

HOW DO THEY CONDUCT CLASS?



A few years ago, one of my colleagues at Northwestern gave a talk on teaching that she called "Are Lectures Useless?" It was actually a vigorous defense of lectures, but the question mark in the title sent another professor on campus into intellectual apoplexy. Armed with the flyer that announced the event, he strolled into class one day ready to tilt at the windmills in his mind, those evil forces raising doubts about the wisdom of his favorite pedagogical weapon. "I want you to know," he told a slightly bewildered student audience while waving the flyer before them, "the teaching center at this university wants us to believe that lectures are no good, but I'm going to continue to lecture whether they like it or not."

More recently, a professor attended one of our summer institutes, fortified with what she believed to be incontrovertible evidence that no one could learn from something called lectures. As part of the program, we featured a demonstration of what students consider to be an outstanding lecture. Our visitor was horrified that anyone would even consider teaching by telling, and later took the opportunity of an elevator ride with the speaker to deliver a fierce tongue-lashing.

These two episodes are part of a growing national debate about lecturing in class. One side in that squabble is convinced that research has proven that lectures never work; the other is often passionately devoted to using the ancient pedagogical device. While this debate has no doubt opened some minds to the possibilities of using tools other than a formal lecture, it has just as often produced rigid positions that shed little light on good teaching, each side convinced that they know a simple truth. Our study of outstanding

teachers revealed, however, that some people can engage their students with good lectures, helping and encouraging them to learn on the highest level; others can do so with case studies, problem-based learning, powerful assignments, playing guide by the side, conducting discussions, or creating stimulating field work. Yet any of these methods can also fail miserably.

So what distinguishes the successful from the unsuccessful? First, some underlying principles cut across practices and shape the learning environment, whether a teacher lectures or not. Second, a few key techniques propel the application of those principles. To understand what makes teaching successful, we must explore both principles and techniques.

UNIFYING PRINCIPLES

Seven fairly common principles emerged in the practices of the teachers we studied.

1. Create a Natural Critical Learning Environment

More than anything else, the best teachers try to create a natural critical learning environment: "natural" because students encounter the skills, habits, attitudes, and information they are trying to learn embedded in questions and tasks they find fascinating—authentic tasks that arouse curiosity and become intrinsically interesting; "critical" because students learn to think critically, to reason from evidence, to examine the quality of their reasoning using a variety of intellectual standards, to make improvements while thinking, and to ask probing and insightful questions about the thinking of other people.

Some teachers create this environment within lectures; others, with discussions; and still others, with case studies, role playing, field work, or a variety of other techniques. A few create it with a central project that students take on, often working collaboratively

with other members of the class. Sometimes students tackle the problems silently while hearing them raised in provocative lectures designed to offer them ideas and evidence that challenge their previous ways of thinking. Other times, they address the problems in small groups or in larger class discussions. Indeed, the method of choice varies considerably depending on a variety of factors, including the learning objectives, the personality and cultures of teachers and students, and the learning habits of both. But the method matters far less than do the challenge and permission for students to tackle authentic and intriguing questions and tasks, to make decisions, to defend their choices, to come up short, to receive feedback on their efforts, and to try again. The best teaching creates a sense that everyone is working together, whether that means working on a problem silently while listening to the professor or reasoning aloud with other students and the professor. Moreover, the questions, issues, and problems are authentic: they seem important to students and are similar to those that professionals in the field might undertake.¹

An intriguing question or problem is the first of five essential elements that make up the natural critical learning environment. The second crucial element is guidance in helping the students understand the significance of the question: Some teachers accomplish this by framing the question in such a way that its implications are clear, giving it power and provocation. Several years ago, we asked Robert Solomon, a philosophy professor from the University of Texas, to talk about his teaching to a group of faculty members. Solomon called his talk "Who Killed Socrates?" and in that title captured much of the intellectual energy of his inquiry into Socratic pedagogy and why it isn't used much anymore. When we watched Solomon conduct an introductory philosophy class on epistemology, he simply stood before the group of freshmen and sophomores, looked them in the eye, and asked, "Does anyone here know *anything* for sure?" The way he asked the question gave it

meaning. Because people learn most effectively when they are trying to answer their own questions, Solomon's effort helped his students accept his inquiries as their own. As students cast about for a positive answer, reeling in one solution and then another, they began to grasp the purpose of this modern inquiry. Once that happened, their learning could begin.

Many teachers never raise questions; they simply give students answers. If they do tackle intellectual problems, they often focus only on their subject and the issues that animate the most sophisticated scholarship in the field. In contrast, the best teachers tend to embed the discipline's issues in broader concerns, often taking an interdisciplinary approach to problems. When Dudley Herschbach teaches chemistry at Harvard, he does so with a combination of science, history, and poetry, telling stories about human quests to understand the mysteries of nature. Because he regards science as a journey rather than a set of facts, he takes his students into the historical struggle to fathom the universe. The lesson on polymers becomes the story of how the development of nylons influenced the outcome of World War II. He invokes the arts, using them to capture the emotional power and beauty with which the poet or the painter stirs the imagination and wonder. He even asks his chemistry students to write poetry while they struggle to comprehend the concepts and ideas that scientists have developed.

Often the most successful questions are highly provocative, what one person outside the study derisively called "come-on" questions. What would you do if you came home from college and found your father dead and your mother married to your uncle, and the ghost of your father appeared saying that he had been murdered? Why did some societies get in boats and go bother other people while others stayed at home and tended to their own affairs? Why are human beings occasionally willing to leave home and hearth and march off into the wilderness, desert, or jungle and kill each other in large numbers? Why are some people poor and other people rich?

How does your brain work? What is the chemistry of life? Can people improve their basic intelligence?

Sometimes teachers tell a story or remind students how the current question relates to some larger issue that already interests them. When Solomon taught an advanced undergraduate course in existentialism, he began with a story about life under Nazi rule in occupied France in the early 1940s, reminding students that even ordinary activities like whispering to a friend could have dire consequences in that police state. He used that account both to help students understand the political and social conditions that shaped Sartre's thinking and to raise questions about the origins and meaning of existentialism.

Third, the natural critical learning environment also engages students in some higher-order intellectual activity: encouraging them to compare, apply, evaluate, analyze, and synthesize, but never only to listen and remember. Often that means asking students to make and defend judgments and then providing them with some basis for making the decision. They might judge the argument they encounter on some important question, decide when and how to use a certain method, determine the implications of what they encounter, or make choices between different methods of solving a problem. Or do all of these. Robert Divine raises an important question about U.S. history, helps students see that question in the context of larger issues, shares with them briefly some of the ways that other scholars have attempted to answer that question, then challenges the class to evaluate the argument he would make. Donald Saari uses a combination of stories and questions to challenge students to think critically about calculus. "When I finish this process," he explained, "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." In essence, he provokes them into inventing ways to find the area under the curve, breaking the process into the smallest concepts (not steps) and raising the ques-

tions that will Socratically pull them through the most difficult moments. Unlike so many in his discipline, he does not simply perform calculus in front of the 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. "I want my students to construct their own understanding," he explains, "so they can tell a story about how to solve the problem."

Fourth, that environment also helps students answer the question. Some of the professors we studied raised important inquiries but challenged students to develop their own explanations and understanding—and defend them. "My greatest success comes," Saari said about his calculus classes, "when I get students to answer the questions for themselves." Others advanced arguments and explanations to aid that process, even sometimes using a "lecture" to do so.

Fifth, the natural critical learning environment leaves students with a question: "What's the next question?" "What can we ask now?" Some instructors respond to questions with a question: "What do *you* think?" "If this is true, then why (how, what, where, etc.) . . .?" "What do you mean by that?" A few of the teachers we studied used a technique that we first encountered in the 1960s, but that has probably been around much longer than that. At the end of class, they would often ask students two questions: "What major conclusions did you draw?" "What questions remain in your mind?" (In the 1980s a few educators discovered this routine, gave it various names—one-minute paper, immediate feedback, and so forth—and claimed it as their own.) Sometimes they would ask students why they drew the conclusions they did. They might raise this question in open discussions or ask students to provide a written response. With the advent of the Internet, some instructors ask for responses on-line after class.

Depending on the teacher, these five elements appeared in interactive lectures or emerged in discussions or problem-based sessions.

In the 1990s, the Institute for the Learning Sciences at Northwestern worked with several professors to develop highly interactive multimedia programs that tried to create the natural critical learning environment. Larry Silver, a professor of art history at the University of Pennsylvania, for example, developed software called "Is It a Rembrandt?" In that program, a museum curator confronts students with this problem: A prestigious exhibit of Rembrandt's work is about to open, but some questions have emerged about the authenticity of three of the paintings. Each student becomes the museum's top art investigator to look into the suspicions. To do so, the students must examine the paintings and build a case to support their conclusions. They can inspect each piece of art, compare it to similar works, view the curator's files, or go to the conservation lab. At each turn, they encounter questions, but they decide which ones to pursue, picking their own path through the material. If they decide to inspect a painting, for example, they can select an area to view in detail, asking about brushwork and composition. They can ask questions about other works and their relationship to the art they are investigating. An art expert pops up on the screen to provide a short answer, and each answer produces more questions. When, for example, the students have been drawn into a close examination of the brushwork on the face of the painting *Old Man with a Gorgon*, they can ask whether Rembrandt's students also mixed brushwork styles in their paintings. If they do ask, Professor Silver appears to tell them about "bravura display," and the students can then ask, "What is bravura brush stroke?" something that would never have been asked except in this context.

Slowly, the students build their understanding of art history, the important questions that the discipline pursues, and what constitutes evidence to answer those inquiries. They develop an understanding of the art world in which Rembrandt worked and of the community of critics, connoisseurs, collectors, scholars, and controversies that have emerged over the years around the work of the

Dutch master, his students, and his imitators. They build a vocabulary for thinking about various issues, a knowledge and understanding of technical details and procedures, and an ability both to remember and to use a vast array of historical facts. In short, they learn to think like a good art historian, to understand and appreciate the questions that the discipline pursues, to frame important questions of their own, and to understand the kinds of evidence that might help resolve controversies and how to use that evidence to do so. And they do all that while building their case about how to attribute certain paintings rather than simply trying to commit facts to memory.

When the students think they can make a case for a particular conclusion, they marshal their evidence and present it to the museum curator. If the argument is weak, she responds with constructive criticism, sending the students back to the investigation. Even if the case is strong, new questions always remain. Any conclusion simply opens other areas of possible investigation.

Gerald Mead developed a similar program for his course on the history of modern France called "Invitation to a Revolution," which invites students to travel to the late eighteenth century to see if they can avoid the excesses of the French Revolution. In Deborah Brown's physics course, students can use a program that challenges them to build an elevator. In Jean Goodwin's course on free speech, students can act as Supreme Court justices to decide a tricky but actual case that asks whether people can be held legally responsible for the long-range consequences of their speech. In still another program called "Emerging Economies," management students can advise the CEO of a fictitious company on how to do business in an emerging economy.

The power of these programs lies not in their sophisticated computer programming (indeed, one might even argue that they would work more effectively outside the "box") but in the creation of natural critical learning environments in which students can learn by

doing, by confronting tasks, intellectual or otherwise, that they want to do.

Fascinating? Yes, but enormously expensive to create. Yet we saw the same kind of natural critical learning environments created in classes that used simulations, case studies, problems, field work, and even lectures. We saw them when Chad Richardson's students did ethnographic research on their own cultures, and when Charlie Cannon's students struggled with how to treat pollution in New York Harbor. Ed Muir, a professor of Italian Renaissance history, recreates trials from that era to help students develop both an understanding of the period and how to use evidence to draw historical conclusions. Donald Saari takes a roll of toilet paper into class, asks students how they will calculate its volume, then nudges them toward breaking that problem into its simplest components. Jeanette Norden confronts her students with actual people who have suffered some malady and challenges the future physicians to think through real clinical cases. Some instructors use case studies. In a history class, for example, students might work in groups to represent various historic interests. In an international relations class, they might formulate policy for Richard Nixon when Salvador Allende, a Marxist, was elected president of Chile in 1970, and later in that same hour, advise Allende—from the perspective of 1972—on how to respond to the economic warfare that the Nixon administration had waged over the previous two years. To prepare for any of these cases, students must work in groups to research the events and the factions they represent, reading a variety of historical accounts and documents. In the process, they learn to recognize the nature of historical questions and how to use evidence to help resolve them. They explore conflicting interpretations and how they might begin to evaluate them, using the evidence, concepts, and reasoning of the discipline.

I have stressed in this chapter that the natural critical learning

environment is not dependent on whether or not teachers lecture. But lectures from highly effective teachers nearly always have the same five elements of natural critical learning noted above. They begin with a question (sometimes embedded in a story), continue with some attempt to help students understand the significance of the question (connecting it to larger questions, raising it in provocative ways, noting its implications), stimulate students to engage the question critically, make an argument about how to answer that question (complete with evidence, reasoning, and conclusion), and end with questions. The only exception? Sometimes the best teachers leave out their own answers whereas less successful lecturers often include only that element, an answer to a question that no one has raised.

In the hands of the most effective instructors, the lecture then becomes a way to clarify and simplify complex material while engaging important and challenging questions, or to inspire attention to important matters, to provoke, to focus. It is not used as an encyclopedic coverage of some subject, or as a way to impress students with how much the teacher knows. We found no great teachers who relied solely on lectures, not even highly gifted ones like Jeanette Norden, but we did find people whose lectures helped students learn deeply and extensively because they raised questions and won students' attention to those issues. The students became engaged in thinking through the problems, in confronting them, in looking at evidence, and in reasoning rather than memorizing. Most important, the lecture was part of a larger quest, one element of a learning environment rather than the entire experience.

Some people use highly interactive lectures in which they might occasionally stop and ask students to talk about a topic, to discuss their understanding, or to consider when and how some concept or procedure might be applied. Many of them organize the class into small groups and carefully craft assignments to charge those groups

with working collaboratively outside of class to confront the intellectual problems and questions of the course. With some topics they might give students a written "lecture" to read in class, asking them to identify its central arguments and conclusions. Because students can read in fifteen minutes what it takes fifty minutes to say in a lecture, they could then gather in their groups to discuss for another fifteen minutes the meaning, application, implications, and so forth of the material in the "lecture." In the final twenty minutes the instructor can entertain questions, clarify misunderstandings, suggest how students can learn more, ask additional questions, summarize, and finally ask students to write their major conclusions and why they drew those conclusions. In some disciplines, the instruction might begin the last twenty minutes when the teacher asks one or more groups to offer a brief summary of the central argument and major conclusion of the "lecture" or, in other fields, to go to the board and work a problem by applying the methods covered in the written material.²

One teacher often asks students to play the devil's advocate and submit every argument they can imagine against the conclusions he draws in class. In recent years he has asked them to submit their responses on-line. Another instructor asks students to list assumptions that she and other scholars are making in reaching certain conclusions. Still another occasionally asks students to discuss the implications of central conclusions or principles.

In all these examples of natural critical learning environments, students encounter safe yet challenging conditions in which they can try, fail, receive feedback, and try again without facing a summative evaluation. They learn by doing and even by failing. They gain specific reasoning skills while the experience itself tells them and their teacher if they have learned to reason in the discipline.

A simple yet profound perception guides the natural critical learning experience: People tend to learn most effectively (in ways

that make a sustained, substantial, and positive influence on the way they act, think, or feel) when (1) they are trying to solve problems (intellectual, physical, artistic, practical, or abstract) that they find intriguing, beautiful, or important; (2) they are able to do so in a challenging yet supportive environment in which they can feel a sense of control over their own education; (3) they can work collaboratively with other learners to grapple with the problems; (4) they believe that their work will be considered fairly and honestly; and (5) they can try, fail, and receive feedback from expert learners in advance of and separate from any judgment of their efforts.

2. Get Their Attention and Keep It

Whereas the ideas of natural critical learning serve as a robust organizing rationale around which the best teaching takes place, some more specific principles guide the actions of the people we studied. They consciously try to get students' attention with some provocative act, question, or statement. "The human mind must first focus on the problem of how to understand, apply, analyze, synthesize, or evaluate something," one of the professors told us in an argument we heard frequently, "and a teacher can help stimulate that focus." Teaching is "above all," Michael Sandel, a Harvard political theorist, argued, "about commanding attention and holding it." That means not just generally motivating students' interest in the subject but capturing and keeping their attention for each class. "Our task," Sandel contended, "is not unlike that of a commercial for a soft drink or any other product." The only difference, he went on to argue, is what professors might do with that attention once they catch it. "For the most part," he said, "we want to hold the attention of students for the sake of changing the things they are likely to pay attention to most of the time. We want to grasp students and direct their attention some place else."

Teachers succeed in grabbing students' attention by beginning a

lecture with a provocative question or problem that raises issues in ways that students had never thought about before, or by using stimulating case studies or goal-based scenarios.

3. Start with the Students Rather Than the Discipline

To gain students' attention and hold it for some higher purpose, the best teachers start with something that, as Sandel put it, "students care about, know, or think they know, rather than just lay out a blueprint or an outline or tale or theory or account of our own." Several ideas rest at the heart of this approach. For Sandel and many others, the method is grounded in Socratic dialogues. "Socrates began," Sandel explains, "by attending to what people thought they knew, and then he tried gradually and systematically to wrench them from their familiar place." Such an approach often means asking students to begin struggling with an issue from their own perspective even before they know much about it, getting them to articulate a position. Donald Saari does some of that when he gets students to break a calculus problem into smaller pieces. Using Socratic questioning, he begins with what "common sense" might suggest to the students; then, through additional probing, he helps them add the "muscle" that disciplinary discoveries can give them. Sandel compares this method of teaching to ways that he might teach one of his children to play baseball: "I could give them detailed instructions on how to hold the bat, where to stand, how to look for the ball from the pitcher, and how to swing, never letting them hold a bat until they had heard several lectures on the subject. Or, I could give them a bat and allow them to take a few swings, after which I might find one thing that the kid is doing, which if adjusted, would make him a better hitter." The second approach seems eminently more sensible than the first for teaching someone baseball, and it is the method Sandel and others use to teach students to think.

Every year more than seven hundred students crowd into Sandel's classroom at Harvard to take his course on justice. To help

them become good political philosophers, he introduces on the first day of class an intriguing puzzle that raises many of the questions with which he wants students to grapple. He asks them to imagine the following scenario: You are the driver of a runaway trolley car that is approaching five men who are working on the track. You cannot stop the train, and it seems destined to run over the men and kill them. As you speed down the track toward this waiting tragedy, you notice a side track where you can steer the trolley car if you choose to do so. The only problem is that one man is working on that track and the train will undoubtedly kill him if it goes that way. What would you choose to do, he asks the students? Do you turn the car onto the side track, killing one person but saving five others? What would be most just and why? Often the students have no difficulty deciding that they would take out the one life to save the five others.

Sandel then introduces a wrinkle to the story. Suppose, he says, that you are not on the train but standing on an overpass watching it speed toward the five workers. As you watch this disaster in the making, you notice a large man standing next to you, also peering over the railing of the overpass. You quickly calculate that if you push this person over the railing, he will land on the track in front of the train. He will die, but his body will stop the train, saving five lives. Would it be just to give that person a shove?

In that exercise Sandel hopes to provoke students to think about fundamental issues of justice and understand their own thinking in relationship to that of some of the major philosophers. When they start, they may be no more prepared for their task than his sandlot kids are to play in the big leagues, but they learn by doing and receiving feedback on their efforts. Throughout the course, Sandel then embeds all the major philosophical schools and writers he wishes to consider in contemporary ideological battles intended to excite the students. His knowledge of the history of ideas helps him select the proper passage from Mills or Kant; his knowledge of and