

*collaborative learning*

intriguing projects that they submit to the faculty for a grade. "Much of the work (in school and in the profession) is done in a linear fashion," Charlie Cannon noted. "Architects do their part, pass it along to landscape architects and industrial engineers, but with little integration of all three perspectives throughout the process." He and his colleagues wanted to help students learn to collaborate, to integrate disciplines, to move beyond their immediate areas of expertise, and even to help define new ways for the profession to think about how large-scale public projects get done—whose voices are heard and how a cacophony of words and ideas gets turned into something concrete. He wanted students to learn to consider environmental, social, economic, community, and political issues in their designs.

In the innovative studio that emerged—a course for both undergraduate and graduate industrial designers and building and landscape architects—Cannon made several key decisions that fundamentally changed the educational experience. First, he changed his role from judge of some final product to facilitator and one-on-one coach. Second, he arranged for students to work collaboratively on a large and complex project, constantly sharing ideas and information from all their fields of study. Everything they learned was embedded in the pursuit of an intriguing collective goal, something authentic with hands-on experience. Third, he helped them do research on a variety of social, economic, environmental, community, and political issues. Most important, he ultimately gave students control over the class and the work—even though he had selected their project.

To give them that control, Cannon carefully chose a project that "appealed to students." On the first day of class, he tried to help all students understand the heavy demands of time they faced and the collaborative nature of the project. He also stressed that their work was authentic and would make a difference. Ideas they generated could be implemented in a real project; and, most important, with

their pioneering explorations of collaboration and the consideration of multiple perspectives, they would reshape the profession. Finally, he left them to decide whether to participate in this demanding, "often grueling," but rewarding experience.

As the semester unfolded, Cannon continued to shift power to the students until "they had assumed ownership." At first he spelled out what they must achieve, but then he left them in charge of means. He invited students to pick an individual topic they would explore thoroughly ("everything from land art to technical solutions"). For the remainder of the semester, every student became the class expert on a single topic. "If we needed to know about the migration patterns of rattlesnakes, we knew who could tell us," Cannon explained. Once students finished their research, they reported back to the class, grilled each other, and synthesized their findings into several large boards that remained on display.

Because collaborative work was new to them, Cannon continually emphasized the shifting roles they must play: facilitator, transcriber, someone to make sure everyone is included in the discussion, and a person or two who "attends to the emotional tenor of the group." He emphasized the need to respect one another's work, and reminded them that they were "all in the same boat," researching topics about which they knew little.

After four weeks in the library and classroom, students visited the physical site of the project—a proposed waste-treatment facility in New York harbor, for example—then toured other related places: a town dump, recycling center, and the office of engineers who make products out of recycled materials. "Their book-based learning," Cannon noted, "was suddenly connected to how dirty things might be on the ground." They drove around local neighborhoods, looked through phone books at the distributions of businesses in the area, and studied aerial and zoning maps. At the end of their tours, Cannon invited six to twelve other people—community activists, an environmental crusader, planners, architects, artists,

and even students from other schools—to join them in two days of brainstorming about possible solutions. He wanted his students to “spell out the broadest array” of possible approaches, to “immerse themselves in the soup of nonconclusion,” and only during the last day to contemplate implications and combine their thoughts into “constellations” of ideas. “They were encouraged to develop ideas that are as physically different from each other as possible,” Cannon explained, “so that they could begin to recognize that no one solution is the sole answer to the problem.”

Then came the Master Planning Stage. “At this point,” Cannon explained, “I lock them in a room and say, ‘it’s not likely that any of our ideas thus far are the right answer. We need to develop design guidelines or philosophies for attacking this work and I want you to come up with those ideas, to decide what direction the studio will go.’ I ask them to work out what the studio project will be, and then I leave the room.” At that crucial moment, the students design the problem they will collectively tackle over the remaining weeks of the term. “Now the year belongs to them. They have usurped my limited problem, reframed it, and defined the goals of the studio.” Ultimately, they consult again with outside experts, pick individual parts of the “master narrative” they each will pursue, and share their work with one another.

The students do not meet many of the traditional standards of a design studio. They do not have time to produce the kind of polished work more conventional studios might churn out. Yet they learn how to work collaboratively, to research and consider a host of related issues, including environmental ones, to weigh multiple perspectives, and to define the nature of the problems. Cannon redefined what he wanted students to learn from the class and then created an experience that fostered the achievement of those goals, throwing aside conventions about what should be done in the course and what students should accomplish.

Highly effective teachers design better learning experiences for their students in part because they conceive of teaching as fostering learning. Everything they do stems from their strong concern for and understanding of the development of their students. They follow few traditions blindly and recognize when change in the conventional course is both necessary and possible. The baker’s dozen can help us remember what to ask when we plan a course, but if we expect to learn from the practices and thinking of highly effective teachers, we must do more than become routine experts, applying and perfecting some inherited pattern—even if it comes from the best. We must use their approaches to help build our own understanding of powerful learning environments and the adaptive spirit and expertise to toss aside inhibiting conventions in search of better solutions.

Best →

graduate and medical school, and over the years, it has acquired a reputation as a demanding and, at times, exhausting experience. The faculty will often note with pride that the average grade is usually at least half a letter lower than the collective GRAs of the students in the class. More than three hundred people regularly sign up for the course and pack themselves into a large lecture hall three times a week to hear a parade of scientists discuss various topics. They also attend weekly laboratory sessions.

When Larry Pinto began teaching in the course in the early 1990s, he and his colleagues were concerned about a broad pattern they observed. Very few, if any, African American, Hispanic, or Native American students ever made higher than a C in the course and most of them failed. When they looked at these students' overall academic records, they found SAT scores, high school grades, and other credentials that suggested these students should have done quite well. Northwestern has tough admissions requirements and they had all met those standards, but they were still failing Biology B10 in alarming numbers. Furthermore, Pinto learned, similar gaps existed between African Americans and other students at most other highly selective universities.

Pinto knew the implications of such numbers. "I want my research labs to look like a cross-section of society," he said, "but they won't if whole segments of the population face insurmountable obstacles." Because the course was a gateway to medical school, the gap meant that few minority students would become physicians. He and his colleagues rejected a racist explanation for the findings and began looking for other answers. Eventually, they turned to Steele's work and the ideas and programs that the mathematician Uri Treisman had fashioned at Berkeley and the University of Texas at Austin. Treisman had confronted similar patterns among African American students in calculus, and he had erased much of the gap with a program that invited minority students into hon-

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ors workshops rather than into remedial classes. Steele's theories and research certainly supported such a counter-intuitive step. If these students were performing poorly because they suffered from stereotype vulnerability—which they apparently did—a remedial program would only make matters worse, reinforcing the notion that society thought they couldn't make the grade in regular classes. An invitation to an honors workshop, however, would do the opposite, expressing faith that the students could succeed with the highest standards. The biologists were impressed with what they learned and soon carved out their own "Treisman-type" program, but with some important twists.

In fall 1997 they invited all students in Biology B10—including minority students—to participate in advanced conceptual workshops. Pinto made a special effort to reach populations of students like the minority students who had a history of doing poorly in the class, in essence saying to them that he had great faith in their ability to do advanced work. If they joined the program, they would meet once a week in groups of five to seven to tackle conceptually rich advanced problems in biology. Treisman had used graduate students to facilitate those sessions, but the Northwestern biologists, working with a small graduate program, decided to use carefully selected undergraduates who had taken the course the year before. They wanted students who had done well and who had "strong people skills." They eventually asked the teaching center to train these students in advanced facilitation techniques ("ask questions rather than explain"), then they met with the facilitators once a week to go over the problems.

For the next two years, the biologists ran a controlled experiment. They accepted only half the volunteers into the program. Wendi Born, a graduate student in psychology who took on the project for her Ph.D. thesis, created matched pairs between the accepted and the excluded and followed the progress of the two

groups. They also made sure that each workshop group looked like the broader society, with usually one or two minority students in each section.<sup>8</sup>

Students in the program did all the work the other students were expected to do and met for two additional hours each week in their volunteer workshops. In those sessions, they wrestled with the problem of the week, struggling with concepts and their implications and applications. Pinto occasionally met with the facilitators, sometimes over dinner in his home, and followed the progress of the program. Students taught students. They struggled to address authentic and intriguing problems in a community of like-minded colleagues. The facilitators occasionally brought food to the sessions and tried to create a sense of camaraderie. The program demanded a higher level of thinking than did the traditional course, but it also gave students control over their own education. They were recruited into the program vigorously but with a strong message of trust in their abilities and judgments.

The results were staggeringly successful for all ethnic groups in the program. Across the board, scores on examinations rose substantially for the participants, and the differences in ethnic groups largely disappeared. They outperformed their matches outside the program. Furthermore, both the facilitators and the workshop participants reported considerably higher interests in the biological sciences than did other students in the class. The workshop students also reported spending less total time on biology than did students outside the experiment, suggesting that "time on task" alone could not explain the improvements. Perhaps most impressive, the improvements generally continued to grow as the year progressed. The following year Pinto and his colleagues repeated the experiment, this time with a slightly larger group, and found much the same results. After two years of controlled experiments, they opened the program to every student in the class. Although they no longer had a control group, they could compare participants with

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those who didn't volunteer and with the historic performances of other students with similar backgrounds. They continued to observe the same phenomenally positive results.

#### FUNDAMENTAL IDEAS ABOUT LEARNING

The exceptional qualities and practices discussed thus far—the view that every student brings something special to the table, faith in abilities, concentration on outcomes, rejection of power in favor of creating opportunities, and the perception that external factors do make a difference—rest on an even more fundamental bedrock of ideas about the nature and meaning of learning. Simply put, the best teachers believe that learning involves both personal and intellectual development and that neither the ability to think nor the qualities of being a mature human are immutable. People can change, and those changes—not just the accumulation of information—represent true learning. More than anything else this central set of beliefs distinguishes the most effective teachers from many of their colleagues.

To understand these ideas more fully and how they contrast with conventional notions, let's return to a discussion introduced in Chapter 2. Recall that we found many less successful instructors who think of memory as a storage unit and intelligence as the capacity to use the information in that tank. In their minds, some people simply have both big tanks and great power to retrieve and use the contents of those containers, and other people don't. Because they believe that there is little if anything that anyone can do to expand either memory or intelligence, they see limited responsibilities for themselves and their colleagues. For some, that implies that they should, as several people put it, "get out of the way of bright students and they will learn on their own." For most, it means that they need only provide bright students with the information necessary to make good decisions.

*Best* → ~~doing, by confronting tasks, intellectual or otherwise, that they want to.~~

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 1 begin with a question (sometimes embedded in a story), 2 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), 3 stimulate students to engage the question critically, 4 make an argument about how to answer that question (complete with evidence, reasoning, and conclusion), and 5 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.<sup>2</sup>

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."<sup>2</sup>

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