The Many Faces

Although most constructivist classrooms feature active, social, and creative learning, different kinds of knowledge invite different constructivist responses, not one standard constructivist approach.

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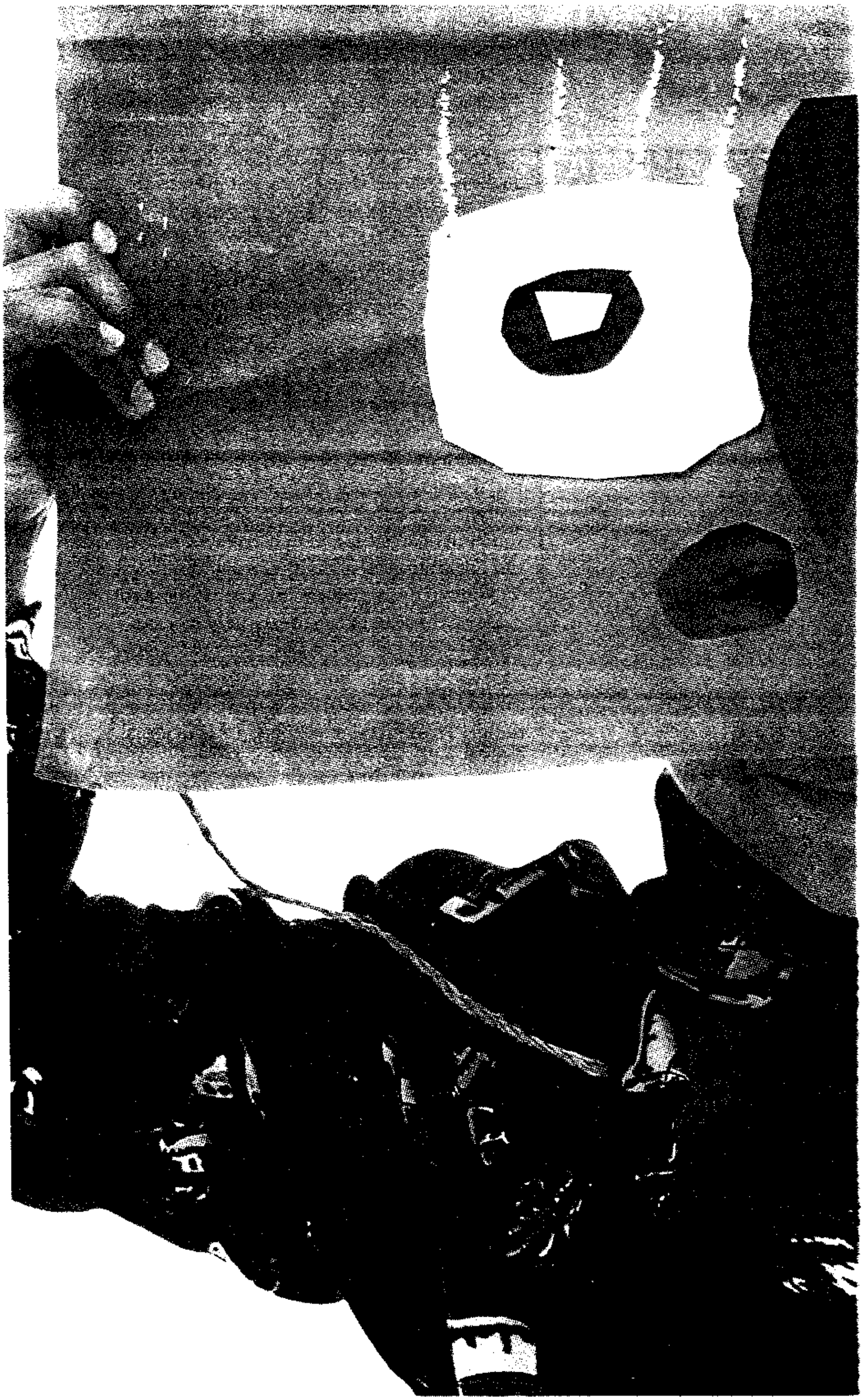

Betty Fable's first day as a student at Constructivist High School was interesting but puzzling. In European history, the teacher challenged each student to write a letter from a French aristocrat to an Italian one, describing a key event of the French Revolution. In physics, the teacher asked students to predict whether heavy objects would fall faster than light ones, how much faster, and why. Then small groups of students designed their own experiments to test their theories. In algebra, where the class was learning the basic skill of simplifying algebraic expressions, the teacher insisted on conducting a discussion about what it means to simplify. Were simplified expressions the same as simplified equations? In English, after the class read Robert Frost's "Acquainted with the Night," the teacher asked students to relate the poem to an episode in their own lives.

Betty Fable expected all the teachers at Constructivist High to teach in a constructivist way—whatever that was. But what was it? Role playing, experimenting, analyzing, making connections to one's life? To her, each teacher seemed to be doing something different.

Many talented, dedicated, and experienced teachers find constructivist ideologies and practices just as bewil-

# of Constructivism

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dering, and for reasons not unlike Betty's. Constructivism does not seem to be one thing. And whatever constructivism is, its advocates sometimes have championed it to the point of overkill. Here and there, mentioning the C word is almost bad manners.

Perhaps it's possible to make better sense of the vexed and messy landscape of constructivism by asking appropriate questions.

What Is Constructivism in Its Variety?

No one can live in the world of education long without becoming aware that constructivism is more than one thing. But what accounts for the variety? Philosopher D. C. Phillips (1995) identifies three distinct roles in constructivism. We'll call them the *active learner,* the *social learner,* and the *creative learner.*

The active learner: Knowledge and understanding as actively acquired. Constructivism generally casts learners in an active role. Instead of just listening, reading, and working through routine exercises, they discuss, debate, hypothesize, investigate, and take viewpoints—a common thread in Betty Fable's first day at Constructivist High.

The social learner: Knowledge and understanding as socially constructed. Constructivists often emphasize that knowledge and understanding are highly social. We do not construct them individually; we coconstruct them in dialogue with others. The teaching of history should make students aware of how historical "truth" varies with the interest groups—hence in Betty's history class, the letters from the aristocratic perspective. The teaching of science should lead students to recognize that scientific truths are arrived at by a social critical process that shapes their supposedly objective reality—thus, the group work in Betty's science class.

The creative learner: Knowledge and understanding as created or *recreated.* Often, constructivists hold that learners need to create or recreate knowledge for themselves. It is not enough that they assume an active stance. Teachers should guide them to rediscover scientific theories, historical perspectives, and so on. Betty's history teacher hopes that the letter exercise will help students reconstruct the aristocratic perspective, and her science teacher hopes that the students' theories and experiments will build a strong understanding of why objects fall as they do.

It is natural to ask how the three constructivist roles relate to one another. An active role for the learner is basic; in practice, social and creative aspects often accompany this role. However, an active learner does not logically require the other two. Teachers can organize learning experiences in active ways that do not require learners to engage in testing and building knowledge in a social manner or to invent or reinvent theories or viewpoints.

Why—and Why Not—Constructivism?

Why has constructivism enjoyed such advocacy for several decades? One reason is simply the search for better ways to teach and learn. With traditional methods, researchers and teachers have noted persistent shortfalls in students' understanding and a great deal of passive knowledge across all ages and grades, including the university (Gardner, 1991).

A philosophical argument also supports constructivist educational practices. The stimuli that we encounter, including messages from others, are never logically sufficient to convey meaning. To some extent, the individual always has to construct or reconstruct what things mean. It thus makes sense to organize learning to reflect this reality.

Another kind of argument looks to psychological sources (Perkins, 1992a; Duffy & Jonassen, 1992; Reigeluth, 1999; Wilson, 1996; Wiske, 1998). Considerable research shows that active engagement in learning may lead to better retention, understanding, and active use of knowledge. A social dimension to learning—what is sometimes called *collaborative* or *cooperative learning*—often, although not always, fosters learning. Sometimes, engaging students in discovery or rediscovery processes energizes them and yields deeper understanding.

Such arguments certainly encourage constructivist teaching practices. However, complications arise. Constructivist techniques often require more time than do traditional educational practices—a cost worth paying, enthusiasts say, but many teachers feel the pressures and conclude that they need to make compromises. Asking learners to discover or rediscover principles can foster understanding, but learners sometimes persist in discovering the wrong principles—for instance, an idiosyncratic scientific theory. Although ardent constructivists may argue that process is all, others believe that one way or another, students need to arrive at an understanding of the best theories propounded by the disciplines.

Constructivism generally casts learners in an active role.

Also, constructivist learning experiences can exert high cognitive demands on learners, and not all learners respond well to the challenge (Perkins, 1992b). Constructivist techniques can even seem deceptive and manipulative. "Why don't you just tell me what you want me to know instead of making a big secret of it?" is not always an unreasonable question.

What Kind of Constructivism Makes Sense When?

The complications make it important to deploy constructivist techniques wisely, in the right place for the right purpose. How can a teacher create appropriate, targeted constructivist responses to learners' difficulties? One approach to the challenge recognizes that different kinds of knowledge—inert, ritual, conceptually difficult, and foreign—are likely to prove troublesome for learners in different ways.

Inert Knowledge

Inert knowledge sits in the mind's attic, unpacked only when specifically called for by a quiz or a direct prompt but otherwise gathering dust (Bransford, Franks, Vye, & Sherwood, 1989; Bereiter & Scardamalia, 1985). A familiar and relatively benign example is passive vocabulary—words that we understand but do not use actively. Unfortunately, considerable knowledge that we would like to see used actively proves to be inert. Students commonly learn ideas about society and self in history and social studies but make no connections to today's events or family life. Students learn concepts in science but make little connection to the world around them. Students learn techniques in math but fail to connect them to everyday applications or to their science studies.

What is the constructivist response when teaching knowledge that is likely to become inert? One strategy is to engage learners in active problem solving with knowledge that makes connections to their world. Betty Fable's English teacher asked her students to make connections between Frost's "Acquainted with the Night" and episodes in their own lives. For another example, science students studying basic machines (levers, pulleys, and so on) might find and analyze examples around their homes.

Another approach is to engage students in problem-based learning, where they acquire the target concepts while addressing some medium-scale problem or project (Boud & Feletti, 1991; Savery & Duffy, 1996). The English students might search out varied poems for a project on the theme "poems of the nights of our lives." The science students might build a Rube Goldberg apparatus or construct useful gadgets that use basic machines.

Ritual Knowledge

Ritual knowledge has a routine and rather meaningless character. It feels like part of a social or an individual ritual: how we answer when asked such-and-such, the routine that we

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execute to get a particular result. Names and dates often are little more than ritual knowledge. So are routines in arithmetic—an analogue of misconceptions in science (Gardner, 1991)—such as the notorious "invert and multiply" to divide fractions. Whereas inert knowledge needs more active use, ritual knowledge needs more meaningfulness (of course, knowledge can be both inert and ritualized).

Constructivists often emphasize that knowledge and understanding are highly social.

A constructivist response to knowledge likely to become ritualized strives to make it more meaningful. For example, a teacher can wrap such knowledge in authentic problem-solving activities, another opportunity for problem-based learning. Students can explore its rationale and utility through discussion, as in the discussion of simplification in Betty Fable's algebra class. A teacher can sometimes involve students in surveying a large-scale story or historical episode or controversy that lends meaning to a piece of ritual knowledge. If Columbus "discovered" America in 1492, what else was going on in the world at about that time? How did Columbus's activities interact in the following decades with those other circumstances?

Conceptually Difficult Knowledge

Before students reach the university level, they meet conceptually difficult knowledge most commonly in mathematics and science, although it can occur in any discipline.

Understanding objects in motion is a good example (McCloskey, 1983). Learners find it hard to accept that objects in motion will continue at the same rate in the same direction unless some force, such as friction or gravity, impedes them. They find it hard to believe that heavier objects fall at the same rate as lighter ones, air resistance aside.

A mix of misimpressions from everyday experience (objects slow down automatically), reasonable but mistaken expectations (heavier objects fall faster), and the strangeness and complexity of scientists' views of the matter (Newton's laws; such concepts as velocity as a vector, momentum, and so on) stand in the way. The result is often a mix of misunderstandings and ritual knowledge: Students learn the ritual responses to definitional questions and quantitative problems, but their intuitive beliefs and interpretations resurface on qualitative problems and in outside-of-classroom contexts.

What are reasonable constructivist responses to conceptually difficult knowledge? Perhaps the most common is to arrange inquiry processes that confront students with discrepancies in their initial theories—either discrepancies between theory and observations (as in Betty Fable's experiments with falling objects) or logical discrepancies.

For example, students commonly believe that a fly on a table pushes down but that the table does not push up on the fly. But they believe that the same table *does* push up on a bowling ball sitting on it. Imagine the bowling ball shrinking down to fly size. Where, all of a sudden, does the table stop pushing? Discussing such cases provides "anchoring intuitions" that make the principle clear and provoke students to extend it (Clement, 1993).


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As with the bowling ball example, it often helps to introduce learners to imagistic mental models or to invite them to invent their own (Gentner & Stevens, 1983). It also often helps to engage learners with qualitative problems rather than with the solely quantitative ones that dominate some textbooks. Qualitative problems lead students to confront the character of the phenomenon rather than just to master computational routines. Such strategies may involve asking learners to "rediscover" the principle in some sense. But not necessarily. The teacher can instead introduce the principles directly and ask learners to test them and to use them to interpret phenomena in an active, exploratory way.

Foreign Knowledge

Foreign knowledge comes from a perspective that conflicts with our own. Sometimes the learner does not even recognize the knowledge as foreign. An example is "presentism" in historical understanding: Students tend to view past events through present knowledge and values (Carretero & Voss, 1994). Harry Truman's decision to drop the atomic bomb on Hiroshima may seem foolish to today's students. Perhaps it was vexed, but viewed through the knowledge and cultural mindsets of the era, it was hardly foolish.

Other examples include value systems carried by different nationalities, faiths, and ethnic groups. How indeed did the French aristocracy view the Revolution, the question that Betty Fable encountered in her history class? To pose such a puzzle is not, of course, to recommend the aristocratic view. But it *is* to recognize that many situations in history, contemporary society, literature, and current science and technology allow multiple serious, sincere, and well-elaborated perspectives that deserve understanding.

What then are constructivist responses to foreign knowledge? We can engage learners in recognizing that there *are* alternative perspectives by asking them to identify and elaborate on them. We can provoke compare-and-contrast discussions that map the perspectives in relation to one another. This method may sometimes involve extensive investigation as students set out to research what other perspectives have to say. Still another approach is to foster role-playing activities that ask students to get inside mindsets different from their own.

Of course, these are neither the only ways that knowledge can be troublesome nor the only constructivist responses possible. For instance, knowledge can be hard to remember—complex, with many pieces of information. Surprisingly, even this difficulty invites a constructivist response. Research shows that the best way to remember a body of information is to organize it actively, looking for internal patterns and relating it to what you already know. Simple repetition is much less effective. Or knowledge can be full of seeming inconsistencies and paradoxes, as when art critics or scientists disagree. Or knowledge can be full of subtle distinctions, such as that between weight and mass. Add your own categories and your own constructivist responses, by all means.

Pragmatic Constructivism

Often, the case made for constructivism seems resoundingly ideological. If learners do not rediscover Greek philosophy or Newton's laws for themselves, they will never truly understand them. To arrive at meaningful knowledge, they must learn through deep inquiry. As the unexamined life is not worth living, so the unexamined fact is not worth believing. And so on.

But the constructivist ideas assembled here are anything but ideological. They make up what we might call pragmatic constructivism. Their message asks us to view constructivism as a toolbox for problems of learning. Troublesome knowledge of various kinds invites constructivist responses to fit the difficulties—not one standard constructivist fix. If a particular approach does not solve the problem, try another—more structured, less structured, more discovery oriented, less discovery oriented, whatever works. And when knowledge is not particularly troublesome for the learners in question, well, forget about active, social, creative learners. Teaching by telling may serve just fine.

In keeping with this flexibility, active, social, and creative learning can play out in rather different ways, depending on the circumstances. Active learning is the common denominator. However, some examples more than others tapped the social dimension of constructivism. For instance, foreign knowledge intrinsically demands that we recognize differently constructed social perspectives. In contrast, inert or ritual knowledge may not call much upon the social dimension of constructivism, unless it happens to concern the social domain. Some constructivist responses to conceptually difficult knowledge ask learners to create and investigate their own theories. But responses to potentially inert and ritual knowledge may well simply foreground the wide and meaningful application of knowledge.

We began with Betty Fable's bewilderment about Constructivist High. In part, her confusion reflected the disparate constructivist moves in different classes. However, we see now that it also reflected a tension between ideological constructivism and pragmatic constructivism. The term *constructivism*, with its ideological overtones, suggests a single philosophy and a uniquely potent method—like one of those miracle knives advertised on late-night TV that will cut anything, even tin cans. But we could look at constructivism in another way, more like a Swiss army knife with various blades for various needs. Indeed, the miracle-knife version of constructivism has become as tired over the years as those TV commercials. At Constructivist High and elsewhere, it's high time we got pragmatic about constructivism. ■

Often, constructivists hold that learners need to create or recreate knowledge for themselves.

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