identity position one is coming from.” Its main concern has been how schools preserve social power differences; there has been hardly any interest in pedagogy except insofar as it pertains to such inequalities and to ways of overcoming them. I would like to think that what I am doing in this book constitutes an effort, however limited, at critical pedagogy in somewhat the way that Philip Agre’s *Computation. and Human Experience* (1997) constitutes a critical AI—that is, a criticism that tries to clarify the constitutive problems of a practice, identifying where it is stuck, and trying to help it get unstuck. Yet there is almost no overlap between the problems I have discussed here and those that occupy the practitioners of ‘Critical Pedagogy.’ To read the literature of Critical Pedagogy, you would think that there are no technical problems in education. That would make education a very strange field indeed. The inspiration for much of contemporary Critical Pedagogy is the work of Paolo Freire (1970), whose educational efforts with peasants convinced him that the difficulties in teaching them to read were not technical but had to do with their powerlessness. This important idea seems to have been generalized by his followers into a universal diagnosis applicable to all educational problems and a corresponding disdain for any technical analysis. (In medicine, this is known as quackery.) Along with Agre, I believe that a real critical practice needs to get into the technical problems of a field, particularly those that are seeming intractable, and look there for underlying and often unstated beliefs that need to be questioned. It is Freire’s method of inquiry, but without Freire’s answer being assumed in advance. It is what has led me to identify

pregnant truth: The public can never be expected to share the enthusiasm of educators for enlightened methods. The public cares about outcomes. Methods stir up public passion only when they are seen as detrimental to outcomes. The public's position is always going to be reactionary, until educators can offer them new and superior outcomes.

The liberalizing reforms of the past century have not done that. Only when carried to absurd extremes have they produced demonstrably bad results, but evidence of good results has been sparse and unconvincing. The enthusiasm that educators have had for these reforms has not come from evidence that students turn out better. It has come, on the philosophical side, from liberal beliefs about rights, democracy, and humane treatment. On the practical side it has come from demonstrations of process that any open-minded teacher is bound to find impressive. Walk into a well-functioning open classroom and you are going to see students going about their work on their own or in small groups, seemingly interested in what they are doing, and not being driven to it by the teacher. The teacher, free of the need to conduct recitations and micromanage schoolwork, has time to work individually with students according to their needs. It's hard to resist. You see students doing what they are supposed to and teachers doing what they always want to do and not doing what they dislike doing. The amazing thing is that such an attractive reform seems never to have caught on with more than a fourth of the teacher population (Elmore, 1996).

Of course, it has some appeal to parents and to the public at large as well, but not of the same intensity. It does not touch them where they live, the way it does many teachers. And so whenever dissatisfaction arises about results, the public is ready to scuttle liberal reforms and go back to what they imagine to be tried and true methods. In this they will be joined by that majority of educators who have either been opposed to the liberal reforms all along or else weakly committed, like the public at large. It seems to me that the reformers and those who work at understanding and engineering processes of change have simply failed to face up to this rather straightforward situation. It has nothing intrinsically to do with

folk theories of knowledge and mind as the source of much educational stuckness.

'resistance to change,' with 'ownership,' status, or power, with top-down versus grass-roots initiative, and all of those factors that enter the picture once a reform movement is underway. It is simply that no reform is going to gather sufficiently widespread and ardent support unless it can be shown to yield results that people value and value highly.

Vision versus Test Scores

As soon as you mention results, everyone thinks of test scores. This is not the place to discuss how it came to pass, but I think everyone will agree that the two ideas are welded together in people's minds. Education can make no major advance until that weld is broken, but the tools to break it are not in any reformer's toolkit.

I was once at a meeting where a host of distinguished educators were complaining that politicians and business people, by their insistence on objective test score gains, were making real educational improvement impossible. Among the group, however, was Ralph Tyler, who perhaps more than anyone then living was responsible for the shape that educational testing had taken in America. Tyler at last rose to say that in his experience politicians and business people had no passionate commitment to test scores, it was just that no one offered them anything better. If you can offer them a superior vision, he said, you will find them receptive. Many idealistic reformers would claim that that is exactly what they are trying to do. But what they are offering is a vision of an educational process. I don't think that is what Tyler had in mind. To draw politicians and business people away from their fixation on achievement test gains one must offer them the vision of a superior kind of *outcome*. The failure to do that is, I believe, the most profound failure of educational thought in our epoch.

A motivating vision must open people's eyes to educational possibilities beyond those currently imagined. That requires demonstrations. People are properly skeptical of high-sounding educational rhetoric. They need visible evidence of the possible. Moreover, we have already had enough visions of the school as an earthly paradise. The public wants to know what young people will carry with them when they leave that earthly paradise, and the widespread fear is that it will be functional illiteracy, mathematical incompetence, and scientific ignorance. An inspiring vision must not

only allay those fears but hold out the promise of higher outcomes worthy of dedication.

Here is where the conceptual difficulties begin. Education is not going to produce some previously unheard of ability or trait of character. The English language contains several thousand words for human attributes; so whatever the educational outcome, it is almost sure to be something that has been recognized for ages and for which there is already a familiar label. But a new vision should give new meaning to that label, introduce a qualitatively higher standard. Let me try to explain that statement with an example from a different field. Art historians talk about the “Greek revolution” (Gombrich, 1960, pp. 99-125). For thousands of years sculptors had represented the human figure facing straight ahead, in a rigid pose, with stylized impersonal features. There were, however, noticeable variations in how lifelike (to modern eyes, at any rate) these stylized figures appear. You could construct a scale of ‘lifelikeness’ and use it to rate these figures, to examine historical trends, regional differences, and the like. But if you then tried to apply that scale to the sculpture of Greece during its Classical and Alexandrian periods, you would find it didn’t work. Everything would be piled up at one end of the scale. Yet there was tremendous change over that time as figures became increasingly fluid and natural, eventually acquiring distinctive human expressions. However, you could not capture what happened simply by extending the scale of lifelikeness. Gombrich attributed the visible changes in style to a change in conception of what a statue should be (a change in goals) and a shift from reliance on knowledge to reliance on observation (a shift in method). A *qualitatively* higher standard of lifelikeness would be a standard that was sensitive to the effects of these underlying changes.

A New Standard of Understanding

I believe that something comparable to the “Greek revolution” is beginning to appear in education. It is the emergence of a qualitatively higher standard of understanding. As an educational goal understanding has been around for thousands of years. Students can be and often have been rated on it. Using commonly observed variations, you could construct a scale of understanding for any particular item or body of subject matter. The scale would range from utter cluelessness at the low end to a high end represented, let’s say, by the most convincing essay examination papers you could turn

up. What I am suggesting is that we are beginning to see among students a sort of understanding for which that kind of scale, even if stretched, will not work. The old kind of scale, and the conception of understanding that goes with it, is essentially a scale of conformity to some approved manifestation of understanding—usually a set of propositions. Call this the conformity criterion of understanding. The conception of understanding that I developed in Chapter 4 does not exclude this criterion. If you understand something, this ought to be reflected in congruence between your beliefs and those of acknowledged experts. But a conformity scale would be insufficient. It would be like a scale for judging sculpture that only took account of conformity to the physical features of the model or person being represented. Greek sculpture would score high on such a scale, compared to the sculpture of earlier civilizations, but the scale would be insensitive to most of what gives Greek sculpture its quality as art. Similarly, a conformity scale of understanding would be insensitive to most of what makes understanding a goal worthy of the fullest commitment of people's intellectual resources and energy.

To bring this discussion closer to earth, let me introduce a couple of examples. They are examples drawn from childhood, for it is easier to see what there is to understanding beyond conformity when one looks at learners who are still a considerable distance away from expertise. Both examples come from combined grade 5/6 classrooms, but otherwise the conditions are quite distinct: The first comes from an inner-city classroom in Oakland, California; the second from a middle-class school in a medium-size city in Iowa. The first comes out of the Fostering Communities of Learners project (Brown and Campione, 1994), the second out of the CSILE/Knowledge Building project (Scardamalia, Bereiter, & Lamon, 1994).

1. Students who were studying about AIDS came upon the reassuring information that AIDS cannot be transmitted by mosquitoes. This struck them as implausible. If hypodermic needles are a major way that the virus is transmitted, why wouldn't mosquitoes, which in their view are flying needles, also transmit it? They called a local AIDS hotline to pose the question and were eventually put in touch with someone who explained to them that mosquitoes transmit malaria because they become infected with it themselves, whereas the AIDS virus does not infect mosquitoes. Some students were satisfied with this explanation but others saw

that it did not really answer their question. The hypodermic needle doesn't get infected either. It transmits the AIDS virus just by the blood that sticks to it, so why wouldn't the same be true with mosquitoes? They pursued the question through library research and asking other informed adults, but as far as I know they never did get an explanation that satisfied them.

2. Students in the class were divided into teams to study different biomes—deserts, tropical rainforests, the Arctic tundra. The Arctic group became interested in the question of why trees don't grow there. Their initial assumption was simply that trees would freeze, but then one student questioned this explanation, pointing out that trees survive in very cold weather. Maybe trees can't freeze. When they learned about the permafrost, this suggested another explanation: If the earth a foot or two beneath the surface is permanently frozen, roots couldn't penetrate it and so the roots would be too shallow to hold up a tree. But then the group studying tropical rainforests reported that trees there had shallow roots. An expert on the Arctic gave a talk at the school. His explanation for the absence of trees was lack of moisture. This explanation didn't satisfy them either, because a check with the desert group yielded the information that trees did grow in some very dry places. Finally they concluded that it must be a combination of factors.

I have intentionally chosen examples in which the quest for understanding did not culminate in anything that would score high on conformity to established knowledge. Indeed, there was not much culmination at all. In both cases the question motivating the inquiry remained unanswered. For that reason, many educators would say that the value was in the process rather than in the outcome—in learning to pursue inquiry, to question authority, and so on. But to treat these cases in that way is to reduce the students' inquiry to mere exercise. That is the bind that folk theory of mind gets you into. The value of instructional effort lies either in the resulting mental content—which can be judged as to its correctness, completeness, or utility—or in skills and attitudes. That is how it was handled in Bloom's *Taxonomy* (1956; see Chapter 4) and how it continues to be treated in curriculum guidelines and test standards.

The unique value of the educational experiences represented in these cases does not lie either in the explicit knowledge acquired (although that may have been considerable) or in the skills and attitudes that were developed (although these are not to be

discounted merely because they would be difficult to assess). Their unique value is in where they lead. The students in the first case had embarked on a path that could lead to a far deeper understanding than most people ever have of the nature of microbial diseases and the complex routes by which they can be communicated. In the second case, we see the beginnings of an understanding of how different environmental characteristics combine to determine whether a particular kind of flora can thrive in a particular environment. In important respects, I would claim, the students' understanding had already progressed beyond that of the average educated adult.

As it happens, I had wondered about mosquitoes and AIDS myself, but it never occurred to me to try to track down an explanation. As for the absence of trees in the Arctic, I had never thought about it. I guess I had implicitly accepted "It's too cold" as an explanation: this despite my having actually been in the Arctic and observed that at the northern limit the conifer forests do not just thin out and then disappear; rather, the trees get smaller until they are the size of Christmas trees—a fact that weighs heavily against the "It's too cold" theory, if I had thought about it. Thus these examples impress me because the young students were investigating questions that are at my level, so to speak—as distinguished from the schoolbook questions one expects elementary school students to be investigating—and making more progress on them than I ever made or even thought of making.

The higher standard of understanding illustrated in these examples can be formulated like this: *Understanding is to be judged according to its ability to produce further understanding*. This is a qualitatively different standard from the familiar correspondence standards. It represents a dynamic rather than a static conception.⁹

What Would It Take to Make Teaching for Understanding a Reform Goal?

⁹ Dewey clearly had such a dynamic conception. He defined education as "that reconstruction or reorganization of experience which adds to the meaning of experience, and which increases ability to direct the course of subsequent experience" (1916, p. 76). For him, this idea was part of the larger idea that education is growth. Unfortunately, it was a simplistic version of the larger idea that survived, while the idea that the main value of school learning lies in its enablement of further learning (1916, p. 53) suffered neglect.

There is a problem in getting *any* objective taken seriously in education. If you argue, as I have done, for the importance of knowledge and depth of understanding, the most common response of critics will not be to disagree but to point out that other things are important too. Then they will give voice to whatever is uppermost in their minds, be it numerical skills, media literacy, or spirituality. Of course many other things are important and of course everything is related, but the effect of this kind of criticism is to make everything matter less and to avoid any serious criticism of the ideas that were actually set forth. There is a time for talking about education in its fullness but the rest of the time it should be possible to focus on particular problems or objectives while tacitly conceiving of them within a larger picture, which is for the time being not brought into question. Why this should be so much more difficult in education than in most other domains I do not understand.¹⁰ It may have partly to do with the complexity of the enterprise but it also, I believe, bespeaks the inadequacy of the folk theories of knowledge and mind that frame the discourse.

At this writing, teaching for understanding is not high on reform agendas in North America. Skills are on top. But understanding was up there not long ago and it will be high again. Education focused on skills is inherently mediocre, and its ascendancy usually means that public confidence in education has sunk so low that mediocre looks like a step up. Teaching for understanding cannot amount to much as a reform goal, however, if it is just another item on a list of standards. It has to be a goal that alters all the other instructional goals. In order for that to happen, three things are required:

1. People have to understand what it means.
2. They have to realize why it is important.
3. They have to realize that teaching for understanding embraces a host of unsolved problems.

The last point might seem dispensible or perhaps even countervailing, but I shall argue that, unless the unsolved problems are recognized, teaching for understanding will remain just another

¹⁰ Educational discourse is pervaded by a mistrust of other people's motives, which makes for a paranoia that every once in a while bursts out, as it has among the anti-phonics people. The rest of the time it is kept in abeyance by continual manifestations of good intentions. This, however, can lead to hypocrisy, which breeds further suspicion, and so on. Beyond that, however, it further defeats efforts to get on with solving an educational problem.

slogan to be tossed about during ideological debates, while the pedagogical pendulum continues to swing.

In the previous chapter I discussed why teaching for understanding is an elusive goal for educators. The ordinary reductive moves—reducing goals to activities, subject matter, or self-expression—eliminate the understanding from teaching for understanding. More generally, teaching for understanding is undermined by folk conceptions of knowledge. It is thought of as something in the mind, which right away makes it intangible and inaccessible. So we see the goal of understanding replaced by the goal of producing demonstrations of understanding (Bloom, 1965; Perkins, 1992). The criterion becomes correspondence between what the learner demonstrates and what an expert demonstrates. This is reasonable as far as it goes, but it is not a very elevating conception. But how to elevate it? The answer, to liberal-minded educators, is to replace product with process—to espouse ‘constructivism,’ ‘social construction of knowledge,’ ‘inquiry,’ ‘critical thinking,’ and other noble processes. That is but another road to reductionism, however, to activities that have lost contact with their goals. And it is also the road to loss of support from a public that wants results, not faddish-sounding processes.

As I argued in Chapter 4, the way to make sense of understanding as an educational objective is to conceive of it dynamically and relationally. To understand something is to have an intelligent relationship to it. The main value of scientific and scholarly understanding is that *understanding one thing increases your capacity to understand other things*. That is its practical value, not only for pursuing further education but also for achieving expertise in any knowledge-based occupation.

If this dynamic conception of understanding is accepted, however, it demands that instructional reform be approached at a deeper level than in the past. As I discussed in Chapter 8, evaluation needs to be concerned with the trajectory students are on—where they are going in their efforts to understand the world—rather than only with what they have managed to understand so far. We have to stop thinking of ‘constructivism’ as a pedagogical method of questionable virtue and start thinking of it as something that students should come to adopt as a way of life. We should be concerned about the students who do not adopt it, no matter how

good their present performance may be, because they are disqualifying themselves for participation in knowledge society.

The Myth that Defeats Reform

To many skeptics, sympathetic as well as unsympathetic, what I have been saying about a higher standard of understanding will sound like just more inflated educational rhetoric. They will want to know what basis there is for believing that the instances I have narrated can be replicated on any considerable scale and that they will have a cumulative effect. Some, less astute, will want to know how “this approach” ensures that graduates will be literate and mathematically competent—not recognizing that at this point I haven’t advocated any approach but have only indicated something to work toward. And then there are those, perhaps not great in numbers but enormously influential within educational organizations, who will reject what I have presented because of their gut feeling that it is overly intellectual, scientific, Eurocentric and in some undefined way racist and sexist.

Whether these objections have merit and how they might be answered are, of course, important questions. But taken together they suggest a matter of more profound importance. It is the great difficulty—perhaps the impossibility—of having any worthwhile discussion about educational goals. Across ideological boundaries discussion about goals is quickly overwhelmed by animosity. Yet it is only at the political extremes that we find groups advocating goals that others reject. Across a very wide ideological range, everyone wants students to be both proficient in basic skills and able to think. They want students to have factual knowledge as well as understanding. They want economically useful learning and they also want moral and cultural values (and there is not much disagreement about what those values should be). The animosity arises because of mistrust of motives and because goals cannot be separated from methods. It does no good for A and B to agree that children need to become fluent readers if A wants to teach phonics and B considers phonics to be a form of violence against children.¹¹

But discussion of goals is difficult even among people who agree enough that they should be able to disagree constructively. Such an occasion was a conference on the future of liberal education (Smith,

¹¹ I’m not being fanciful. This very charge was made by one of the leading spokesmen for Whole Language in an e-mail discussion group.

in press). We (I was one of the organizers of the conference) restricted the participants to those who could be expected to agree that a liberal education is a good thing. Within this large category, however, we invited participants with interestingly different viewpoints on the matter—philosophers, economists, and educationists of different persuasions. The result was indeed an interesting conference, but the discussion never got as far as what you could call constructive disagreement. Instead, all the effort went into clearing up misunderstandings, questioning one another's use of terms, denying supposed disagreements and sometimes denying supposed agreements. Some discussions continued after the conference and a year later were just beginning to bear fruit.

Why is it so difficult? Why is it so much harder for a school system to discuss and arrive at a set of realistic and motivating goals than it is for an information technology company, for instance? Well, interestingly, IT companies sometimes also lose hold on reality when they tangle with educational goals. In the middle '90s, a major IT company announced that it was going to shift from marketing educational software to marketing educational 'solutions.' Having some acquaintance with the educational arm of that company, I wondered where these 'solutions' were supposed to come from. Where was the educational problem solving capacity? The answer it seems, is that there wasn't any. The bold venture quickly faded away. No company would announce that they were getting into the genetic engineering business or the machine translation business unless they were sure they had the capacity to do it or knew how to acquire it. The company's marketing people, I suspect, had simply adopted a myth that pervades the whole education system. It is the myth of unlimited problem solving capacity. Adopt any educational goal and means can be found to achieve it. All it takes is marshalling the resources already available in the system.

To John Dewey means and ends were inseparable. An aim was the 'foreseen end' of an activity (1916, p. 106). He spoke of "having a mind" to do something—a quaint expression that he used to convey a quite modern notion:

To have a mind to do a thing is to foresee a future possibility; it is to have a plan for its accomplishment; it is to note the means which make the plan capable of execution and the obstructions in the way,—or, if it is really a *mind* to do the thing and not a

vague aspiration—it is to have a plan which takes account of resources and difficulties. ((1916, p. 103).

Yet Dewey seems not to have reckoned with education's incapacity for this kind of foresight and planning. A clue to why he overlooked it comes from his comparison of education to farming:

The educator, like the farmer, has certain things to do, certain resources with which to do, and certain obstacles with which to contend. The conditions with which the farmer deals, whether as obstacles or resources, have their own structure and operation independently of any purpose of his. Seeds sprout, rain falls, the sun shines, insects devour, blight comes, the seasons change. His aim is simply to utilize these various conditions; to make his activities and energies work together, instead of against one another. It would be absurd if the farmer set up a purpose of farming, without any reference to these conditions of soil, climate, characteristic of plant growth, etc. (p. 106-107).

Farming, at the time Dewey wrote, was a traditional craft, much as teaching still is. The goals Dewey imagined for the farmer were formed within the scope of that traditional craft and attaining them required no advances in it. They were to plant certain crops that the farmer already knew how to plant, and to cultivate and harvest them, taking into account the variables that the farmer already knew how to take into account. That seems to be how he saw teaching as well, and it is how teachers quite reasonably see it on a day-to-day basis. They are to teach certain things that they know how to teach, taking into account the variables that they already know how to take into account.

Although Dewey (1929) did acknowledge a role for research in shaping educational practice, he seemed to have little sense of large unsolved problems, of worthy educational goals that we don't know how to achieve and that call for advances in knowledge and invention. Instead, he too seems to have accepted the myth of unlimited problem solving capacity, so that all that was required for education to advance was clear thinking, resolve, and the abundant resources of experience. In the decades of dispute that Dewey's own ideas helped to ignite, all sides have tacitly accepted the myth, as do most reformers of the present day. In the opening chapter of this book I asserted that education is stuck. This myth is what it is stuck on.

Here is the worst of it: The belief that the necessary knowledge is already in hand not only inhibits the search for means, it undermines efforts to construct a new vision. For, as the Latin proverb says, we cannot desire what we do not know. It takes advances in knowledge to create new visions of what is educationally possible.

Beyond 'Excellence'

When U. S. President George Bush, in 1989, vowed that his nation should be first in the world in science and mathematics achievement by the year 2000, serious educators across the land groaned. It was obvious that it couldn't be done, but that was not the cause for dismay. The dismay was over what would happen to education as a result of pursuing a goal that was not only impossible but retrograde. Instructional researchers in science and mathematics felt at the time that breakthroughs were imminent. The previous decade of research had probably yielded more insight into the difficulties of learning school subject matter and academic skills than all preceding decades together. Instructional experiments were beginning to show promise of student learning of a quality not previously imagined. Now all of that stood to be forgotten in the rush to raise scores on tests—tests that had been created long before any of the knowledge advances that were raising new hopes.

I happened to be in Singapore, meeting with educationists, when word came that Singapore had scored first in the world on the computational part of the Third International Mathematics Study. People were naturally elated, but they scarcely missed a step in their pursuit of what they saw as the next objective, which was to improve mathematical problem solving and invention. Their vision was not borne aloft by romantic fluff but by the economic drive for which that small nation is famous. A front-page newspaper headline appearing in the same week gave the flavor of it:

Can Singapore Compete with Bill Gates?

The article's reasoning was straightforward. Singapore has a population of a few million. Microsoft can select talent from a pool a hundred times larger, plus being able to recruit talent worldwide. How, then, can Singapore hope to compete in an industry based on technically sophisticated inventive and design talent? Answer: Liberalize immigration and do a much better job of developing talent. There was no suggestion that being first in the world in arithmetic skills was even relevant to the problem.

If the current back-to-basics reforms in the United States work, it is just possible that mathematics test scores will in a decade or so be up to where Singapore's were in 1996. But where will Singapore be then—or any of the other high-scoring countries, almost all of which are seriously pursuing higher-level goals? I'm not sure. The road to thinking skills and creativity is lined with quacks. Some countries are liable to fall victim to quackery and may even lose ground as a result, but I expect others will not. The Dutch, for instance, not only score well now in mathematics but they seem to have better quack detectors than North Americans do.

International economic competitiveness is not an exalted goal, of course, but it is a notch up from winning a test score race. A still higher notch is that of producing the kinds of citizens who can thrive in and contribute variously to a knowledge society. For strategic purposes it is well to think of these as hierarchically ordered rather than as competing goals. That is, the goal of producing economically competitive talent ought to include the goal of raising conventional achievement test scores. The goal of full citizenship in a knowledge society ought to include development of economically competitive talent. And if a still higher goal is to be proposed, it should include all of those. This is strategically if not logically necessary, because support quickly evaporates when people think they have to give up their sensible goals in order to adopt your riskier ones. Educational innovators would prefer not to be bothered with goals of a lower order than those they intend to reach, and some of the effort that may have to go into raising conventional tests scores is effort that, in a more ideal world, could better be spent elsewhere. But innovators who want to be taken seriously realize that the admission ticket for being taken seriously is evidence that their innovation satisfies other people's goals as well as the goals they are trying to get people to adopt. Easier said than done? Of course, but no one has suggested that instructional reform is easy.

What are these higher level goals, and how can the sights of educational reform be raised to target them? The metaphor I have just used suggests a major conceptual problem to be overcome. As soon as you move to goals above the level of test scores or specifiable performances, the target-shooting metaphor no longer works. You must conjure up a state of things, a network of conditions that must be met altogether rather than as separate targets. (This does not mean, of course, that they cannot be reached by stages, only that the

stages themselves are complex.) All sorts of organizations must find ways to pursue complex goals. The top-level goal of a for-profit company might take the form of a clear target, such as achieving a certain level of return on investment; but if the company determines that achieving this goal entails providing a superior quality of service, then they face a problem not much different from that of a school system that determines its goal is to provide a superior quality of education. Each must craft an image of something beyond what presently exists but that looks achievable. Creativity is required, not only to achieve the goal but to imagine it in a sufficiently realistic way that it can be pursued.

An educational vision, I have been insisting, must offer an image of an outcome, not of a process. It is time now to look more closely at this stricture. When innovators move beyond test scores and other immediate indicators of achievement, they find themselves issuing rather long-term promissory notes for future benefits to the learner and to society. Unless they are among the few who manage to achieve celebrity status, they are likely to find those notes rejected: no credit rating, no collateral. As observed in Chapter 7, creditable ideas about what should be done now to prepare students for the uncertain future are in short supply. Back-to-basics, liberal education, and developmentalism offer at most slightly renovated versions of their traditional answers. Futurists generally offer nothing of substance. The people attached to these schools of thought are not fools, they are just faced with a problem that is very difficult.

To keep matters in perspective, it is important to realize that test scores are promissory notes, too, when they are used to judge the worth of an educational program. They require us to believe that if School A's students score higher than those of School B, then School A's graduates will do better in the future than those of School B on worthy criteria of membership in society.¹² These promissory notes have been in circulation long enough that they have come to be accepted as legal tender, but that does not necessarily mean there is anything behind them. There is ample evidence, as one might expect, that reading test scores have wide-ranging predictive value, much

¹² That prediction may be self-fulfilling, of course, if universities and employers believe it and award opportunities on the basis of it. All that does in the present context, however, is add further obstacles to the selling of a new educational vision.

like the IQ, with which they are closely associated. But if we move from there to more specialized kinds of achievement, predictive validity trails off. At the extreme, we have no evidence at all that a program that increases scores on thinking skills or creativity tests has any effect on performance in later life.¹³

Futurists stir our imaginations by telling us that the future is going to be qualitatively different from the past. Therefore, the futuristic reasoning goes, education must produce a new kind of educated person. This is an exciting notion, but one that quickly trails off into verbalism and technohype. I would like to see educational reform take on some of this excitement, without the verbalism and hype. We must dismiss suggestions that surfing the Internet or processing hypertext requires a differently functioning brain. Previous discussion has suggested two important constraints that a realistic futurism must honor:

1. New human traits are unlikely to emerge. Whatever may be posited as desirable characteristics for tomorrow's citizen, they are likely to have been recognized as desirable for centuries and already to figure in lists of educational objectives. If that is true, reformers can forget about inventing new objectives and must craft a new vision out of familiar objectives.
2. Whatever new or elevated vision may be pursued, it must be translatable into objectives for the here-and-now. Achievement test scores will continue to hold sway unless they can be replaced by other immediate indicators of effectiveness.

These constraints may at first seem to rule out everything new and exciting, but as I tried to show earlier, they do allow one possibility. It is the possibility of *qualitatively* higher standards—that is, standards that are not merely an extension of current metrics but that introduce a new and higher realization of things educators have been trying to accomplish right along. The prototype for introduction of a qualitatively higher standard was the so-called 'Greek revolution' in sculpture. The educational examples I gave of a qualitatively higher standard of understanding may seem trivial by comparison, but I would not reject the possibility that they mark the

¹³ The same, actually, can be said about score increases on any mental test. The fact that reading test scores correlate with future academic performance does not mean that doing something to raise reading test scores will have a corresponding effect on future academic performance. That is a separate empirical issue and one that has hardly been researched at all.

beginnings of another Greek revolution. Early Greek sculpture does not look dramatically different from its predecessors, either, except that we can now see where it was starting to head.

Reading reform has of late been almost exclusively concerned with bringing poor readers up to an average level.¹⁴ This is reform aimed at a *quantitatively* higher standard, albeit an extremely important one. But for education as a whole, we should be considering the possibility of a *qualitatively* higher standard of reading. Assuming that the world's knowledge keeps increasing not only in quantity but in level of complexity, competent citizens of the future will need to be able to read and understand harder stuff. A competitive edge will be gained by those who can get it right the first time and not require cycles of e-mail messages and phone calls before their initial misreadings are straightened out. (When researchers talk about reading comprehension, they mean comprehending the kinds of discourse that ordinarily come in written form; that these may be received aurally rather than visually is, except for dyslexics, largely irrelevant.)

By a complementary argument, people in a knowledge-based society will have more complex things to communicate and therefore will need a qualitatively higher level of writing or text composing ability. More communication will be at a distance and so will require more of the literary skill of putting necessary context into the text (Olson, xx). People whose communication skills depend overly much on pointing will be at a disadvantage.

Qualitatively higher standards of understanding, reading, and writing are so closely tied together that it is hard to imagine getting very far with one without also attending to the others. Reading is the primary means of access to the conceptual tools, facts, and ideas necessary for sophisticated understanding; and writing, when carried out in a knowledge-transforming way, is a powerful means of developing understanding (Scardamalia & Bereiter, 19xx, 1991).

I am speaking very broadly here. If you look into the cognitive research in any subject area you will see qualitatively higher standards taking shape. Some of the ideas come from studying experts in the disciplines. Others come from studying students who

¹⁴ *Whose* average is an issue in this context. One highly-touted approach, Reading Recovery, is aimed at bringing the poorest readers up to the average of their class. But this typically means bringing them up to the average of a class that is itself markedly below the national average.

show qualitatively advanced abilities and knowledge. Still others come from educational experiments that yield results beyond the kind anticipated. The last are especially important, because they show that qualitatively higher outcomes can be produced, that they are not just lucky accidents of birth and experience. Taken together, these ideas represent a new kind of educated person. The characteristics of such a person are the same ones that have been honored throughout modern times and many of them go farther back than that. What is new is a quality of understanding, a quality of intellectual skills, a quality of interest, sensitivity, and appreciation that have heretofore been found only in exceptional people but that may now become expected results of regular education.

This, however, is a promissory note backed by only scattered experiments of limited scope. How could one ever hope to get reformers to honor it? There have to be convincing demonstrations. There have to be evaluations which assure people that conventional standards of achievement are not being sacrificed in pursuit of qualitatively different goals. But demonstrations can only be convincing if people understand what you are demonstrating, and that is where the conceptual limitations I have been discussing become crucial. People have to understand knowledge as more than stuff in people's heads. They need a conception of what it is to create and work with knowledge. They need to believe that the hidden iceberg of personal knowledge is as important and much larger than the two peaks of it that show. They need to judge educational reforms according to what they do for the whole iceberg.

Strategy: Reforming the Reformers

Are we not, then, in an impossible bind—where reformers cannot adopt a qualitatively higher goal until they have seen it being achieved and they cannot see it unless they understand it and they cannot understand it unless they see it? Broadly speaking, yes. But there are some breaks in the vicious circle. The breaks are of recent origin. They have come about because of things going on outside education, especially the rise of knowledge-based industries and of occupations devoted to knowledge work, and the spread of ideas such as intellectual property, knowledge management, and knowledge evolution. More and more people are acquiring, through their work, concepts that should help them grasp a new educational vision, if someone can help them make the connection.

At one time our research funding required that we attend a yearly technology fair in Silicon Valley and show off our accomplishments to a flock of engineers. The software we had to demonstrate at that time—CSILE (Scardamalia et al, 1989)—was not of a kind to impress techies. It didn't do much. All that made it interesting was what kids did with it. So instead of showing off the technology, we showed videos and transcripts of kids working on problems such as why humans can talk but chimpanzees can't or what happens in an asthma attack. Within minutes the engineers quit acting like engineers and started acting like parents. Their overwhelming reaction was that they wanted this for their own children. They recognized that they had never done anything comparable to that in fifth or sixth grade, and that kids who could do it were at a tremendous advantage over those who were memorizing facts or piddling away the hours on multimedia 'projects.'

These were not average parents, of course. Two things set them apart. First, they appeared to be little concerned about achievement test scores. If there was a competitive slant to their interest, I would guess it was toward how their children might gain an edge over other high-achieving kids—and we were showing them what that edge could be. Second, they were themselves employed in the creation of knowledge, and so were able to recognize it when they saw it and to appreciate its significance. Yet there is no reason to suppose they were especially sophisticated in matters of education. They merely had a better idea of what counts in the modern world.

The lesson I draw from this experience is that if a higher level of reform is to have a chance, it must build a constituency among people like those Silicon Valley engineers—people who are already part of a knowledge building culture and who have a sense of what it takes to belong. This does not automatically make them favorable to knowledge building in schools. Back-to-basics reformers are often recruited from the same population, and many others are romantic believers in the magic of the Internet and multimedia. All I am saying is that they have many of the conceptual resources needed to understand. They are not stuck in the vicious circle and so they may be educable.

To build a power base among such an elite, however, requires a shifting of priorities. Educational reform, especially in the United States, is overwhelmingly concerned with improving education for the most disadvantaged. This has a great deal of political will behind

it. It appeals both to the liberal interest in welfare and equality and to the conservative interest in productivity and self-sufficiency. Although the reasons for this emphasis may be compelling, they introduce a bias into educational policy-making that ultimately works against even the people it is most intended to help.

Educational policy making typically consists of people with university degrees and secure economic positions deciding what is best for children whose prospects are not of the brightest. In this situation, proposals such as teaching for understanding are unlikely to get far. They will be seen as failing to address the main problems and likely not to work anyway. There will instead be a bias toward quantitative improvement on low-order objectives. This does not mean that the policies these people might devise for their own children would be much different or that a more representative group of policy-makers would arrive at more enlightened policies. The crack in the vicious circle is very small indeed. All it amounts to this: People are more educable when they are thinking about educating their own children than when they are thinking about educating someone else's. Not because of their emotional involvement; that may work against reason. They are more educable because they can connect their own experience to that of the students who are the targets of their policies. If you can show knowledge workers a much closer connection than they had imagined between things going on in school and what goes on in their professional lives, they may become receptive to a whole new range of possibilities for education. The place to start, I am suggesting, is by getting reformers to want something different for their own children. After that you can try to show them that less advantaged children can have it too.

Sometimes it is possible to merge these two steps into one. In the Jasper Project at Vanderbilt University, they have an ingenious way of presenting their educational approach to business people. "Jaspers" are complex realistic problems conveyed through professionally produced video dramas. Representative Jaspers are one having to do with the logistics of setting up a dunking tank for a school money-raising event and another having to do with the problem of flying a wounded eagle out of a distant field. The central problem may require formulating and solving a score of mathematical subproblems. The Jaspers are aimed at middle school students, who work on them in small groups. The idea is to get

students to use mathematics the way it is used in real life, where the needed information is embedded in the environment and in the flow of events rather than being neatly set out as it is in traditional word problems. To give adults a feel for this approach to mathematics learning, the presenters show them a Jasper video and then divide them into small groups and set them to work trying to solve the problem. After the adults have worked at the problem long enough to have run into difficulties, the presenters announce that they are bringing in consultants to help out. On signal, a line of sixth-graders, with visible minorities well represented, file into the room, causing an outburst of laughter. The young students fan out to the working groups and proceed to help them move ahead on the problem. It is easy to see why such a demonstration has impact. Here are the kinds of adults who are busy across the land agitating for higher standards in mathematics and a return to the basics, encountering a mathematics problem that is too hard for them now, that would have been unthinkable for them when they were in grade school, and they may well suspect is also beyond the capabilities of their own children. Then suddenly they find themselves being coached by students for whom this kind of problem is familiar fare—students, moreover, who look like the ones they have assumed to be in need of emergency repairs. How can they not believe they have been missing something?

The crucial first step, as illustrated in both the Jasper example and the Silicon Valley technology fair example, is to get influential adults to see themselves, their own work, their own aspirations and those they have for their children, as part of the educational reform picture. This is just a first step, but in order for it to amount to more than a momentary glimmer, education and knowledge work have to be brought into the same conceptual space, and that is a big order. As it is now, education talk has almost no relation to real-world knowledge talk. Some of the same words are used, but the contexts are perceived so differently that there is little common meaning:

Word	What it Means in Knowledge Based Enterprises	What it Means in Schools
Knowledge Building	Producing intellectual property	Learning by doing
Achievement	Recognized contributions to the success of the enterprise	Test scores; grades

Understanding	Knowing the non-obvious stuff	Having beliefs that correspond to those of experts; being able to explain
Creativity	Innovative design and strategizing	Uninhibited self-expression
Problem solving	Figuring out ways to achieve goals when off-the-shelf ways won't do	Solving word problems in which all the necessary information is provided
Cooperative work	Collaborative knowledge building	Collaboration on seatwork or in producing reports, displays, presentations, etc.
Science	What you need to know in order to understand the technology or the causes of many problems	A body of knowledge about physical and biological things; what scientists believe about these things; research methods
Mathematics	Conceptual tools needed in many kinds of technical work	Procedures for solving numerical problems
Research	Finding out things you need to know in order to solve a problem or produce a result	Exercising research methods; collecting material for a report; pursuing curiosity

The discrepancies obviously are not just semantic. What normally goes on in schools is very different from what goes on in knowledge based enterprises and no fiddling with the vocabulary is going to bring them any closer. But what I have been arguing in recent chapters is that they could be much closer. Schools could be places where knowledge is a public product and not just something in students' minds; where its production is a collective, collaborative effort and the focus of students' individual efforts is on the success of this joint enterprise; where what is learned is put to use in the further creation of knowledge; where the problems to be solved are problems in the advancement of knowledge. Much of the more innovative educational research is heading in that direction. But how you talk about things, the concepts you bring to bear, do make a difference. Talk about education tends to sound like the right-hand column no matter who does it. This not only makes it difficult for people outside education to connect it with their own work, it impedes the movement of education toward real knowledge building.

Note that I am not saying business people have the answers and educators should learn from them. The business literature on knowledge is just as primitive as the educational literature and equally bound to folk theory. It is just that the nature of their work has led people in knowledge-based enterprises to adopt a more pragmatic approach to knowledge, less encumbered by ritual and fetishism.¹⁵ Conceptual advancement is needed on both fronts. It ought to go on in concert. This book, although tilted heavily toward education, is really about conceptual problems that are common to knowledge businesses and education. Getting people who are already at home in knowledge-producing enterprises to see schools as sharing the same problem space with them would be an enormous step in moving public thinking toward a higher level of educational objectives and this in turn could do much to draw the thinking of educators in that direction as well.

Along with the talk there have to be demonstrations. People have to see instances of real knowledge building going on in schools. In the work that we have been doing on Computer Supported Learning Environments (CSILE), we have produced a lot of quantitative evidence of educational gains (Scardamalia et al., 1992) and this has been important for credibility, but by far the most influential results come from simply having young students walk viewers or visitors through the CSILE database they and their classmates have constructed, explaining what they have accomplished. One grainy video alone has been worth millions to us in research support. On it, an eleven-year-old boy takes you through his investigation of why chimpanzees can't speak. He shows hand-drawn computer graphics comparing the oral cavities and the vocal apparatus of chimps and humans, explaining the critical differences, and then does the same with diagrams of their brains, wrapping up his tour with, "And that's why we can talk and chimpanzees can't." People's jaws drop. They have never seen anything like it. Yet it is obvious that the boy got his information from books, that the neuroscience is simplistic, that the explanation leaves many questions unanswered. And it is also obvious that this is not your average eleven-year-old. He is

¹⁵ As for imitating business practices, one hesitates to generalize. There are surely 'best practices' here and there that schools could adapt to their needs, but without better conceptual equipment there is no way to recognize them or to do more than imitate surface features.

unusually articulate and serious-minded. So what is impressive about it as an educational demonstration?

Several qualifications are in order before I try to explain. In order to be *seriously* impressed—that is, impressed enough to do something—people need to be assured that what they saw on the video was not a one-of-a-kind event. They need to see a whole room full of students doing comparable things. And not everyone is impressed even then, or they are impressed for the wrong reasons. We have had educational technology supervisors who ignore what the students are doing, look at the software, sniff, “It’s just a database,” or “It’s just a bulletin board,” and go tell their bosses to forget about it. (This is a version of the “We already do that” syndrome.) And then there are the educators who see it only as a case in support of their pet idea, be it constructivism, project-based learning, or child-centered education. (Yet another version of “We already do that.”) That leaves, however, a significant number of people who really seem to get it, and so the question is, what do they get?

A revealing remark came from a visitor who was a highly-placed civil servant with the job of promoting knowledge-based industries. After spending an hour in a CSILE classroom, he said, “I think I have seen my first learning organization.” We have seen companies where they thought that being a learning organization meant having a company-run school for training employees. If that is what learning organization means, then all schools are learning organizations and the visitor's remark was absurd. In business literature, the term is used in different ways by different writers and so its meaning in common usage is far from clear. Business literature relies heavily on examples rather than definitions, but the examples used to convey the idea of a learning organization range over practically everything that could be considered a smart personnel policy or way of making the most of employee's brain power. What holds the examples together is some vague idea of the pervasiveness and value of knowledge in an organization and the importance of nurturing it. As I argued in Chapter 6, I don't think you can get much farther than that unless you cash in folk theory for a better epistemology and theory of mind.

But in the absence of clearer definitions, it helps to have cleaner examples. The CSILE classroom offered one. There wasn't any product or service going out into the world. Yet something was being

produced, and about the only thing you could call it was knowledge. What was it made from? Other knowledge—mostly knowledge brought in from the outer world and processed into something of more local value. What was the product good for? For the production of more knowledge. Thus, in the classroom you had a model of a learning organization or, as we would prefer, a knowledge building organization in relatively pure form, unobscured by the many other functions of a money-making business. I don't suggest that our visitor saw it in just that way. I don't think you can see it that way until you have absorbed the idea of conceptual artifacts. But his experience had sharpened his impressionistic knowledge enough that in some less articulated way he knew what he was looking for, and recognized it when he saw it.

There are other approaches to knowledge building in schools, that may be as effective or more effective than CSILE in what they are trying to do. Typically, they are less clean as examples because they either look more like conventional schooling—there is a teacher up front leading a discussion, for instance—or there is some tangible project—such as producing a multimedia document—that capture's the observer's attention. But to the extent that schools can provide the public with examples of what it means to produce and work with knowledge, they connect to concerns of the working world at a higher level than before.

Schools presently connect to the concerns of the working world at a very low level. The concerns are over why Johnny can't read or calculate or find Rome on the map. Those are legitimate concerns and they need to be addressed. But if the connection is only at this low level and everything beyond it is hand-waving about higher-order thinking skills and lifelong love of learning, we can expect a continuation of low-level reforms. To connect at a higher level, people in knowledge-based organizations need to see the work that goes on in schools as similar, at a reasonable level of abstraction, to the work that goes on in their organization. Once they see it that way, they can not only be receptive to a qualitatively higher level of educational goals, they may even begin to understand their own work better. But all of this presupposes a conceptual framework for knowledge building and learning that enables both business people and educators to think more penetratingly and constructively about what they are doing. That is the transformation that will make it possible to reform educational reform.

Conclusion

In broadest terms, the problem as I have tried to formulate it in this book is to get educators and others out of the two-dimensional world of folk theory and into a three-dimensional world in which it is possible to do fuller justice to the role of knowledge in a knowledge society. There is no way that this can happen overnight. The left-right swings of educational reform and counter-reform are likely to continue for years. But if Peter Drucker is right that education will be the most important factor in a nation's prosperity in the 21st century, then the future belongs to that society that can fasten on to and achieve qualitatively higher standards. The successful society will steer past back-to-basics movements and the periodic revivals of child-centered education. It will try to steer education to the same place it is trying to steer itself.

The problem is that, in whatever sense a society may be said to know or intend, society does not know where it is trying to steer itself. The envisioned knowledge society that Drucker and many others are now talking about is not a place where any of us have been. We may have experienced intimations of it on a small scale, in our own families or in groups we have worked with, but we have not seen it on an institutional scale. We can make visionary statements, but we cannot say with confidence that any particular reform is a step in their direction.

Schools will continue. Will they continue to be the battleground of old pedagogies or will they become Internet cafes? If those are the only choices, it is a safe bet that they will continue to be battlegrounds. There is a third possibility, however, and that is that they become laboratories for testing designs for a knowledge society. Schools have many limitations but for this third possibility many of those limitations are advantages. Schools are places where knowledge creation can go on, but where it does not have to be market driven or competitive. That has been the virtue of research universities and they continue to demonstrate its value, despite alarming intrusions of the marketplace. But knowledge creation in universities is the work of a minority, and most of it takes place out of eyeshot of the undergraduates, who go about their business much as they did in centuries before the research university was invented. Knowledge creation that goes on *within* the educational process is a different matter, and while it is possible in undergraduate university programs, it is easiest to implement in schools.

Knowledge creation in schools is the creation of knowledge by students for their own use. It is thus like subsistence farming.¹⁶ The school is like an agricultural village. Unlike knowledge-creating companies, its members are not selected because of their skills. They belong because of where they live. Thus the school is more a miniature society than a miniature enterprise, and accordingly it has the potential to be a model for a knowledge society rather than only a model for knowledge-creating organizations within some perhaps quite different kind of society. If a school is to be a humane and successful knowledge society, everybody in it must have a part, everyone must find it meaningful and rewarding. A vast range of talents and temperaments must be accommodated. And the knowledge that is produced must be good knowledge. It must be effective in producing more knowledge and it must be worth students' carrying with them when they leave school. Transforming schools in this way presents big and mostly unsolved problems, but they are problems society as a whole must solve if the knowledge age is to be a good age for humanity. Schools will have to tackle them too, sooner or later. I am suggesting they do it sooner, thus in certain ways leading social change rather than following in its wake.

In order for any of this to make sense, however, people have to be able to see knowledge creation by students as genuine productive work, not fundamentally different in kind from the knowledge-creating work that goes on out in the world where people produce knowledge of various kinds for a living. They must not confuse the work of producing knowledge with the learning that inevitably accompanies it or with the media objects and performances that may grow out of it. Such confusion exists to some extent in the world at large, but in education it is endemic. The result is to undermine any effort to make the classroom into a genuine rather than a pretend knowledge creating community and to give it a role in the functioning of a knowledge society beyond that of merely furnishing students with knowledge and skills that may be of use in the future.

¹⁶ The analogy can be carried further. To the extent that knowledge created in schools has value beyond the classroom where it is created, it enters into a barter economy. No one is likely to pay money for it, but it may be exchanged with other classrooms or with other social groups such as museum curators or teacher trainees or more advanced students, who find value in it for their own purposes and who have knowledge of their own to trade (Scardamalia & Bereiter, 1996).

The main point of this closing chapter has been to elaborate on the idea of a qualitatively higher standard of educational outcome. *Quantitatively* higher standards are easy to understand. Simply take the scales by which we currently measure educational results and point somewhere higher up than the current level. *Qualitatively* higher standards require that you imagine a different kind of outcome. You need a different conception of what it means to be a good reader or writer, of what it means to understand a scientific theory, a historical event, or a poem. Folk theory of knowledge and mind fails at this point. Conventional standards are grounded in the folk conception of the mind as a container and in commonsense notions of skill. Raising standards means demanding more items in the mental container and moving the bar a notch higher in tests of skill. A notion like *deeper understanding*, which implies a qualitative shift, becomes either an empty slogan or it gets translated into tests of skill.

Envisioning qualitatively higher standards does not require exceptional imagination. We can point to people who are exemplars of superior kinds of reading and writing ability, of scientific, historical, or literary understanding. What we need are conceptual tools for translating exemplars into goals and goals into pedagogy. The two-dimensional world of folk theory and folk pedagogy does not provide the tools or the space in which to use them. We need, I have argued, a third dimension that allows conceptual artifacts to be distinguished both from the mental states of the people who create or deal with them and from the physical and social world that these conceptual artifacts relate to. Qualitatively higher standards of cognitive skill imply skills in working with conceptual artifacts. Qualitatively higher standards of understanding imply qualitatively different relationships between the knower and conceptual artifacts.

There are plenty of educational problems that can be recognized with our old folk theoretic conceptual equipment, and available knowledge sometimes suggests a solution. But, as we are seeing in the case of reading reform, the equipment is so crude that reformers tend to get it wrong, can't distinguish a solution from a subterfuge, and the counter-reformers get it wrong as well. And so we get pendulum swings instead of progress. The society that moves ahead will not be one that fixes the pendulum at one position or another. It will be a society in which there is enough conceptual change that

something begins to happen that has not been seen before: the disciplined production of new educational ideas.