Understanding Great Teaching

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At Texas A&M University recently, the chancellor created a firestorm of controversy over his plan to pay faculty members hefty bonuses for favorable comments and ratings from students. Some people feared the plan would become a corrupting influence, leading professors to buy high marks from their students with inflated grades or free beer. For student supporters of the idea, however, it was an opportunity to express legitimate assessments of their teachers. "I understand their concerns," one student leader said of the plan's critics, "but a student can distinguish between a good teacher and a popular teacher."

Behind that controversy lies a much older struggle over the very meaning of good teaching. If there is a difference between good instructors and popular ones, what is it? Every year hundreds of promotion and tenure committees struggle with that question, and for good reasons. Without some definitions, all attempts to improve teaching wander aimlessly in a sea of conflicting ambitions. In this essay, we offer a way across those troubled waters. With a definition of good teaching clearly in mind, we can then offer some insights into how the best teachers achieve them.

DIFFERENT STUDENT APPROACHES TO LEARNING

Our journey begins with a single experiment in 1976 that, at first glance, seems far distant from any questions about teaching quality and how to achieve it. In that experiment, researchers at a Swedish university gave a group of students a text and said, here, read this; when you finish, we're going to ask you some questions.

After the reading was done and the researchers began asking questions, they quickly realized that different students had taken fundamentally different approaches to the exercise. On one end of the scale of responses, students had simply attempted to remember as many details as possible, trying as best they could to replicate what they had read. On the opposite end of that same scale, other students had thought about arguments they encountered in the text, and had distinguished between evidence and conclusions in those arguments. They had identified key concepts, mulled over assumptions, and even considered implications and applications. The researcher called the first group "surface learners" and the second, "deep learners."

In subsequent investigations, researchers identified a third kind of approach, often called "strategic learners." The strategic student is primarily concerned with making good grades, and while that may seem like an acceptable alternative, it has some severe limitations. The strategic student isn't focused on understanding or application, only with making high marks. They generally are not risk takers. They will often choose the easiest way out rather than the one that will help them grow intellectually.

We should emphasize that these three categories—deep, surface, and strategic learning—refer initially to the feelings that students have toward their studies and the strategies they employ in that learning. Generally, surface learners fear failure and simply try to survive academically. They try to replicate what they encounter. Because they understand little, they complain on the math exam, "You didn't show us a problem exactly like that one before."

Strategic learners want high grades, and will typically spend time trying to find out what the teacher will ask them. For that math exam, they may memorize formulas and master algorithmic procedures, but, as we will discover later in more detail, they will often fail to understand conceptually, and their learning will have little sustained or substantial influence on the way they subsequently think, act, or feel. Only deep learners are primarily concerned with understanding, with how to apply their ideas to consequential problems, with implications, and with ideas and concepts. Only they are likely to theorize and make connections with other ideas and problems. Only they are likely to become adaptive experts who both recognize and even relish the opportunity and necessity for breaking with traditional approaches and inventing new ones.

Much of the research around these concepts has focused on why a student might take surface or strategic approaches, and it is that research that ultimately ties back to our initial question about the nature of great teaching. If you suspect that the answer is simply that smart students take deep approaches while less capable people take surface ones, you won't find much support for your suspicions in the research findings. Instead, you will discover considerable evidence that the major reasons why anyone takes a deep, surface, or strategic approach can be summarized in a single word: "schooling." In other words, it is what teachers do with students that makes the biggest difference. Some teachers produce lots of students with deep intentions while others rarely produce any. Thus, we could think of great teachers as those people with considerable success in fostering deep approaches and results among their students.

INVESTIGATING GREAT TEACHING

We used that simple idea to investigate great teachers. We wanted to find and examine people who nurture deep approaches to learning. Bain published the initial results of that study in 2004 but this investigation into great teaching has also been an ongoing focus of the Research Academy for University Learning at Montclair State University. What we have found will not surprise anyone familiar with the growing literature on good teaching.

Before we explore some of those primary findings, however, we must note one other factor that can prevent even students with good intentions from achieving a deep, conceptual understanding. It has to do with the way the mind creates meaning, and it is something highly successful teachers understand profoundly. When human beings learn, we construct our own sense of reality. We begin that process in the crib where we encounter a barrage of sensory input coming at us through our five senses. Since we are not born with dictionaries in our diapers, we have to make sense of all that data streaming into our brains. We do so by connecting one sensory input to another, testing and confirming these causal linkages, and building sophisticated mental models as a result.

We also begin to use those constructed paradigms to understand new sensory input, and we continue doing that for the rest of our lives. Before you enter a room for the first time, you already have a model of something called floors, ceilings, walls, and furniture, and you use all of those constructed models in your mind to understand the sensory input you receive from "seeing" things. You understand the room, not just in terms of the light waves hitting your retina, but also from the previously constructed mental models you brought with you.

That ability, that habit, of understanding something new in terms of some model we already have in our minds proves to be enormously useful as we navigate the world. But it also creates—as good teachers realize—one of our greatest challenges as educators and learners. Often we want our students to build *new* models of reality, or at minimum to question some of their existing ones. In the humanities, we often say, educated people are able to realize the problems they face in believing whatever they may believe. In the sciences, we say that learners, when confronted by overwhelming data, should abandon old models and adopt new ones consistent with the data. Either way, we are expecting our students to engage in what might be regarded as an unnatural act. While their natural tendency is to understand the new in terms of the old, we are asking them to build completely new models of reality, or question old ones. Most students don't do that very well, or very easily.

The problem to which we refer is well illustrated by a story told in the second chapter of *What the Best College Teachers Do.* Some years ago, two physicists at Arizona State University asked this question: Does my introductory physics class change the way students think about motion? You can substitute for the phrase, "think about motion," anything that fits within your own academic discipline. Does your course change the way students think about… .you fill in the blank. To find out in physics, these two scientists devised an instrument—the Force Concept Inventory (FCI)—to measure students' conception of motion and administered that instrument to several hundred people coming into an introductory course. On the front end, they discovered that most students came into the course with what might be described as an Aristotelean view of motion. It wasn't a nonsensical belief, but it wasn't the way modern physics thought about motion either—not since Newton, let alone Feynman.

But that's before the students took the course. Some months after the term ended, they brought the students back and gave them exactly the same instrument to see how much change had taken place in their basic concepts of motion. Guess what? Virtually none. Even more disturbing, the degree of change didn't seem to be related to the grades that the students had made. The A and C students brought their Aristotelean views of motion to the class and both groups simply wrapped all of the sensory input they received around their existing models—the textbooks they read, the lectures they heard, the experiments they performed in the lab—and those models did not change. Many A students were simply better at memorizing formulae and plugging the right number into the equation, but in terms of conceptual understanding, the FCI data suggested that they were probably no better off than their C colleagues. Yet this problem does not exist only in the sciences. It prevails in all fields because we are all dealing with human beings who are attempting to reconcile new sensory information with their existing mental models. Sam Wineburg captured the point in the title of his prize-winning book, *Historical Thinking and Other Unnatural Acts*.

If this is such a huge problem, however, how do great teachers overcome it? Certainly not by just telling the students the "truth." Those physics students were told the truth repeatedly, yet it had little influence on their conceptual understanding. How then can great teachers stimulate a deep approach to learning that can have a sustained and substantial influence on the way students will subsequently think, act, and feel? How do the subjects of our ongoing study achieve the unnatural?

Here's a summary of what our great teachers told us: Human beings are most likely to learn deeply when they are trying to solve problems or answer questions that they have come to regard as important, intriguing, or beautiful. This is their description of what we call the Natural Critical Learning Environment (you can see more about that kind of environment at www.montclair.edu/academy/ncle.html and the links from that page). Moreover, students are most likely to question and perhaps shift their paradigms if, in the course of pursuing those questions or problems, they find themselves in a situation where their existing paradigms produce incorrect or unsatisfactory explanations. They face what some have called an "expectation failure"—their mental model has predicted an outcome, but that expected result doesn't match with their current sensory input and how they interpret it. What happens next is critical to the development of the learner and speaks directly to the distinction uncovered by a simple experiment conducted in Sweden more than thirty years ago. When faced with new information that is in conflict with their current mental model, students typically invoke one of two processes. They can choose to take a surface approach to this event by dismissing this new information as a special case and simply wrapping it around their current paradigm, or those same students can take a deep approach by grappling with how this new information will irrevocably change their mental model, ultimately creating a new and deeper conceptual understanding. If they have an opportunity to grapple with the dissonance they encounter—to try, fail, receive feedback, and try again—before anyone makes a judgment of their efforts, they are more likely to learn deeply.

The course of action chosen by a student confronted with an expectation failure is hardly an individual choice made in a vacuum. Research indicates that a student's response to this type of event can be greatly influenced by the words, actions, and assessment choices made by the teacher. Not all college classes provide opportunities for students to choose the deep approach, yet that chance forms a key ingredient of a Natural Critical Learning Environment.

ENCOURAGING A DEEP APPROACH TO LEARNING

So what can a teacher do —indeed, what *do* the best teachers do—to encourage students to take a deep approach to their learning? Hanging in the front office of the Research Academy for University Learning at Montclair is an old poster from the 1930s. It's one of those Depression era placards encouraging schoolchildren to develop good habits. A little boy is tugging at a large yellow question mark, hooking a book labeled "knowledge." The caption reads: "Ask Questions. Sometimes the only way you can capture Mr. Knowledge is with a question mark." A bit stilted and old-fashioned, the poster nevertheless captures something we've known for a long time. People are most likely to learn deeply when they are trying to answer their own questions or solve their own problems.

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Lots of evidence points to that conclusion. But here's the catch: in a formal educational environment, learners typically are not in charge of the questions. Teachers usually frame the curriculum and at least implicitly shape the questions. Perhaps rightly so, but that reality produces an enormous chasm between an ideal *natural* critical learning environment and conditions existing in most universities. To bridge that gap, to reach the students educationally, the best teachers—and this may be their most profound ability—find ways to link their own disciplinary concerns and interests with those of the students. This special genius we saw in our best teachers was the ability to frame questions in ways that would both capture the students' imagination *and* challenge some of their most cherished paradigms. The best teachers found questions that were already on the minds of their students and helped them move to new inquiries that those students had never imagined.

As a student of U.S. politics, Melissa Harris-Lacewell, a professor of politics at Princeton, had a question she wanted her students to consider about that historical period we call Reconstruction, which took place immediately following the American Civil War. How did Reconstruction influence the development of political institutions and traditions, and social and economic realities, especially for African Americans? If she had asked that question initially of a group of typical undergraduates, however, only a few of the history buffs might respond with much enthusiasm. Rather than asking that question, she began with another question that she knew was already on the minds of her students. She knew it was on their minds because as a political pollster, she knew in fall 2006 that particular question was on the minds of most Americans, and had been for a year. It was a question that has transformed American politics since August 2005: What in the world happened with Katrina? How did a Category 3 hurricane—certainly not the biggest beast ever to churn the Gulf waters—wipe out an American city? How did that disaster happen?

She organized a class called Disaster, Race, and American Politics, and invited her students to study questions about disaster and Katrina. When the class began, however, she subtly shifted the agenda while keeping her students on board. When did the disaster begin, she asked the class: Did it begin when the storm struck New Orleans in August 2005? Or did it begin in 1866 with the beginning of Reconstruction? Suddenly, she had transformed their initial interest to questions she had in mind, and sparked their focus on issues that were probably far afield from their initial concerns. She had bridged that chasm that often ensnares the best of educational intentions.

When Donald Saari goes into his calculus class on the first day, he often carries two items, a large rectangular paper cutout with a sinusoidal top edge and a roll of toilet paper. With a big grin, a great sense of fun, and a positive attitude that says, I think you can do this, he holds up the paper cutout and says to the students, "This is the area under the curve. How can we calculate it?" With Socratic questioning and in a nonthreatening atmosphere, he prods them into constructing a way to solve the problem, almost as if it is a big Sudoku puzzle. "When I finish this process," he explains, "I want the students to feel like they have invented calculus and that only some accident of birth kept them from beating Newton to the punch." Unlike so many in his discipline, he does not simply perform calculus in front of students; rather he raises the questions that will help them reason through the process, to see the nature of the questions, and to think about how to answer them. The roll of toilet paper? How can we calculate the volume of this roll of toilet paper? "Toilet paper works well," Saari once explained, "because it's so absurd. No one expects it. And also because we can tear off sheets and begin to consider the relationship between the area of those sheets and the volume of the whole roll." Saari told us recently that he doesn't use "real life examples" He uses absurd examples that students will find fascinating. But it isn't the absurdity that makes it work. It's the ability to engage students in something they will find fascinating partly because it's so unexpected but also because someone has taken them seriously. It's the novelty that challenges their already existing mental models regarding the items in question.

In these cases, and in many others we have observed, one important pattern prevails. Through the power of the questions they raise, these outstanding teachers engage students in doing the discipline even before they know the discipline. While most undergraduate textbooks are organized deductively, moving from general principles to specific examples, teachers who promote deep learning approaches help students to learn inductively, moving from fascinating and important questions to general principles of the discipline. Aristotle said it long ago: "For the things we must learn to do before we can do them, we learn by doing them." John Dewey added, "We don't learn from experience; we learn by reflecting on experience."

Can students tell the difference between "good teachers" and "popular teachers," as the student at Texas A&M suggested? Probably, but only if they take deep approaches to learning and we ask them the right questions. In a particularly elegant experiment, Scottish researchers Hillary Tait and Noel Entwistle found that deep learners said they liked courses that pushed them to explore conceptual meanings and implications, whereas their surface learning classmates hated such experiences. Surface learners praised courses that valued recall while deep learners said they didn't learn much in those environments.

Student ratings have their limitations, and it is precisely those limitations that call for clearer notions about what we mean by good teaching. If we think of excellent teachers as those people who help and encourage their students to take deep approaches to their learning, we can begin to identify, as we have done in this essay, those practices and perspectives that achieve those noble ends. ▪

REFERENCE

Bain, K. 2004. *What the best college teachers do.* Cambridge, MA: Harvard University Press.

Wineburg, S. 2001. *Historical thinking and other unnatural acts: Charting the future of teaching the past.* Philadelphia: Temple University Press.