Chapter Two

What Is Understanding?

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What is understanding? When students attain understanding, what have they achieved? One could hardly ask a more basic question toward building a pedagogy of understanding. If the aim is a way of thinking about teaching and learning that puts understanding up front on center stage most of the time, we had better know what we are aiming at.

Knowledge, skill, and understanding are the stock in trade of education. Most teachers show a vigorous commitment to all three. Everyone wants students to emerge from schooling or other learning experiences with a good repertoire of knowledge, well-developed skills, and an understanding of the meaning, significance, and use of what they have studied. So it is worth asking what conception of knowledge, skill, and understanding underwrites what happens in classrooms among teachers and students to foster these attainments.

For knowledge and skill, a rough answer comes readily enough. Knowledge is information on tap. We feel assured a student has knowledge when the student can reproduce it when asked. The student can tell us what Magellan did, where Pakistan lies, what the Magna Carta was for, what Newton's first law of motion is. And if knowledge is information on tap, skills are routine performances on tap. We find out whether the skills are present by turning the tap. To know whether a student writes with good grammar and spelling, sample the student's writing. To check arithmetic skills, give a quiz or assign a problem set.

But understanding proves more subtle. Certainly it does not reduce to knowledge. Understanding what Magellan did or what Newton's first law means calls for more than just reproducing information. Understanding also is more than a routine well-automatized skill. The student who deftly solves physics problems or writes paragraphs with topic sentences may not understand much at all about physics, writing, or what is being written about. Though knowledge and skill can be translated as information and routine performance on tap, understanding slips by these simple standards.

So what is understanding? One answer lies at the heart of this book and this project; it is simple but rich with implications. In a phrase, understanding is the ability to think and act flexibly with what one knows. To put it another way, an understanding of a topic is a "flexible performance capability" with emphasis on the flexibility. In keeping with this, learning for understanding is like learning a flexible performance—more like learning to improvise jazz or hold a good conversation or rock climb than learning the multiplication table or the dates of the presidents or that $F = MA$. Learning facts can be a crucial backdrop to learning for understanding, but learning facts is not learning for understanding.

This performance view of understanding contrasts with another view of understanding prominent in both our everyday language and in cognitive science. We often think of an understanding as some kind of a representation or image or mental model that people have. When we achieve understanding, we say, "I've got it." Understandings are things possessed rather than performance capabilities. There is a real issue here. Which view is better, and why? The answer offered here delves both into an analysis of concepts and into ideas about constructivism from contemporary cognitive science. Readers who think the performance view is obviously sound and feel no need for a disquisition about the mechanisms of understanding could well skip to the next chapter and the teaching framework based on this idea. Readers who wonder about whether this performance view makes sense or how it can hold its own against the representational view of understanding had best read on.

A Performance Criterion for Understanding

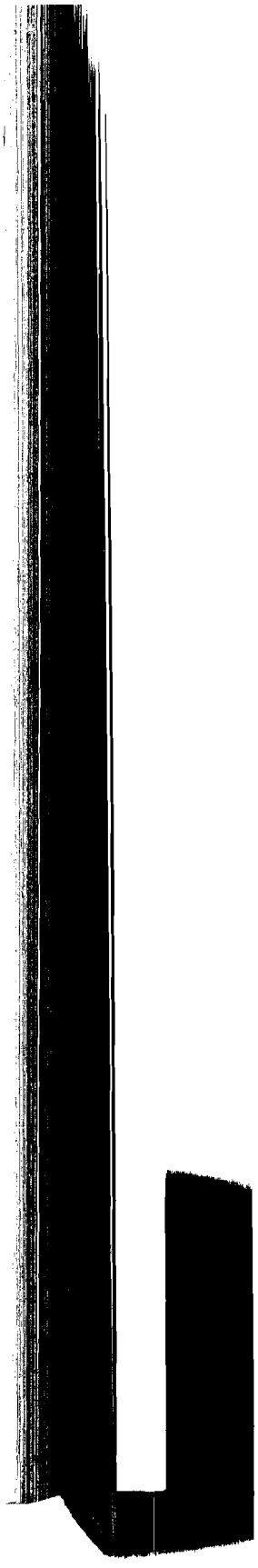
"What is understanding?" is a tricky question. But in practical terms people are not so bewildered. We know it when we see it. Teachers and indeed most of us seem to share a good intuition about how to gauge understanding. We ask learners not just to know, but to think with what they know.

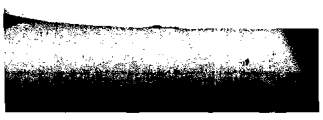
For example, one teacher who participated in this project was introducing the taxonomy of plants and animals. To probe the students' initial understanding of classification systems, she asked them to construct one. Almost everyone has a drawer full of junk at home—old pencils, can openers, nails, worn spoons. Her assignment for the students: survey the contents of a junk drawer and create a classification system for its contents. How they did this made them more aware of classification as an enterprise, told the teacher what they understood so far, and allowed her to highlight some of the purposes and challenges of designing a classification system.

Much later on in developing the same theme, the teacher assigned a more traditional but also challenging task. The students were to use a "key" of critical features to classify organisms. If they could make the taxonomy work, this would show at least a partial understanding.

Two ideas follow from these commonsense observations. First, to gauge a person's understanding at a given time, ask the person to do something that puts the understanding to work—explaining, solving a problem, building an argument, constructing a product. Second, what learners do in response not only shows their level of current understanding but very likely advances it. By working through their understanding in response to a particular challenge, they come to understand better.

The notion that people recognize understanding through performance not only makes common sense but appears throughout a range of research in human cognition. Swiss developmental psychologist Jean Piaget tested children's understanding of basic logical structures by setting tasks for them to perform—for instance, seriating a collection of sticks from smallest to largest. Investigators of students' understanding of physics pose qualitative problems





that ask students to think about the physics rather than turn a well-practiced quantitative crank. For instance, when an object is dropped from an airplane will it hit the ground ahead of the plane, directly under the plane, or behind the plane, neglecting air friction? With no numbers in sight, students' answers and explanations reveal whether they understand the physical principles involved.

To make a generalization, we recognize understanding through a *flexible performance criterion*. Understanding shows its face when people can think and act flexibly around what they know. In contrast, when a learner cannot go beyond rote and routine thought and action, this signals lack of understanding.

A Performance View of Understanding

The flexible performance criterion signals the presence of understanding. But does it tell us what understanding is? The core proposal here is that yes, it does: not only do people recognize understanding through flexible performance, but it is reasonable to view understanding as a flexible performance capability. An understanding of Newton's laws or the Civil War or the subjunctive tense amounts to nothing more or less than a flexible performance capability around those topics. To understand a topic means no more or less than to be able to perform flexibly with the topic—to explain, justify, extrapolate, relate, and apply in ways that go beyond knowledge and routine skill. Understanding is a matter of being able to think and act flexibly with what you know. The flexible performance capability *is* the understanding.

All this becomes easier to articulate and elaborate with the help of a key term: *understanding performances* or, equivalently, *performances of understanding*. By definition, understanding performances are activities that go beyond the rote and the routine. An understanding performance is always something of a stretch. The teacher who asked students to sort their junk drawers was calling for an understanding performance because they had never done such a thing before and had to think about it. Had they already done it five times, asking them to construct one more variant would not be much of an understanding performance. Exactly because un-

derstanding performances ask the learner to stretch, they lead to advances in understanding as well as displays of understanding.

Performances of understanding contrast with important routine performances called for by life in general and schooling in particular. Well-practiced knowledge and habits figure fundamentally in grammatical speech, knowing the multiplication tables, manipulating algebraic equations, recalling the times and places of historical events, and so on. In no way does the emphasis on performances of understanding mean to slight the importance of basic knowledge and skill. Indeed, we would all be profoundly crippled without an undergirding of the rote and the routine. Nonetheless, understanding demands something more.

Of course, the contrast between understanding performances and routine performances is not absolute. It involves degrees. Remembering one's phone number seems little more than a well-practiced reflex, about as far from a performance of understanding as one can get. But remembering a friend's new phone number can involve recalling a few digits, guessing at another, asking yourself whether it sounds right, checking whether the first three digits match well the person's locale. This is a much more active, constructive process, a process of extrapolating from what you remember specifically to the whole number. It is, in effect, a small-scale understanding performance. Though remembering often amounts to a simple act of recall, it can demand much more.

Inevitably, what counts as a performance of understanding will vary with a person's sophistication. A physics problem that challenges high school students and so lets them demonstrate and extend their understanding might be mere routine for a graduate student. Broad developmental factors may figure as well. A task that puzzles a six-year-old with its intricate logic may appear transparent to the same child at fifteen. Finally, what kinds of performances signal understanding varies with the field and context, which place more priority on some kinds of performances than others. A writer of a short story need not necessarily strive to have the characters argue cogently with one another; what counts is the revelation of character through the argument. But an essayist had better have the argument straight.

A further complicating factor recognizes that many different kinds of performances of understanding apply to the same topic. Students may attain one handily while finding another difficult. Students who can explain in their own words the historical forces behind the Boston Tea Party may have trouble relating it to other more contemporary cases of social protest. Students who get the idea of a physics concept may have trouble with the math while others who master the math may miss the point.

All this might be read as a challenge to a performance view of understanding. It seems that the performance view leads into a maze of subtle distinctions: performances of different kinds, learners of different levels, topics with different demands. But if matters are complicated, it is not because of the performance view of understanding but because of understanding itself. Different topics and disciplines *do* pose distinctive demands; understanding *does* come in degrees; people of differing experience and development *do* display more or less insight. These complications hold regardless of the theory of understanding. If anything, it is reassuring to find that they can be expressed in performance terms, more encouragement for a performance view.

The Representational View of Understanding

The natural response to the flexible performance view of understanding is "Instead of what?" That is, with what alternative conception of understanding does the flexible performance view contrast? The answer is that what might be called a *representational view* of understanding thrives in both everyday discourse and psychological theory.

In casual speech it is commonplace to say things like these: "I see what you mean." "I see the point." "I see through you." "I see the answer." "I see the trick." Such phrases testify to a firm link in folk psychology between perception and understanding. Just as we see houses and trees, in a metaphorical sense we see what we understand. Seeing involves taking in visually, capturing some kind of an internal image of what we have seen. Following through with the metaphor, understanding-as-seeing requires achieving a mental representation that captures what is to be understood.

Psychological research often echoes this folk conception in a more sophisticated way. Understanding depends on acquiring or constructing an appropriate representation of some sort—a schema, mental model, or image. For example, Richard Mayer reviewed a series of experiments addressing diverse science and engineering concepts.[1] The findings showed that what Mayer called *conceptual models* promote understanding. Conceptual models are flow diagrams and similar representations—for instance, of a radar system. They are generally presented to students prior to a textual explanation. Learners gain by internalizing these models. Students generally benefit from conceptual models, solving problems much more flexibly than students not given conceptual models. However, they make little difference for students with good background knowledge and high aptitude for the topics, presumably because these students construct their own models.

The well-known sourcebook *Mental Models*, edited by Gentner and Stevens, includes a number of articles that argue that understanding of science concepts depends on runnable mental models.[2] These are imagistic constructions that people can run or manipulate to test questions about the behavior of a system, such as the operation of an electrical circuit imagined as the flow of a liquid through the wires.[3] Philip Johnson-Laird and Ruth Byrne offer an analysis of formal reasoning that foregrounds the role of representations in modeling situations and mediating reasoning.[4] They propose that people work from the givens of a logical argument to build "possible world" scenarios and test questions of entailment by examining and manipulating these scenarios. Noel Entwistle and Ference Marton introduced the concept of "knowledge objects," representations that students construct through intense study for exams or other purposes.[5] Students can survey these knowledge objects in a bird's-eye manner and navigate through them flexibly to answer questions and write essays. Numerous other scholars have proposed representational accounts of understanding, including Roger Schank's "explanation patterns,"[6] Stellan Ohlsson's "abstract schemas,"[7] and the "epistemic games" of Allan Collins and W. Ferguson[8] and of David Perkins.[9]

Turning to developmental research, Piaget argued that sophisticated thinking reflects the acquisition of schemas for a small set of fundamental logical operations. Some neo-Piagetians,

though suggesting that development proceeds much more domain-by-domain than did Piaget, also foreground the role of schemas. For example, Robbie Case and his colleagues see development as dependent on the advance of several "central conceptual structures," including one concerning narrative and another concerning quantity.[10]

All these cases involve representations in one or another sense, but they are not all the same. In fact, it is useful to recognize two different kinds of representations. The first might be called *mental models*. These kinds of representations are mental objects that people manipulate, run, or tour in the mind's eye. Mayer's conceptual models and Entwistle and Marton's knowledge objects have this character. The second might be called *action schemas*. Sometimes representations are taken to lie in the background, not inspected consciously by any inner eye but somehow guiding our actions. So, for example, we do not have to examine any central conceptual structure for narrative with our mind's eye to encode narratives; we simply do it, governed somehow by the central conceptual structure.

How does all this relate to a performance view of understanding? The representational view explains understanding in a fundamentally different way. Understanding lies in possession of the right mental structure or representation. Performances are part of the picture, but simply in consequence of having the right representation. A flexible performance capability is a symptom. It does not constitute the understanding but simply signals possession of the appropriate representation. In contrast, the performance view says that understanding is best seen as lying in the performance capability itself, which depending on the case may or may not be supported partially by representations.

The next two sections build a careful argument for preferring a performance view of understanding over a representational view. The performance view may seem persuasive enough already, but there are technical sides to the issue that deserve attention.

But does it matter practically? The distinction between the two might appear to have as little significance as the fine points of doctrine that spawn religious splinter groups. Yes, it *does* matter in ways explored in the last two sections, which draw out what a performance view of understanding says about teaching and learning.

Why Prefer a Performance View over Mental Models?

The basic problem with a representational view is this: although representations certainly play an important role in some kinds of understanding, it is difficult to sustain the general case for understandings *being* representations in any interesting sense.

Remembering the contrast between mental models and action schemas, consider the case of mental models first. Does it make sense to say that understanding something *is* having a mental model of it? No, because we can have a mental model of something without understanding it, as gauged by the flexible performance criterion. A mental model is not enough for understanding simply because it does not do anything by itself. For performances that show understanding, a person must operate on or with the model. For instance, suppose a student tries to understand electrical circuits through the image of fluid flow. Then it is not enough for the student to imagine fluid in the wires or even in motion. The student must imagine what happens to the fluid as it passes through resistors and other circuit elements and read off the consequences from the model. In other words, the student has to manipulate and interrogate the model. To recall a phrase mentioned earlier, the model is a "runnable" mental model and nothing will be got from it without running it.

A defender of mental models as understanding might propose that, although not logically sufficient, mental models are generally practically sufficient: with the representation in mind, the person can easily show the flexible performance called for. But this is not so. Simply told to think of electricity as fluid flow, a learner might not know what to do to reason with the image. In the case of logical reasoning, people commonly fail to make appropriate inferences, displaying such classic errors as affirming the consequent and denying the antecedent instead. Johnson-Laird and Byrne interpret the errors as reflecting how the reasoners mistakenly manipulated schematic mental models.[11] Likewise, you may have a good model of your neighborhood and yet give inaccurate and misleading directions—forgetting for the moment a turn you knew was there and would never miss yourself. In general, the point is that effective manipulation of a model to yield flexible performances cannot be taken for granted. Mental models are often

complex, demanding of short-term memory, tricky to track when running, or challenging to handle in other ways.

To all this, the defender might reply, "Well, of course, when I say understanding is a matter of having a mental model, I don't mean just having the model in mind but being able to work with it." But this is exactly the concession the performance view wants.

So far, the point is that mental models are not enough for understanding by themselves. But are they even necessary? Certainly not always, because people understand some things without mental models. For instance, in a practical sense we understand the grammar of our mother tongue without any explicit access to the rules that govern grammatical speech. We pass the test of flexible performance: we can encode grammatical speech, produce it, discriminate grammatical utterances from ungrammatical utterances, correct ungrammatical utterances to make them grammatical, and indeed start with grammatical utterances and rework them to make them ungrammatical in interesting ways, as poets and novelists sometimes do.

Someone might object that though we may be able to do all these flexible things, most of us do not really understand the grammar of our mother tongue because we cannot immediately identify the rules, analyze their function, make comparisons with other languages, and so on. This makes an important point. It signals that we have what might be called an *enactive understanding* of the grammar of our language but lack a reflective understanding of it. Moreover, academic contexts usually call for a reflective understanding too: the ability to talk about grammar, not just to function grammatically.

Still, enactive understanding is a kind of understanding; it passes the test of flexible performance. The understanding may be partial, but all understandings are partial—one never understands everything about anything. And it is an important kind of understanding. The student of French who can discuss French grammar but not use it flexibly is missing something. So enactive understanding is an important kind of understanding that need not involve any explicit mental model.

Thus it should not be left out of the picture. Enactive understanding with no conscious mental models at work is commonplace, not rare. There are principles of conversational turn-taking

that people have assimilated but do not know as such. Yet people behave according to them in a flexible manner. Most of us understand how to have a graceful conversation without studiously contemplating the patterns of turn-taking that govern it. We flexibly handle many motor demands: we walk carefully on ice, catch ourselves when we start to slip, and dodge around a particularly slippery spot with hardly any awareness of the governing principles or mechanisms. Most of us have everyday musical ability: many people learn to carry a tune and sing or whistle ornamentations and variations with no knowledge of music notation, scales, or any of the paraphernalia of Western musical formalism. All these are possible even if we have no developed way of representing to ourselves or thinking about what we are doing.

Even when people do have explicit mental models to help them with their grammar, conversations, walking on ice, or singing, it is clear that the models do only part of the work. As we flexibly and fluently converse, navigate, or sing, we clearly do not do so by hovering over our mental models. We act effectively with only occasional reference to them.

Related observations accompany a skeptical look at the role of representations in behavior developed by Terry Winograd and Fernando Flores.[12] Building on the work of Maturana and Heidegger, they argue that in general an organism does not require mental models to get along in the world. Moreover, mental models always involve a certain point of view and emphasis; they can inform but can also mislead. What is central is effective involvement in activity, not representations.

Why Prefer a Performance View over Action Schemas?

All this argues that mental models alone are not enough to sustain the case for a representational view of understanding. A performance view wins easily. So what about reinforcing the representational view with action schemas, that other kind of representation? If mental models do not account for grammar, conversations, walking on ice, or singing, certainly action schemas could, silently underlying and guiding behavior.

What account of understanding do action schemas offer? Perhaps it makes sense to say that an understanding *is* an action

schema. But this does not add much beyond saying that an understanding is a performance capability. The action schema would be whatever it takes to regulate the performance, no more and no less. This could be called a representational view of understanding, but it is a weak one.

Moreover, there may be no action schemas at all. It is easy to presume that regularities in behavior trace back to an internal representation of some sort that regulates the behavior. But this need not be so. Turning from psychology, consider physics for a moment. Newton's laws describe how nature behaves in a deep and illuminating way. But this does not mean that nature behaves the way it does because Mother Nature monitors those laws and regulates the way things happen. The laws are descriptive, not prescriptive. Likewise, just because scholars can write down rules that describe grammatical speech or conversational turn-taking or narrative structure, this does not mean that those rules sit somewhere in the mind and exercise an executive function.

But how else could large-scale patterned behavior arise? Contemporary psychology recognizes that much behavior occurs not because of any governing executive but because tiny elements interact in such a way as to bring about large-scale patterned behavior. For instance, there is no ruler of a termite nest. The queen is basically an egg factory and there are no foremen or other managers. No termite has a grand plan for the nest. Yet as each termite follows its simple programming, the nest emerges.[13]

Connectionism, a contemporary cognitive theory, advances what amounts to a view of mind as termite-nest architecture. This school of thought argues that orderly complex behavior can emerge simply from the strengths of connections distributed throughout a neural network. The individual connection strengths are, so to speak, the contributing termites. Connectionist research demonstrates that simulated neural networks can learn to recognize letters and perform other tasks of some complexity. Yet nowhere in the neural network is there any representation of anything. For instance, in a network that recognizes letters, there is no "A area" of the network that represents A, "B area" that represents B, and so on. Rather all the connection strengths collectively help to recognize all the letters. One could call the whole network an action schema for recognizing the letters. But this is not usually what is meant by a governing representation.

The issue here is not whether connectionist theory is correct. Perhaps it will win out in the end, perhaps not, perhaps something in between. But at least connectionist theory warns us that orderly behavior in the world need not stem from some representation that prescribes it. People can have flexible performance capabilities without any representations at all in any useful sense of representation.

In summary, the case for a performance view of understanding over the rival representational view goes like this. Basically, the representational view is an effort to identify something behind the flexible performance capability, some kind of representation that enables the performance. But this move simply does not work in general. If representations mean mental models, some kinds of understanding do not require mental models. For those that benefit from mental models, just having such a model in mind does not always lead to the flexible performances that mark understanding. If representations mean action schemas, they do not add much to just saying "performance capability." Moreover, connectionist research shows that flexible performance can occur without action schemas.

These limits of a representational view of understanding should not be read as dismissing the importance of mental representations in building or displaying understanding. Both research and practical experience demonstrate that mental models are often important parts of understanding something. However, often is not always and parts are not wholes. What is left is the performance view, which says that understanding amounts to a flexible performance capability around the topic in question.

A Performance View of Learning and Teaching

Reasonable though all this may seem, does it matter to the learner and the teacher? What does a performance view of understanding recommend?

Certainly there is a contrast with some commonsense views of learning for understanding that reflect the representational stance. People often refer to attaining understanding as a matter of "getting it," "catching on," or "things falling into place." Such remarks recall the idea of understanding as perception. They suggest not only that understanding involves attaining an internal representation but that it comes quickly, like a visual gestalt.

Such a mind-set demonstrably works against invested learning. Carol Dweck and her colleagues draw a contrast between what they call "entity learners" and "incremental learners."[14] Students of these kinds have starkly different views of the nature of intellectual challenge and of what to do when challenged. Entity learners believe "you either get it or you don't." They expect to understand something by "getting it," and when this proves difficult conclude that they lack the capacity to understand. Incremental learners, in contrast, treat understanding something as a matter of extended incremental effort. These contrasting belief systems correlate with different learning behaviors. Entity learners quit too early; by exercising persistence they might win through to an understanding.

The performance view of understanding favors incremental learning and fosters incremental learners. No one views acquiring a complex performance as a matter of "getting it." Performances require attention, practice, refinement. Performances characteristically involve multiple aspects that need careful and artful coordination. Indeed, this is the principal broad-stroke implication of the performance theory of understanding: developing understanding should be thought of as attaining a repertoire of complex performances. Attaining understanding is less like acquiring something and more like learning to act flexibly.

Such a stance casts teachers less in the role of informers and testers and more in the role of facilitators or coaches. Their challenge is one of choreographing performance experiences that constantly extend students' repertoires of understanding performances, and hence their understanding. Though a teacher operating in this way may well from time to time give a lecture or grade a test, these are supportive, not central, activities. The main agenda is arranging, supporting, and sequencing performances of understanding. This vision of teaching aligns well with several contemporary conceptions of pedagogy, including cognitive apprenticeship,[15] the idea of communities of inquiry,[16] and building a culture of thinking in classrooms.[17]

With the notion of performance learning at the center, some broad principles help to define the enterprise for learner and teacher alike:

1. *Learning for understanding occurs principally through reflective engagement in approachable but challenging understanding performances.*

Engagement in performances is primary: no performance can be mastered without engagement in it. Yet in many conventional educational settings students never undertake performances resonant with certain goals of instruction. For instance, it is hoped that students will see contemporary events through the lens of the history they are studying, but no classroom time gets committed to such connection making. Also, learning benefits from *reflective* engagement, including ways of getting clear and informative feedback from oneself or others and the opportunity to think about how one is performing and how one might perform better. *Approachable* performances have an obvious importance: attempted engagement in a performance one finds unapproachable is unlikely to yield learning. And *challenge* is also central: execution of an understanding performance already well in hand is not likely to extend the performance repertoire.

2. *New understanding performances are built on previous understandings and new information provided by the instructional setting.* One cannot simply engage in an understanding performance without a foundation. Sometimes learners build new understandings entirely through reflecting on and working through prior knowledge and understandings. More characteristically, however, new information obtained from verbal definitions, distinctions, narratives, models, and the like figures in the process. This affirms the importance of making information available, even in didactic ways such as lectures, providing that performances of understanding follow that allow working through the information.

3. *Learning a body of knowledge and know-how for understanding typically requires a chain of understanding performances of increasing challenge and variety.* Unless an area of knowledge and know-how is very simple, a reasonable understanding of it involves a variety of understanding performances, including ones that the learner could not reasonably attempt early in the learning process. Accordingly, the understanding needs to evolve through a series of understanding performances that increase in challenge and variety.

4. *Learning for understanding often involves a conflict with older repertoires of understanding performances and their associated ideas and images.* Often prior understandings stand in the way of building new understandings. One barrier is misconception, especially in the sciences. For instance, common sense and common experience say that heavier objects fall faster, so the Newtonian notion that all

objects fall at the same rate (air resistance aside) seems counterintuitive and easily dismissed. Another barrier is rigidly applied algorithms, especially in mathematics. For instance, mathematics is commonly seen by teachers and students alike as a matter of adroitness with routines for addition, subtraction, multiplication, and division. Yet another is stereotypes, especially in the social sciences and humanities—for instance, racial prejudice or blind nationalism.[18]

Throughout this project the aim has been to transform the performance view of understanding and general principles such as these into a useful framework for inspiring and guiding educational practice. The next chapter introduces that framework in detail. By way of preview, the framework foregrounds four elements. *Generative topics,* rich themes and questions, provide a fertile focus for teaching for understanding. *Understanding goals* spell out the target attainments the teacher and students aim at. The goals, shared with students early on and sometimes even coconstructed with them, provide a challenge to meet and a clear sense of direction. *Understanding performances* are flexible thought-demanding performances selected and sequenced by the teacher, again sometimes with student collaboration, to both express students' understanding-so-far and push it further. Understanding performances do not just appear toward the end of the learning sequence. They appear from beginning to end in progressively more complex and challenging forms as students advance from early and basic understanding of the generative topic toward later, more sophisticated understandings. Finally, *ongoing assessment* names the important practice of offering students frequent informative assessment throughout, not so much for grading purposes as to advance their mastery of the performances that express their growing understanding.

A Kind of Constructivism

The view of learning for understanding described here plainly has a constructivist turn, challenging the idea that learning is information centered, reframing the role of the teacher as more like that of a coach, and placing the learner's efforts to build under-

standing squarely in the center. But virtually all contemporary approaches to teaching and learning have a constructivist cast. What makes this one distinctive?

One answer is that it should not be *too* distinctive. There is considerable insight in a range of contemporary approaches to teaching and learning, including those cited earlier. More than that, the work discussed in this book has revealed over and over again the wisdom of teachers' practice. Many practitioners who never heard of understanding performances day in and day out teach in ingenious ways that amount to a performance approach. Indeed, a heartfelt ambition of this initiative from the beginning has been not to create something utterly new but to crystallize insightful practice into a recognizable form that others might learn about and adapt to their own idioms with their own insights.

That granted, it can also be said that the constructivism implicit in a performance view of understanding has its own character. The notion of understanding advanced here leads to a view of constructivism somewhat different from that generally heard in at least two ways:

What gets constructed: representations versus performance capability. In any version of constructivism, a fundamental question is what gets constructed. The most common answer, implicit or explicit, is a representation of some sort—an action schema or mental model. The learner assembles and revises a mental representation to fit the topic.

As already outlined, the performance view of understanding challenges the centrality of representations. What the learner acquires is not just a representation but a performance capability. Learning a topic with understanding is not so much constructing a representation to fit the topic as developing a flexible performance capability around the topic. Indeed, the very metaphor of construction becomes less apt; learners could be said to construct performances, but it is more natural to say that learners develop them or work them up.

How construction proceeds: discovery versus diverse performances of understanding. Often constructivist approaches to teaching foreground a kind of discovery process. Imagine a handyman beginning to fit shelves into a corner without a plan, getting a few hints

from a neighbor, trying this, trying that, and finally working it out. Another suitable metaphor looks to scientific inquiry, a scientist formulating a hypothesis, testing it, modifying or discarding it, and finally finding a hypothesis that works. In other words, discovery is the paragon performance that both attains and demonstrates understanding. What you can then go on to do—store books on the shelf, apply the theory—is a secondary spin-off enabled by the discovery.

However, the performance view gives no special priority to discovery. Rather discovery is simply one kind of understanding performance among many; it may not figure as a pivotal performance in a particular episode of learning for understanding. The handyman might become very handy not by working out his first shelf largely by himself but by following a plan and then later adapting his initial experience to diverse circumstances. A student might come to a good understanding of Newton's laws not by some kind of scaffolded discovery process but by an up-front presentation followed by a range of ever more challenging applications and extrapolations.

Why does constructivism tend to place such a high priority on discovery? Perhaps in part because of its emphasis on representations. As the understanding supposedly *is* the mental representation, attaining that representation is key. But just telling people what to think does not usually instill good mental representations; if you merely explain Newton's laws, people don't "get it." So to arrive at a good mental representation, learners have to discover it for themselves with some help. Discovery becomes the key performance of understanding.

In contrast, the performance view has no special commitment to representations. There need be no key episode of discovering the right representation. The performance view more evokes the metaphor of developing a flexible performance capability toward mastery over time. So whether one asks learners to discover core ideas for themselves or gives them direct instruction to get them over a front-end hump becomes much more a tactical question, a matter of choosing an approach to suit the students, the topic, the moment—an exercise of sensitive and seasoned judgment.

With no sweeping policy about discovery versus up-front instruction in sight, how does a performance view inform the practice of teaching? By encouraging teachers and students alike to treat learning for understanding as a kind of performance learning. Whether learning is discovery oriented or not, students will benefit from a performance viewpoint. They will gain from an early vision of the understanding goals pursued and the kinds of understanding performances that realize those goals. They will learn from reflective engagement in performances that challenge without overwhelming them. They will advance through learning experiences sensitive to the prior conceptions they bring to the occasion, indeed from attention to all the points foregrounded in the previous section and crystallized into a Teaching for Understanding framework in the following chapter.

To sum up, the performance view of understanding yields a brand of constructivism that might be called *performance constructivism* because of its emphasis on building learners' repertoire of understanding performances more than on cultivating the construction of representations. This does not mean that performance constructivism yields a prescription for practice radically different from other varieties. Any version of constructivism allows considerable latitude; the contrasts lie in the nuances of practice, not in the big picture. In any case, constructivism with this performance character has provided the guiding image for our explorations in classrooms with students over the past several years. Its ramifications and applications are explored throughout the rest of this book.