

Chapter Three

RETHINKING WHAT WE KNOW

Positivist and Constructivist Epistemology

Let us acknowledge that the objective or disinterested researcher is always on the side that pays best.

Wendell Berry

QUESTIONING ASSUMPTIONS

Imagine a blustery speaker on school reform insisting that “our students must know more when they leave school!” Now, imagine the audience’s likely response: nods of agreement? an enthusiastic “absolutely!” here and there? Few listeners would hear anything to doubt or challenge in the speaker’s claim—except, of course, for the critical theorist, who frequently examines the murky deep structure under the apparently simple surface structure of everyday language. Working to uncover cultural assumptions, the critical theorist asks of the speaker: “But what do you mean by *know*? And what makes *more* necessarily better?”

However rarely such questions are asked, they are essential ones, because embedded in common demands for students to “know more” are philosophical definitions and assumptions that few educators have ever consciously considered. Like many Americans who buy primarily American music because that’s what they hear on radio stations *they* listen to (or like some other Americans who buy primarily Latin music because that’s what they hear on the radio stations they listen to), educators make choices endorsing one particular perspective largely because they haven’t been exposed to an alternative. Though a world of music is available, shoppers buy primarily the kind of music that surrounds them culturally; they don’t notice that their selections also involve a default decision not to buy anything significantly different, like African or Asian music; they don’t notice that their choice implies that only the specific type of music they buy is worthy of their interest and investment.

I've asked countless college students if they've ever listened to any African music, only to have them look at me as if I'd asked them whether they had ever dropped by Mars. Many opera devotees might react similarly to a question about rock. Of course, any individual human being might really enjoy one type of music and not the other as a matter of personal taste. But when whole hordes of people embrace the same wholesale exclusions—as in “What? Me listen to opera/rock? Are you crazy?”—then it seems likely that something cultural, rather than something personal, is shaping the choice.

Thus, being immersed in a culture, as earlier chapters detailed, limits our imagination and consequently affects our actions. When mainstream school culture limits how teachers conceptualize their work with students, teachers become limited in the classroom choices they make. In fact, teachers who believe they've created a classroom reflecting their individual goals may be no better off than people whose CD collection has been shaped entirely by what radio stations play. They consider only a limited menu, like CD buyers who choose between Smashing Pumpkins and Weezer, perhaps, or between Luciano Pavarotti and Placido Domingo—but never between Pumpkins and Pavarotti. They are unaware, too, that their “choices” implicitly endorse one specific perspective as being always and everywhere preferable to another—like rock fans and opera buffs who are equally scornful of the others' area, which they usually know nothing about.

As a specific radio station devotes itself to playing one type of music, schools devote themselves to breeding some particular kind of “knowledge.” This must be so; if it weren't, school personnel couldn't ever talk about measuring what students know, a continuing preoccupation everywhere these days. If they want to measure “it,” they must have *some* sense, conscious or not, of what “it” is.

Of course, any individual school's definition of “knowledge” and of what it means “to know” is usually implicit and unexamined. Like other cultural assumptions, the definition of “knowledge” is rarely explicitly discussed because it has been so long a part of the culture that it seems a self-evident truth to many, simply another part of the way things *are*. And,

like other unconscious beliefs, this unexamined assumption limits our vision and has a profound impact on our actions.

The particular definition of knowledge a teacher assumes will shape her practice, consciously or not, because our definitions always shape our actions. If we define "good music" as rock, we buy one thing; if we define it as "opera," we buy another. Similarly, the mother who defines "a good breakfast" as "cereal the kids like" will buy Chocolate Captain Cavity with 53 g of sugar, whereas the mother who defines "a good breakfast" as "nutritious cereal, low in sugar" will buy whole grain Oaty O's with 2 g of sugar. Shoppers will buy one product or another based on how they define a "good" this or a "good" that—and teachers will teach one way or another, depending at least in part on how they define the "knowledge" they want their students to have, on what they mean when they say they want their students "to know" something.

But, no matter how routinely we take for granted the prevailing definition of "knowledge" embodied in common classroom practices, that definition is not a sacred truth. Instead, it reflects one very specific, dominant philosophical stance—to which there is an alternative. There are, in fact, two different epistemologies—that is, two different conceptions or definitions of knowledge—embodied in a variety of contemporary classroom methodologies. And therefore, to make genuine choices in their practice and to create a classroom that is philosophically coherent, educators need to understand both perspectives. They need to understand positivist epistemology, because it provides the foundation for traditional practice and is central to the "back to basics" movement. And, they need to understand constructivist epistemology as well, because it lies at the core of critical theory and is central to a variety of reform strategies currently being urged upon teachers.

WHAT EPISTEMOLOGY IS, AND WHY IT MATTERS

The formidable word "epistemology" sounds just like the kind of academic concern teachers frequently scorn: ivory tower stuff that has nothing to do with real world practice. Nothing could be further from the truth.

Epistemology is the branch of philosophy that seeks to define “knowledge,” that seeks to explain what it means “to know” something, that seeks to understand how humans come to “know” things. Since all of schooling is about students coming to know things, what we mean by “knowing” is an essential question. Epistemology provides an answer to that question, and so it also provides an essential philosophical foundation for educational practice.

Choosing an epistemological position—that is, deciding which definition of “knowing” to accept—is much like choosing a destination, a goal to pursue. The New York driver who intends to travel to California must head her car west; she can gauge her progress along the way by checking the states she passes through against a map. But the New York driver heading for Florida, having an entirely different objective, must steer his car south and check his progress against a whole different set of states. While each might use exactly the same words to state their intentions (“to reach my destination”), their routes and checkpoints will be vastly different because their specific definition of “destination” differs.

It’s useful, I think, to think of education in these terms of traveling toward a specific destination. While educators may use a common phrase to describe their goals—“to increase students’ knowledge”—the specific way they define or conceptualize “knowledge” will involve goals as different educationally as California and Florida are geographically. And again educationally as well as geographically, vastly different goals dictate vastly different routes and assessment of progress.

My goal in this chapter is to give you sufficient understanding of different goals to choose consciously between them. Therefore, in the following sections, I’ll first define positivist and constructivist epistemology and explain how the different definitions shape our vision of student learning. Then, I’ll go on to discuss which methodologies and which assessments make sense for which stance. I invite you to keep your own thinking and practice in mind as you read, checking to see which camp your practice lies in now, whether you like it there, and whether your methods suit your intentions.

I hope you take this invitation for self-study seriously, because educators who have not identified their goals and checked their practice against them

run the risk of trying to drive from New York to Florida via San Francisco. It simply makes no sense to use positivist methodology to reach constructivist goals, or vice versa. Unfortunately, few of us learn as undergraduates to choose our own philosophical destinations, to select appropriate pedagogical routes to them, and to monitor our activities for necessary course corrections. Teacher education programs have, alas, been much more likely to provide teachers-in-training predesigned Trip-Tiks than to teach them to be navigators in charge of their own classroom journeys. However, better late than never.

"JUST THE FACTS, MA'AM": POSITIVIST EPISTEMOLOGY

Simply put (too simply put, but we have to start somewhere), positivists conceptualize knowledge as a *thing*—essentially, as verifiable information born of scientific investigation. Certain facts, truths, relationships exist in the world; if we apply ourselves to exploring the world methodically, we can discover them. Knowledge is there, waiting for us to find it. The world is flat, or it is not; it is round, or it is not. When we can say with complete confidence that one or the other of these statements is true beyond any doubt at all, we have some "knowledge" about the earth's configuration. For a positivist, then, "knowledge" constitutes factual and verifiable information.

From this perspective, knowledge comes from science, whose job it is to discover truths about the world. To add to what we "know," researchers use a carefully monitored process they describe as "objective," seeking information that remains constant under stringent scientific scrutiny. Rigor in scientific methodology is intended to ensure that when science says something is so, we can count on the information, we can accept it as true. Specifically, scientists use an experimental method to determine the effect of variable a on subject b. When results are verified in trial after trial, the scientific community says it "knows" something new about the world. Employing this process, natural scientists (chemists, biologists, physicists) have compiled extensive information about the properties and the interaction of natural elements and forces.

Social scientists following the lead of natural scientists have also pursued the verifiable. They, too, have conducted experiments on the effect of variable a on subject b, extending the methodology of natural science to human sciences, including psychology and education. For example, educational researchers have pursued cause and effect questions like "What effect does time-on-task have on learning?" and "What effect does teacher wait-time have on student response?" (Educational research like this, conducted from a positivist perspective, is most commonly labeled *process-product* research. It is such research that has yielded prescriptions for specified amounts of time-on-task and wait-time.)

For positivists, the verifiable findings of scientific researchers comprise our "knowledge" of a subject—the trustworthy information about it we have to date, born of scientific investigation. If we keep in mind that positivists insist upon scientific verification of information, we can use the terms "knowledge" and "information" interchangeably in talking about the positivist perspective. We should note, too, that science also seeks to build theory upon the information it uncovers, but there is a clear distinction between "theory" and "knowledge." Something is not "known" until it has been demonstrated repeatedly under experimental conditions. Over the course of time, the sheer amount of information—of facts, of "knowledge"—that researchers have produced is virtually incomprehensible. An important educational question results from the production of so much information: Given all that we "know," how do we organize and share the knowledge that researchers have uncovered?

The apparently logical answer to this question has been to keep the verified facts that constitute what we know sorted into categories—chemistry, mathematics, grammar, music, history, and so on. While some of these fields are labeled "arts" or "humanities" rather than science, for the purposes of schooling they are treated the same: discrete areas where researchers pronounce what is known about the field. There is no distinction made in art history and chemistry textbooks to explain the different processes researchers used to determine the knowledge contained within their pages; each book presents the known facts of the field. Within universities, of course, the chemistry researcher may scorn the work of the art historian as not truly "research" (because it's not born of scientific

method). Still, the general framework—"knowledge is information that is identified by experts who conduct research in the field"—is so firmly in place that the distinction between "science" and "not science" for the purposes of education never comes up in schools. That Beethoven was a great composer and Twain a great writer are presented as facts as credible as the fact that water freezes at 32° Fahrenheit.

Since each category (mathematics, science, English, music) is so large, each also contains multiple levels of subcategories to make information still more manageable—everything we know about verbs in one subcategory within the subcategory of grammar, for example, everything we know about Romantic composers in another subcategory within the subcategory of composers, and so on. Thus, all of the knowledge we have is neatly divided and subdivided to smooth the way for its acquisition by others, and the parameters that shape positivist "teaching" and "learning" and "schooling" are in place.

TRADITIONAL PRACTICE: POSITIVIST LEARNING

If knowledge consists of information, then "to know" means "to be familiar with what has been discovered/recorded by researchers/experts." "Knowing" means "having information about." If education is to ensure that students "know more" when they leave school than when they enter it, then the task of the school is to help the young acquire more and more of the information that experts have already discovered and categorized. The task of teachers is to become somewhat expert in what is known, and then to pass information along to their students. The higher the grade level taught, the more expert the teacher must be in subject matter (ultimately culminating, of course, in the university professor/researcher who is expert in all that is known in her field and responsible for helping to conduct research in order to uncover new knowledge).

Traditional school practices reflect this conception of knowledge, teaching, and learning. Curriculum, for example, is organized around discrete subjects (math, English, history, music, art) and each subject functions as a sort of bin of important facts in the field. Exactly which

facts are worth knowing and exactly how they should be arranged sequentially are decisions usually made by experts outside K-12 schools, because they are more familiar with the range of subject matter. Students have math lessons to learn about math, history lessons to learn about history, and lessons in different subjects are usually as isolated from each other as are the experiments of chemists and psychologists.

In addition, the whole of what students are to learn in the course of their schooling is divided into year-by-year plans: these things in first grade, followed by these in second, and so on. (In college, the division is into discrete courses, numbered at different levels: the 100 courses, followed by the 200 courses, and so on.) The assumption is that subcategories can be used to organize lessons and that the student's "knowledge" about a subject will be cumulative: first letters, then words, then sentences, then paragraphs, and then essays, with each bit cemented on top of the bit that came before, like bricks in a wall. Textbooks support this structure by keeping different bits of information neatly sorted into and confined within different grade level and/or subject matter texts.

It is very early in school years when subject matter is considered significantly specialized and difficult to require teachers with some expertise in a specific subject matter. In many schools, elementary students in very low grades are with one teacher for math and science, another for language arts and social studies, another for art, and another for music. Walls between subject matter are usually as firm as those enclosing the schoolhouse: the reading teacher tells children not to ask him math questions, and the math teacher informs the principal that she cannot be expected to teach writing.

The positivist conception of knowledge as some independent and objective *thing* also permeates common language about teaching and learning. We talk about a "body of knowledge" as if it were a physical smorgasbord for students to ingest. We talk about "acquiring" or "getting an education" as if it were analogous to strolling through the produce section and picking up a package of celery. We talk about next year's lessons "building on" this year's, as if teachers were all subcontractors: the plumber waiting for the mason to finish the foundation before putting in the pipes, the carpenter waiting for the plumber to finish putting in the pipes

before putting up the drywall. Teachers talk about “covering” material as if they were walking from one corner of a rug to another. All such images invoke the perception of knowledge as a *thing*. If it is a thing, then we can also talk about some people having it and others not having it (just as some people have heaps of money and others don’t); we can talk about who knows more than someone else. We can also say that the goal of education is for those who do have it (teachers) to pass their knowledge on to those who don’t (students).

Brazilian educator and theorist Paulo Freire has a memorable metaphor for this conception of knowing and teaching and learning, which he refers to as “banking” pedagogy (1970, 58). Teachers, or experts, first acquire heaps of information, the currency of the classroom. When teaching classes, they deposit the information that they have, the facts that they know, into students. Testing constitutes withdrawal, a process of extracting from students the same information deposited in them during classes. The teacher, then, functions as banker, making deposits and withdrawals, and he also provides grades as a kind of bank statement indicating how much “knowledge” was successfully transferred from him into each student’s account. It is a very different conception than that held by constructivists.

MAKING SENSE OF FACTS: CONSTRUCTIVIST EPISTEMOLOGY

I’ve attempted to define constructivist epistemology more times than I can count to more people than I can count. This involves explaining that “knowledge” can be defined as something very different from verifiable facts—the definition unconsciously held by nearly every educator exposed to and using traditional practices. Because the constructivist perspective is so alien for so many, I’ve had a lot of practice finding a beginning point that a majority of nonphilosophers finds accessible. Experience has taught me that one dependable gateway into this unfamiliar mental territory is a personal anecdote that strikes a familiar chord for many people. Ergo and forthwith, oversimplifying yet again: here is the story of an old skirmish between my husband, Ed, and my Aunt Wanda.

On our way home from an afternoon visit, Ed and I compared impressions that Aunt Wanda had cold-shouldered him during our conversation. She largely ignored his remarks and had a distinct edge in her voice when she had to address him for some reason. "What did I do?" he asked. "Beats me," I answered. "I'll go down for lunch tomorrow and try to find out for you."

Lunch was revealing, and my subsequent after-dinner talk with Ed touchy. The facts were clear: Ed had not invited Aunt Wanda and Uncle Frank to see our regional Triple A baseball team play once all summer, despite the fact that his company has season tickets and despite the fact that he knows they both love baseball. The season was over, and we had not taken them to a single game. What was not so clear was what exactly these facts meant. To my relatives, the facts added up to only one thing: Ed was an insensitive and ungrateful twerp. The things Aunt Wanda and Uncle Frank have done for us and our children over the years are countless, involving vastly generous amounts of time, energy, and sometimes money. They rarely leave their farm. She doesn't drive, and they both prefer he not drive if it can be avoided. They are both delighted and quick to accept when someone invites them out, especially for something like an afternoon or evening of baseball. Given that context, only an insensitive and ungrateful twerp would have failed to invite them to a game.

Ed didn't see it precisely this way. In the summer, he works six or seven days a week, twelve or more hours a day. An avid golfer, he'd found precious few hours for golf over the entire summer. He was often so tired that he was in bed half an hour after he ate dinner. Baseball was the *last* thing on his mind. If they *wanted* to see a game, why didn't they just *ask* us? (I knew what my aunt would say: "He *knows* we love baseball—why should we have to ask?") From Ed's perspective, he was innocent of the charge of thoughtlessness, and they were guilty of being unreasonable and insensitive.

The facts were indisputable; it was the meaning of them that was open to interpretation ("You're a thoughtless twerp." "No, you're insensitive and unreasonable."). Which picture seemed more true depended upon whether you were the person sitting around the back porch bored all summer instead of munching peanuts at a ball game, or you were the guy answering

telephones and solving logistical problems for a fleet of trucks and men scattered all over the East Coast 70 or so hours a week.

The point of this anecdote is no great revelation: of course the way humans perceive things is influenced by their personal circumstances and personal views of the world. That's why we generally make a distinction between "opinion" and "fact." People look at facts—at what others do or don't do, at what they say or don't say, and how—and then they decide for themselves what those facts mean.

For the constructivist, it is the *meaning assigned to facts*, rather than the facts themselves, that matters when we talk about *knowledge*, about *knowing* something. When we have only the facts of my family dispute, how much can we say we "know" about it? The facts are inert and meaningless until we attempt to interpret them, until we try to add them up into some coherent picture. No, my aunt and uncle weren't invited and didn't go to a baseball game. The important question here is "So? What does *that* mean?" To genuinely "know" what's going on, we have to understand the situations of both parties, how their past experiences shaped their expectations and actions, and so on.

For the constructivist, not just personal dispute but all knowledge is a matter of human interpretation. "Knowledge" is not something existing independently in the world just waiting for us to find it; instead, "knowledge" comes into being only when a human being examines data (facts, artifacts, and so on) and assigns meaning to it. Knowledge consists not of the facts themselves (which critical theorists often pointedly refer to as "factoids"—untrustworthy, decontextualized bits of information). Instead, knowledge is the sense that humans make of factual information. In the words of John Mayher, "*there is no knowledge without a knower*" (79).

Consider, for example, the difference between a student being able to *say* or *write* "two plus two equals four" and genuinely understanding what the words "two" and "plus" *mean*. As any teacher who has ever taught a vocabulary list of any kind knows, the fact that a student can repeat a definition does *not* necessarily mean the student has any understanding of what the word signifies, of what the word *means*. What good are the words

(the names, the dates, the formulas) if they don't accompany personal understanding?

Consider the fact that Spanish missionaries traveled to California and worked to introduce Native Americans to Christianity and farming. So? What does that fact tell us? Does it mean that the missionaries were earnest moral men who dedicated their lives to saving the souls and improving the lives of the Native Americans? Or, that they were arrogant cultural imperialists who destroyed cultures while mouthing pieties and concurrently developing the near equivalent of slave labor? Without context and interpretation, the bare fact is meaningless, inert.

It is also a fact that grammatical rules of standard English call for regular third person singular verbs to have an s at their end. So? Does that mean that everyone in the United States is somehow morally obligated to say *she walks* or *he talks* rather than *she walk* or *he talk* every time they speak—even in informal situations? Or, does it mean that a person whose speech and writing conform to that rule in formal, public situations will be thought smarter than someone who doesn't? Again, of what use are facts if they aren't presented to us in some context, if they don't *mean* something to us? What good is a rule if we don't know where it came from, when and where and why we might choose to follow it? Only when we can make sense of facts and rules, only when we have some personal understanding of data, can we say we *know* something.

The constructivist, then, insists that "knowledge" is *constructed* by human beings when they assign meaning to data; it is not simply sitting out in the world waiting for us to find it. No one "knows" anything until he can add separate bits of data up into a coherent, meaningful picture for himself. Predictably, then, in constructivist education, information takes a back seat to student *processing* of information.

LESS IS MORE: CONSTRUCTIVIST LEARNING

Since the constructivist doesn't perceive knowledge to be an external thing, the constructivist teacher doesn't believe knowledge is something she possesses, something that she can simply hand off to (or deposit in, or

transmit to) students. Instead, the task of the constructivist teacher is to design experiences that will give students an opportunity to develop their own understanding of the data at hand. The teacher's goal is for students to use information in some way that will deepen their own understanding of an area. Whether or not all students have precisely the same experience is often irrelevant; what matters is that every student's personal understanding is moved forward.

While there may be reasons for a group of students to read the same novel, for example, there is no need for all of them to read the same novel in order to learn about theme, or about characterization, or about dialogue, or about any other element of literature. Students can apply the same question to a variety of novels, share their answers with each other, and learn a great deal. The teacher might say something like "This time, let's give some thought as to how an author might choose to begin a novel, why one author might start with scenery and another with a dramatic event." In this case, if every student were reading a different novel and each read the first paragraph of his or her novel aloud, there would be a great deal of data for students to analyze. It doesn't matter *which* novel a student reads; what matters is that the student comes to understand that authors make choices among certain devices in order to try and affect the reader this way or that. The focus in this example is on the student's increasing sophistication as a reader, not on the content of a specific work.

Since I'm a constructivist teacher, my foundations course offers multiple examples of my concern with process and understanding rather than with regurgitation of fact. The foundations textbook I use, for example, explains different types of power arrangements between school boards and communities, between school boards and superintendents, and among school board members themselves. I might require my students to memorize the information—a typical positivist task, since the positivist equates having information with knowing. Instead, I require my students to attend a school board meeting and to characterize it according to the information in their texts. Which type of power structures do they think they saw? What specific events or factors support their interpretation? How do they think this arrangement functions to promote or impede the good of the community? In effect, my students must apply their own

intelligence and the information they have at hand to construct their own understanding of an event they witnessed themselves. Students freely choose the meetings they will attend, meaning that they will work with different data and construct different understandings of events. But being a constructivist, I am not concerned with the exact data a student works with and the exact answer a student formulates. My question is "can the student apply her intelligence and this information to data and formulate a sensible interpretation of the whole event?" If so, then I would say that the student has learned something about power and school boards, that the student now "knows" something she didn't before. I don't especially care if students memorize the formal terms in their texts, because they can always look that information up if they need it.

Again, constructivist teachers are concerned with process, not product. They are concerned with individual renderings of personal understanding, knowledge they have constructed for themselves, not lockstep regurgitation of reified fact. They don't care which formula a student uses to solve a problem as long as the student can explain why a given formula works, or why two different formulas work. The focus is not on facts nor on "right" answers, but on how students process facts, on what meanings students can construct using the facts at hand, on how they make sense of information they receive.

The positivist teacher says a student "knows" a Frost poem when the student knows what expert critics say it means; the constructivist teacher says a student "knows" a Frost poem when he can make sense of it for himself, when he can articulate an interpretation that fits with the actual words of the poem—whether any critic has ever endorsed that interpretation or not. Whether a student can *do* something sensible with information, rather than whether a student can repeat information on demand, is the constructivist teacher's concern.

POSITIVIST METHODOLOGY AND ASSESSMENT

When a positivist teacher says she wants her students to "know more," she is essentially talking about having more information, about giving the

students more of what she, the expert, knows. Therefore, a logical characteristic of positivist education is the teacher lecture (teacher talk). Books provide some information, and the expert teacher clarifies or extends this information for students. Students talk little because they are the ones who don't know the subject yet; what can they contribute to classroom talk? When they do talk, then, it is usually so that the teacher can check to see whether information is being retained: "So, then, John, what were the three causes of that battle?" "So, then, Mary, what does X stand for in this case?" Students listen, and they take notes—often in exactly the same words as the teacher or the text used. They do the same tasks over and over ("Write these spelling words ten times. Underline the nouns in these sentences.") so that they remember what the teacher or text has told them.

Work comes from a predetermined curriculum, selected by experts who know even more than the teachers: this list of spelling words this week, that list next week. These historical facts this month, those historical facts next month. Based on the grade level textbook, we get teacher talk and teacher plans: "Do this factual, multiple choice (fill-in-the-blank or short answer) worksheet. Do the questions at the end of the chapter. Tell me what the book says. Tell me what I said yesterday. Memorize this. That will be on the test. You have to know it because I said so, or you have to know it because you'll need it next year (or in high school, or when you get to college—can't put the walls up before the foundation is poured!)."

Even "personal opinion" questions have "right" answers. Once, for example, after reading a far-fetched story about a little boy home alone who experienced every conceivable household fiasco possible, from a foaming and flooding dishwasher to a wet St. Bernard escaping from the bathtub, my son had to answer questions at the story's end. One asked, "Have you ever had a day like this?" My son's answer was "No, I have never had a day like this." The teacher gave him no credit for that response. *BZZZZZTT!!*: "Sorry, boy—wrong opinion!"

Assessment is based on tests, and the test questions have one right answer (a fact is a fact—1492 is not 1493). The teacher is the sole authority, the only expert on knowledge: "I don't care if your answer made sense to you, I say *this* is the right answer and *I'm* the teacher, and so you're wrong and

I'm right." Scores are in numbers, and a 68 is not a 70, and the student who earned an 85 surely "knows more" than the 68 and 70 students.

Learning—that is, memorizing—is hard work, drudgery of sorts. Generally, positivist teachers would agree that "We can't expect students to enjoy it. They'll need carrots and sticks, and at least once in a while we'll probably have to break down and play Jeopardy or something so that they can feel like there's *some* fun in school, anyway." In a positivist classroom, good students are students who listen carefully, who repeat what they've read and heard faithfully. They don't challenge the teacher's authority, and they don't question that what the teacher says is true or important. A positivist classroom is predictable, orderly, sequential, and managed by the teacher, who is the most important and knowledgeable person in the room.

CONSTRUCTIVIST METHODOLOGY AND ASSESSMENT

The constructivist classroom offers a stark contrast to the positivist one. When a constructivist teacher says she wants her students to "know more," she is essentially talking about increasing students' ability to make sense of information; she doesn't imagine transferring information to students because she believes all learners must work to develop individual understanding of facts at hand.

Because students need to build their own understanding of information and ideas, their interests and experience are very important to classroom life. In the example above about reading novels, students are allowed choice so that the novel they read is interesting to them. If it is interesting to them, then it will be easier for them to use their own responses to see how authors try to orchestrate readers' responses to the book. If the task is to learn about how novels are constructed, any well-constructed novel is suitable. Later, even ill-constructed novels can help students learn about judging the merit of different books—what's trite, what's innovative; what's predictable, what's pleasantly surprising to the experienced reader.

No doubt some of you are already worried about core experiences and will be protesting here that there must be some books all students must

read, that there must be some events all students must know about. Please note that I have not said that students should never consider the same information, simply that it is not essential for them to always use the same data to develop an understanding of a single concept. There is no reason that one student can't explore division by counting out cookies while another counts out candy corn, and there is no reason that one student can't explore foreshadowing in a Poe novel while another explores it in a Stephen King novel. Every student might read Poe—or they might not. It depends on what sort of understanding the teacher hopes to encourage.

Following individual interest remains important even when a single area of information is considered essential to students. If students are not somehow personally engaged in a task that holds some relevance or interest for them, they are not likely to be able to construct a personal understanding of information. As a university writing teacher, for example, I was responsible for being sure that all of my students knew how to complete and incorporate library research into a paper. I never saw any reason (except, possibly, for my own convenience) for every student to do library research at exactly the same time. Now, I think it's useful to learn about library research—but certainly not for its own sake. A writer goes to the library when she feels strongly about a topic, wants to write persuasively about it, and absolutely must be thoroughly knowledgeable with the pros and cons of the topic at hand. Therefore, I gave students some information on when they might choose to do library research and then left them to decide *when* in the semester the paper they were working on required some outside expertise. They had to do it sometime, but when and why were up to them.

This was because I would not have said my students knew about library research if they merely had information about how to do it. What good would it have done for them to be able to look up journal articles if they never understood when a writer might incorporate research into a piece, if they couldn't identify times in their own writing experience when a trip to the library would be useful? And how could they have understood a need for research if I didn't allow them to discover one in their own unique experience? For a student to remember that I said research is useful is not the same as that student coming to understand for himself, through personal

experience, when and where and why research is useful. And understanding cannot be assigned or memorized.

In the constructivist classroom, talk—spoken or written—is an essential part of learning. Teachers who have ever said “You know, I confess that I never really understood this subject/topic until I started teaching it” can refer to their own experience for evidence that putting ideas into words is crucial to learning. It is when we try to find words for our understanding that we are forced to grapple with pinning our sometimes vague ideas down into specific, coherent statements of meaning. This is exactly why most of us find writing so difficult. Often, it is only after the ordeal of trying to clearly say or write what we know that we come to really understand it. And often, in trying to say what we know, we discover just how much we don’t yet know or understand.

For this reason, students in constructivist classes spend most of their time writing, talking with others, or working on projects that involve personal interaction. Teachers and texts do, of course, offer information. However, every student talks far, far more than he listens to the teacher, who spends most of his time working with individuals or small groups. Small group tasks, “pair and share,” journal writing, learning logs, and discussion groups are all common ways for students to talk about the ideas in their heads. Students or groups may work to explain information from the text in their own words, or to formulate questions about the implications or applications of specific information, or to tackle any one of countless tasks that engage students in working with the information they’ve received, with processing that information in some way that reveals its point, its relevance, its usefulness.

In most cases, individual student writing and talk, rather than tests, signal to the teacher whether learning has occurred. An elementary school teacher might, for example, ask students in class one day to explain in writing what it means to “add” something, to “divide” something, what a decimal point is, or why a sentence includes a verb. The student who can explain in her own words what “add” means and who can invent and complete three or four addition problems demonstrates a thorough understanding of the concept of “addition.” What would a test with 30 problems prove that such writing doesn’t?

Consider the following student math definitions, taken from a teacher-written text on how to use writing to promote learning.

A decimal point divides a whole number from parts of one number—Chris.

A decimal is like a period but it separates numbers from each other—Earl.

It [a decimal] separates the holes from part of a hole—James.

Why? You round because you have to. Rounding is part of math that you have to know. You round when the book says to round. Rounding you have to know! Rounding isn't hard. Some of the numbers you round is in trillions. How? You can round every number in math. The control number is the number on weather you can stay or go up one—Patty. (Owen 1987, 25)

Is there any question which students have conceptual understanding of decimal points and which don't? Or that Patty does not yet understand rounding? Is there any question which students might be allowed to work on an independent project and which students might be called to an in-class conference with the teacher, or with a student whose understanding is firm?

Generally and logically, then, constructivist teachers orchestrate different experiences for different students at different times, and they support portfolio assessment rather than standardized, objective tests. Writing like that described and demonstrated above, often completed on something as informal as an index card, immediately tells the teacher who has "gotten" it and who hasn't, who needs to be engaged in more work with addition or decimals tomorrow, who can work concurrently on other projects. The individual writing, rather than a whole class test, goes into a portfolio, along with a variety of other tasks, to demonstrate progress toward individual understanding.

If the constructivist teacher should give a test, it's usually an essay exam, centered on a question that asks students to add discrete bits of information up into a coherent big picture. In my foundations course, for example, I might ask:

Using the traits described in your text as a starting point, explain which characteristics of a *professional* you believe you already exhibit and which you will need to cultivate

before you enter teaching. Include anecdotes from your own experience to support your analysis.

Much more often than such essay tests, however, student-designed projects are assigned to ensure that students have learned enough about a topic to *use* the information in some way. For example, when I taught business writing, I asked students to identify a piece of writing they had needed since coming to the university, but which they found incomprehensible (perhaps an explanation of the university's policy on a diversity course requirement) and to work with the appropriate campus office to make a more useful document available to students.

Or, in some cases, students chose to compose new documents, as in the case of the student who researched long-distance telephone rates. She eventually wrote a brochure explaining which company offered the best rates for certain kinds of calling habits; the brochure was subsequently distributed by the student affairs office and widely used by resident students choosing a long distance service. The point in every project was to be able to discriminate between clear and confusing writing, to identify a particular need for a clear (or more clear) document, and then to use the skills developed in class to produce a useful document. Everyone wrote something different, but every project demonstrated the same kinds of understanding and skill.

In schools that have endorsed constructivist philosophy, curriculum is often interdisciplinary and theme-based. Constructivists perceive walls between subjects as a sometimes convenient fiction. The walls are fictional because everywhere, subjects overlap: can literature and history really be neatly separated, for example? But walls are sometimes convenient as an aid in focusing our attention as we work on logistics. For example, having a category of literature described as "The Lost Generation" makes it easier for us to answer the question "Which novel might students read to get a sense of the country's mood after World War I?" Still, the overriding goal in every classroom is to enable students to tie disparate information into some coherent, personally meaningful whole, and so visible subject walls are beginning to crumble in constructivist classrooms.

For example, I was once a frequent visitor to a New York City school during a marking period when every class was exploring the theme of

power. Humanities classes (where students spent one third of their day) read, talked, and wrote about such phenomena as war and political elections. Concurrently, quantification classes (where students spent another third of their day) explored such topics as how science has given us power over our natural environment (as well as over countries with less sophisticated weapons), and how various kinds of statistics and mathematical graphics can be manipulative and confer ill-deserved authority. (The third part of the day was spent in a variety of activities, including such options as internships and community service.)

A WORD ON CRITICISMS

As I wrote this chapter, I received electronic mail from a colleague who advises a student group that was sponsoring a speech on "objectivism." There are many "good faith" educators who worry terribly about the constructivist's lack of faith in the "objectivity" that they believe science represents. They fear that constructivists have elevated what this colleague termed "whim" to the status of "knowledge," and that constructivists are undermining a solid, stable, dependable world with an irrational world view (or paradigm, another word common in the language of educational philosophy).

Their concerns will, no doubt, echo many objections that educators steeped in positivist tradition are likely to have had as they read through the above sections. "But 1492 is *not* 1493," they may have challenged above, "and science *is* objective and dependable." And, therefore, an additional word on why constructivists have rejected positivism seems in order here.

Facts, notes the constructivist, do not ever exist in a vacuum. Certain facts are uncovered because some scientist decided to research a specific area, and certain facts find their way into textbooks because some expert found those particular facts important. But scientists and experts are, when all is said and done, human—and no human can make a decision about what's important without using a particular world view to sift through what's available. It's impossible to do such sorting "objectively," because every human is immersed in at least one culture, and our culture shapes our

perceptions. Any fact presented to us, then, necessarily comes to us filtered through someone else's vision.

The positivist would acknowledge that perspective shapes perception, and then would point out that that's precisely the difference between what we *know* from science and what we simply *think about* things. It's because human perception is so untrustworthy that scientific method is so important: in order to get information we can count on, the process of identifying it must be completely objective. We can't have any human opinions mucking up the process, clouding the knowledge that's out there in the world with a personal perspective. Positivists believe that scientific method is a corrective for unreliable humanity. If human bias were allowed into the process, the results would no longer be trustworthy. The objective researcher doesn't dabble in such matters as the ethics of California missionaries; he is interested only in the facts of the historical event. Science is in the business of *knowing*, not evaluating. If we're talking about judgments, then we're out of the arena of science and verifiable knowledge.

For example, the positivist is fully aware that an industrial farmer is going to *think* differently than an environmentalist, and that these two are likely to disagree on how much weed killer is too much to spray on crops. It's the job of scientists to focus on the verifiable "this much of this substance will or will not kill these weeds; this much of this substance will or will not affect human breathing." Science is one thing, policy quite another. But here the constructivist asks: "And just how do we keep the human perspective out of science when every scientist is human?" Consider this farming example. The work of the scientist researching weed killers is shaped by a cultural assumption that it's best for a society to have huge, commercial farms largely managed by technology rather than for communities to grow native crops and be more self sufficient. If we weren't in the cultural habit of shipping strawberries from California to Pennsylvania, there might have been less research done on preservatives and on chemical coolants for refrigerated trucks.

And, if *someone* weren't paying for research in these areas, they might have gone unexplored. How are we to think of science as objective, asks the constructivist, when areas worthy of research are determined by money

provided by government, industry, and other special interest groups? To what extent has government-funded research, or lack of research, on cancer and on the AIDS virus been determined by political climate? Do we imagine that the tobacco industry is going to use its enormous resources to support research on drugs to help smokers kick a nicotine habit? Is a Catholic government likely to support research on birth control pills, or a Jewish government likely to support research on pork tenderizers? Scientists cannot research projects no one will fund. They find what they find because someone, somewhere, for some reason of her own is interested in having certain kinds of information uncovered. There is nothing at all objective about the funding process that shapes research agendas

And, the individual humanity of the scientist further biases the process. Much of science involves visual observation—and what we report seeing is conditioned by what we expect to see. Didn't man once know for a certainty that the sun revolved around the earth? The data didn't change; scientists found otherwise only when they were able to imagine that things *could* be otherwise, a cultural heresy at the time. Other such revolutions have occurred in physics and other areas. Listening to National Public Radio recently, in fact, I heard a report that some scientists claim to have discovered a "new" bone in the head; asked how it was possible the bone might have gone unnoticed for so long, the researchers responded that no one saw it because no one expected to see it there. Also, they explained, for as long as anyone in the field can remember, there has been only one way to dissect a skull. With open minds (or minds desperate to find something new, I don't know) this pair attempted a new method of dissection. As a result, they report that they have perceived something that no one claims to have perceived before.

Our attention is selective and our language imprecise, or precise in ways that affect our perception. For example, in a northern culture where snow is a critical element of everyday life, the person having six words available to describe different kinds of snow literally *sees* the falling snow differently than someone who knows only one word to describe it. Fine points in the language prompt this observer to attend to different characteristics of snow than does the English speaker who has only one

word to name it. But even in English, a skier watching for a chance to hit the slopes will attend to—will actually look at and see—the texture of falling snow differently than a nonskier, or than a sixteen-year-old driver with no winter driving experience.

Being human, scientists cannot escape language and perceptual influences, no matter how stridently they may insist on their objectivity. The constructivist says to the scientist: “You do not live in a vacuum.” Science is no less steeped in its own assumptions than any other culture; it is no less vulnerable to the influences of historical assumptions and values, as well as constraints of human perception and specific language systems. There are verifiable facts in the world, all right, but to insist that science is thoroughly objective, untainted by culture and the humanity of its workers, is to engage in wishful thinking.

CONSTRUCTIVISM AND CRITICAL THEORY

All constructivists are not critical theorists. However, *all critical theorists are constructivists*. The difference lies in how various groups define the purpose of education. A liberal constructivist, for example, might say that students must become skilled readers so that they can read newspapers and magazines thoughtfully, offer articulate opinions to representatives in government, and vote wisely in elections. A person can call himself a constructivist and also endorse many cultural maxims. For example, the educator who is a liberal constructivist might want a student to be able to detect bias in such magazines as *Newsweek* and *Time*, without thinking more deeply about the nature and effect of the bias.

The characteristic that sets critical theorists apart from other constructivists is an insistence that there is no part of the status quo that should not be challenged. The critical theorist will encourage students not only to recognize how a magazine report might be slanted, but will also ask “What accounts for this particular bias in this particular story, or magazine? Who gains what, who loses what, when the facts are added up this way? Whose version of this story hasn’t been told? Why are these two particular magazines so widely read, and how significant are their

differences? What can we learn if we look into which stories these magazines are *not* reporting?"

In short, critical theorists are very different from other constructivists in their constant search to discover whose choices account for the status quo and how things might be otherwise. They are interested not only in different interpretations that might be made of data, but in the way one account of facts or events—one narrative—privileges some people over other people, how it benefits some to the detriment of others. The critical theorist is aware not only that Native Americans can be named either "savages" or "victims," but also that to name them one way benefits the Caucasians who now own what was formerly tribal land, and to name them the other way suggests that an injustice might have been done and reparation owed. Every story is *someone's* story, every truth is *someone's* truth, and it is dangerous to accept any version of anything without asking "Whose story is this? Why are they seeing the data this way? What other meaning might these facts suggest?"

When thinking about this aspect of critical theory, I often remember the fable of the three blind men and the elephant. Because one could feel only the trunk of the elephant, one only a leg, and one only the tail, each had a very different idea of what an "elephant" was. Like a snake, said one; like a tree, said another; like a rope, said the third. Each was "right," and each was also "wrong." Their perceptions had to be combined and reconciled to formulate anything approaching a reasonable representation.

Critical theorists believe we are all in the position of blind men, limited in our individual perspectives. Before we can begin to claim to "know" anything, we have to consider what a variety of others can tell us. No one else can give us a single accurate picture of what the world "is," what is "important" in it: we have to construct our own understanding of the world for ourselves, basing it on a variety of sources. The facts of science are only one set of facts, American history only one of many global histories. We need to be informed by science, but also by art. We need to hear the voices of men, but also of women who have been traditionally silenced. We need to listen to those who speak standard English impeccably, but also to those who do not. Each of them has a perspective we can't see for ourselves, and only by adding their vision into our own can we begin to

understand the multiple realities that actually exist in the world. To pretend to students that a single world view can be "accurate" and to ignore the ways different views privilege different people is to distort their vision in the guise of "educating" them.

The critical theorist's stance and goals are, of course, fully antithetical to traditional positivist education with its monolithic curriculum and its "right answer" orientation. A critical education based on constant questioning is diametrically opposed to lockstep ingestion of fossilized facts. It seeks above all to give students practice in examining existing power arrangements. Some Americans can order \$93,000 dinosaurs from a Neiman Marcus catalogue while others beg coins for food. Some people are told what to do, and others tell them what to do. Some make decisions, others live with the results.

The culture is full of explanations. People who work hard get rich, lazy people don't. Smart people get good jobs, dumb people don't. If you want to keep your job, you have to learn to do as you're told. And on and on and on. Always, the critical educator asks "Do you believe that? Why? How did you come to believe it? Who does it benefit for you to believe that? What is the cost to you if you believe that? How else might you explain what's happening? Who would gain, who would lose, if this alternative view were accepted?"

Whereas the positivist believes that a single verifiable reality exists, *believes* that we can pile up and pass on to students a body of knowledge, the critical theorist denies that very possibility. Because of this difference in perspective, the critical educator prompts students constantly to question the status quo, the "official" or "accepted" account of events on which positivist practice is based. Therefore, critical theory and traditional, positivist practice are in opposition on every count—predictably and especially in the areas of classroom approach and authority, the subjects of the next two chapters.