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Abstract: Two alternative paradigms for undergraduate education are compared; one holds teaching as its purpose, the other learning. The natures of the two paradigms are examined on the following dimensions: mission and purposes, criteria for success, teaching and learning structures, underlying learning theory, concepts of productivity and methods of funding, and faculty and staff roles in instruction and governance.

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FROM TEACHING *to* LEARNING —

A New Paradigm for Undergraduate Education

BY ROBERT B. BARR AND JOHN TAGG

The significant problems we face cannot be solved at the same level of thinking we were at when we created them.

—ALBERT EINSTEIN

A paradigm shift is taking hold in American higher education. In its briefest form, the paradigm that has governed our colleges is this: A college is an institution that exists *to provide instruction*. Subtly but profoundly we are shifting to a new paradigm: A college is an institution that exists *to produce learning*. This shift changes everything. It is both needed and wanted.

We call the traditional, dominant paradigm the "Instruction Paradigm." Under it, colleges have created complex structures to provide for the activity of teaching conceived primarily as delivering 50-minute lectures—the mission of a college is to deliver instruction.

Now, however, we are beginning to recognize that our dominant paradigm mistakes a means for an end. It takes the means or method—called "instruction" or "teaching"—and makes it the college's end or purpose. To say that the purpose of colleges is to provide instruction is like saying that General Motors' business is to operate assembly lines or that the purpose of medical care is to fill hospital beds. We now see that our mission is not instruction but rather that of producing *learning* with every student by *whatever* means work best.

The shift to a "Learning Paradigm" liberates institutions from a set of difficult constraints. Today it is virtually impossible for them to respond effectively to the challenge of stable or declining budgets while meeting the increasing demand for postsecondary education from increasingly diverse students. Under the logic of the Instruction Paradigm, colleges suffer from a serious design flaw: it is not possible to increase outputs without a corresponding increase in costs, because any attempt to increase outputs without increasing resources is a threat to quality. If a college attempts to increase its productivity by increasing either class sizes or faculty workloads, for example, academics will be quick to assume inexorable negative consequences for educational quality.

Just as importantly, the Instruction Paradigm rests on conceptions of teaching that are increasingly recognized as ineffective. As Alan Guskin pointed out in a September/October 1994 *Change* article premised on the shift from teaching to learning, "the primary learning environment for undergraduate students, the fairly passive lecture-discussion format where faculty talk and most students listen, is contrary to almost every principle of optimal settings for student

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learning." The Learning Paradigm ends the lecture's privileged position, honoring in its place whatever approaches serve best to prompt learning of particular knowledge by particular students.

The Learning Paradigm also opens up the truly inspiring goal that each graduating class learns more than the previous graduating class. In other words, the Learning Paradigm envisions the institution itself as a learner—over time, it continuously learns how to produce more learning with each graduating class, each entering student.

For many of us, the Learning Paradigm has always lived in our hearts. As teachers, we want above all else for our students to learn and succeed. But the heart's feeling has not lived clearly and powerfully in our heads. Now, as the elements of the Learning Paradigm permeate the air, our heads are beginning to understand what our hearts have known. However, none of us has yet put all the elements of the Learning Paradigm together in a conscious, integrated whole.

Lacking such a vision, we've witnessed reformers advocate many of the new paradigm's elements over the years, only to see few of them widely adopted. The reason is that they have been applied piecemeal within the structures of a dominant paradigm that rejects or distorts them. Indeed, for two decades the response to calls for reform from national commissions and task forces generally has been an attempt to address the issues *within the framework of the Instruction Paradigm*. The movements thus generated have most often failed, undone by the contradictions within the traditional paradigm. For example, if students are not learning to solve problems or think critically, the old logic says we must teach a class in thinking and make it a general education requirement. The logic is all too circular: What students are learning in the classroom doesn't address their needs or ours; therefore, we must bring them back into another classroom and instruct them some more. The result is never what we hope for because, as Richard Paul, director of the Center for Critical Thinking observes glumly, "critical thinking is taught in the same way that other courses have traditionally been taught, with an excess of lecture and insufficient time for practice."

To see what the Instruction Paradigm is we need only look at the structures and behaviors of our colleges and infer the governing principles and beliefs they reflect. But it is much more difficult to see the Learning Paradigm, which has yet to find complete expression in the structures and processes of any college. So we must imagine it. This is what we propose to do here. As we outline its principles and elements, we'll suggest some of their implications for colleges—but only some, because the expression of principles in concrete structures depends on circumstances. It will take decades to work out many of the Learning Paradigm's implications. But we hope here that by making it more explicit we will help colleagues to more fully recognize it and restructure our institutions in its image.

That such a restructuring is needed is beyond question: the gap between what we *say* we want of higher education and what its structures *provide* has never been wider. To use a distinction made by Chris Argyris and Donald Schön, the difference between our espoused theory and our theory-in-use is becoming distressingly noticeable. An "espoused theory," readers will recall, is the set of principles people offer to explain their behavior; the principles we can infer from how people or their organizations actually behave is their "theory-in-use." Right now, the Instruction Paradigm is our theory-in-use, yet the *espoused* theories of most educators more closely resemble components of the Learning Paradigm. The more we discover about how the mind works and how students learn, the greater the disparity between what we say and what we do. Thus so many of us feel increasingly constrained by a system increasingly at variance with what we believe. To build the colleges we need for the 21st century—to put our minds where our hearts are, and rejoin acts with beliefs—we must consciously reject the Instruction Paradigm and restructure what we do on the basis of the Learning Paradigm.

The Paradigms

When comparing alternative paradigms, we must take care: the two will seldom be as neatly parallel as our summary chart suggests (see pages 16 and 17). A paradigm is like the rules of a

game: one of the functions of the rules is to define the playing field and domain of possibilities on that field. But a new paradigm may specify a game played on a larger or smaller field with a larger or smaller domain of legitimate possibilities. Indeed, the Learning Paradigm expands the playing field and domain of possibilities and it radically changes various aspects of the game. In the Instruction Paradigm, a specific methodology determines the boundary of what colleges can do; in the Learning Paradigm, student learning and success set the boundary. By the same token, not all elements of the new paradigm are contrary to corresponding elements of the old; the new includes many elements of the old within its larger domain of possibilities. The Learning Paradigm does not prohibit lecturing, for example. Lecturing becomes one of many possible methods, all evaluated on the basis of their ability to promote appropriate learning.

In describing the shift from an Instruction to a Learning Paradigm, we limit our address in this article to undergraduate education. Research and public service are important functions of colleges and universities but lie outside the scope of the present discussion. Here, as in our summary chart, we'll compare the two paradigms along six dimensions: mission and purposes, criteria for success, teaching/learning structures, learning theory, productivity and funding, and nature of roles.

Mission and Purposes

In the Instruction Paradigm, the mission of the college is to provide instruction, to teach. The method and the product are one and the same. The means is the end. In the Learning Paradigm, the mission of the college is to produce learning. The method and the product are separate. The end governs the means.

Some educators may be uncomfortable with the verb "produce." We use it because it so strongly connotes that the college takes *responsibility* for learning. The point of saying that colleges are to *produce* learning—not provide, not support, not encourage—is to say, unmistakably, that they are responsible for the degree to which students learn. The Learning Paradigm shifts what the institution takes responsibility for: from quality instruction (lecturing, talking) to student learning. Students, the co-producers of learning, can and must, of course, take responsibility for their own learning. Hence, responsibility is a win-win game wherein two agents take responsibility for the same outcome even though neither is in complete control of all the variables. When two agents take such responsibility, the resulting synergy produces powerful results.

The idea that colleges cannot be responsible for learning flows from a disempowering notion of responsibility. If we conceive of responsibility as a fixed quantity in a zero-sum game, then students must take responsibility for their own learning, and no one else can. This model generates a concept of responsibility capable of assigning blame but not of empowering the most productive action. The concept of responsibility as a framework for action is quite different: when one takes responsibility, one sets goals and then acts to achieve them, continuously modifying one's behavior to better achieve the goals. To take responsibility for achieving an outcome is not to guarantee the outcome, nor does it entail the complete control of all relevant variables; it is to make the achievement of the outcome the criterion by which one measures one's own efforts. In this sense, it is no contradiction to say that students, faculty, and the college as an institution can all take responsibility for student learning.

In the Learning Paradigm, colleges take responsibility for learning at two distinct levels. At the organizational level, a college takes responsibility for the aggregate of student learning and success. Did, for example, the graduating class's mastery of certain skills or knowledge meet our high, public standards for the award of the degree? Did the class's knowledge and skills improve over those of prior classes? The college also takes responsibility at the individual level, that is, for each individual student's learning. Did Mary Smith learn the chemistry we deem appropriate for a degree in that field? Thus, the institution takes responsibility for both its institutional outcomes and individual student outcomes.

Turning now to more specific purposes, in the Instruction Paradigm, a college aims to transfer or deliver knowledge from faculty to students; it offers courses and degree programs and seeks to maintain a high quality of instruction within them, mostly by assuring that faculty stay current in their fields. If new knowledge or clients appear, so will new course work. The very purpose of the Instruction Paradigm is to offer courses.

In the Learning Paradigm, on the other hand, a college's purpose is not to transfer knowledge but to create environments and experiences that bring students to discover and construct knowledge for themselves, to make students members of communities of learners that make discoveries and solve problems. The college aims, in fact, to create a series of ever more powerful learning environments. The Learning Paradigm does not limit institutions to a single means for empowering students to learn; within its framework, effective learning technologies are continually identified, developed, tested, implemented, and assessed against one another. The aim in the Learning Paradigm is not so much to improve the quality of instruction—although that is not irrelevant—as it is to improve continuously the quality of learning for students individually and in the aggregate.

Under the older paradigm, colleges aimed to provide access to higher education, especially for historically underrepresented groups such as African-Americans and Hispanics. Too often, mere access hasn't served students well. Under the Learning Paradigm, the goal for under-represented students (and *all* students) becomes not simply access but success. By "success" we mean the achievement of overall student educational objectives such as earning a degree, persisting in school, and learning the "right" things—the skills and knowledge that will help students to achieve their goals in work and life. A Learning Paradigm college, therefore, aims for ever-higher graduation rates while maintaining or even increasing learning standards.

By shifting the intended institutional outcome from teaching to learning, the Learning Paradigm makes possible a continuous improvement in productivity. Whereas under the Instruction Paradigm a primary institutional purpose was to optimize faculty well-being and success—including recognition for research and scholarship—in the Learning Paradigm a primary drive is to produce

CHART 1
COMPARING EDUCATIONAL PARADIGMS

The Instruction Paradigm	The Learning Paradigm
Mission and Purposes	
➤ Provide/deliver instruction	➤ Produce learning
➤ Transfer knowledge from faculty to students	➤ Elicit student discovery and construction of knowledge
➤ Offer courses and programs	➤ Create powerful learning environments
➤ Improve the quality of instruction	➤ Improve the quality of learning
➤ Achieve access for diverse students	➤ Achieve success for diverse students
Criteria for Success	
➤ Inputs, resources	➤ Learning and student-success outcomes
➤ Quality of entering students	➤ Quality of exiting students
➤ Curriculum development, expansion	➤ Learning technologies development, expansion
➤ Quantity and quality of resources	➤ Quantity and quality of outcomes
➤ Enrollment, revenue growth	➤ Aggregate learning growth, efficiency
➤ Quality of faculty, instruction	➤ Quality of students, learning
Teaching/Learning Structures	
➤ Atomistic; parts prior to whole	➤ Holistic; whole prior to parts
➤ Time held constant, learning varies	➤ Learning held constant, time varies
➤ 50-minute lecture, 3-unit course	➤ Learning environments
➤ Classes start/end at same time	➤ Environment ready when student is
➤ One teacher, one classroom	➤ Whatever learning experience works
➤ Independent disciplines, departments	➤ Cross discipline/department collaboration
➤ Covering material	➤ Specified learning results
➤ End-of-course assessment	➤ Pre/during/post assessments
➤ Grading within classes by instructors	➤ External evaluations of learning
➤ Private assessment	➤ Public assessment
➤ Degree equals accumulated credit hours	➤ Degree equals demonstrated knowledge and skills

learning outcomes more efficiently. The philosophy of an Instruction Paradigm college reflects the belief that it cannot increase learning outputs without more resources, but a Learning Paradigm college expects to do so continuously. A Learning Paradigm college is concerned with learning productivity, not teaching productivity.

CRITERIA FOR SUCCESS

Under the Instruction Paradigm, we judge our colleges by comparing them to one another. The criteria for quality are defined in terms of inputs and process measures. Factors such as selectivity in student admissions, number of PhDs on the faculty, and research reputation are used to rate colleges and universities. Administrators and boards may look to enrollment and revenue growth and the expansion of courses and programs. As Guskin put it, "We are so wedded to a definition of quality based on resources that we find it extremely difficult to deal with the *results* of our work, namely student learning."

The Learning Paradigm necessarily incorporates the perspectives of the assessment movement. While this movement has been under way for at least a decade, under the dominant Instruction Paradigm it has not penetrated very far into normal organizational practice. Only a few colleges across the country systematically assess student learning outcomes. Educators in California community colleges always seem to be surprised when they hear that 45 percent of first-time fall students do not return in the spring and that it takes an average of six years for a student to earn an associate's (AA) degree. The reason for this lack of outcomes knowledge is profoundly simple: under the Instruction Paradigm, student outcomes are simply irrelevant to the successful functioning and funding of a college.

Our faculty evaluation systems, for example, evaluate the performance of faculty in teaching terms, not learning terms. An instructor is typically evaluated by her peers or dean on the basis of whether her lectures are organized, whether she covers the appropriate material, whether she shows interest in and understanding of her subject matter,

The Instruction Paradigm	The Learning Paradigm
Learning Theory	
➤ Knowledge exists "out there"	➤ Knowledge exists in each person's mind and is shaped by individual experience
➤ Knowledge comes in "chunks" and "bits" delivered by instructors	➤ Knowledge is constructed, created, and "gotten"
➤ Learning is cumulative and linear	➤ Learning is a nesting and interacting of frameworks
➤ Fits the storehouse of knowledge metaphor	➤ Fits learning how to ride a bicycle metaphor
➤ Learning is teacher centered and controlled	➤ Learning is student centered and controlled
➤ "Live" teacher, "live" students required	➤ "Active" learner required, but not "live" teacher
➤ The classroom and learning are competitive and individualistic	➤ Learning environments and learning are cooperative, collaborative, and supportive
➤ Talent and ability are rare	➤ Talent and ability are abundant
Productivity/Funding	
➤ Definition of productivity: cost per hour of instruction per student	➤ Definition of productivity: cost per unit of learning per student
➤ Funding for hours of instruction	➤ Funding for learning outcomes
Nature of Roles	
➤ Faculty are primarily lecturers	➤ Faculty are primarily designers of learning methods and environments
➤ Faculty and students act independently and in isolation	➤ Faculty and students work in teams with each other and other staff
➤ Teachers classify and sort students	➤ Teachers develop every student's competencies and talents
➤ Staff serve/support faculty and the process of instruction	➤ All staff are educators who produce student learning and success
➤ Any expert can teach	➤ Empowering learning is challenging and complex
➤ Line governance; independent actors	➤ Shared governance; teamwork

whether she is prepared for class, and whether she respects her students' questions and comments. All these factors evaluate the instructor's performance in teaching terms. They do not raise the issue of whether students are learning, let alone demand evidence of learning or provide for its reward.

Many institutions construe teaching almost entirely in terms of lecturing. A true story makes the point. A biology instructor was experimenting with collaborative methods of instruction in his beginning biology classes. One day his dean came for a site visit, slipping into the back of the room. The room was a hubbub of activity. Students were discussing material enthusiastically in small groups spread out across the room; the instructor would observe each group for a few minutes, sometimes making a comment, sometimes just nodding approval. After 15 minutes or so the dean approached the instructor and said, "I came today to do your evaluation. I'll come back another time when you're teaching."

In the Instruction Paradigm, teaching is judged on its own terms; in the Learning Paradigm, the power of an environment or approach is judged in terms of its impact on learning. If learning occurs, then the environment has power. If students learn more in environment A than in environment B, then A is more powerful than B. To know this in the Learning Paradigm we would assess student learning routinely and constantly.

Institutional outcomes assessment is analogous to classroom assessment, as described by K. Patricia Cross and Thomas Angelo. In our own experience of classroom-assessment training workshops, teachers share moving stories about how even limited use of these techniques has prompted them to make big changes in their teaching, sometimes despite years of investment in a previous practice. Mimi Steadman, in a recent study of community college teachers using classroom assessment, found that "eighty-eight percent of faculty surveyed reported that they had made changes in their teaching behaviors as a result." This at first was startling to us. How could such small amounts of information produce such

Structures reflecting an old paradigm can frustrate the best ideas and innovations of new-paradigm thinkers. As the governing paradigm changes, so likewise must the organization's structures.

large changes in teacher behavior? Upon reflection, it became clear. The information was feedback about learning, about results—something teachers rarely collect. Given information that their students were not learning, it was obvious to these teachers that something had to be done about the methods they had been using. Likewise, we think, feedback on learning results at the institutional level should have a correspondingly large impact on an institution's behavior and on the means it uses to produce learning.

Of course, some will argue, true education simply cannot be measured. You cannot measure, for example, true appreciation of the beauty of a work of art. Certainly some learning is difficult, even impossible to measure. But it does not follow that useful and meaningful assessment is impossible.

If we compare outcomes assessment with the input measures controlling policy in the Instruction Paradigm, we find that measures of outcome provide far more genuine information about learning than do measures of input. Learning outcomes include whatever students do as a result of a learning experience. Any measurement of students' products from an educational experience is a measure of a learning outcome. We could count the number of pages students write, the number of books they read, their number of hours at the computer, or the number of math problems they solve.

Of course, these would be silly methods to determine institutional incentives, and we do not recommend them. Any one of them, however, would produce more useful information on learning than the present method of measuring inputs and ignoring outcomes. It would make more sense to fund a college on the number of math problems students solve, for example, than to fund it on the number of students who sit in math classes. We suspect that *any* system of institutional incentives based on outcomes would lead to greater learning than any system of incentives based on inputs. But we need not settle for a system biased toward the trivial. Right now, today, we can construct a good assessment regime with the tools we have at hand.

The Learning Paradigm requires us to heed the advice of the Wingspread Group: "New forms of assessment should focus on establishing what college and university graduates have learned—the knowledge and skill levels they have achieved and their potential for further independent learning."

Teaching/Learning Structures

By structures we mean those features of an organization that are stable over time and that form the framework within which activities and processes occur and through which the purposes of the organization are achieved. Structure includes the organization chart, role and reward systems, technologies and methods, facilities and equipment, decision-making customs, communication channels, feedback loops, financial arrangements, and funding streams.

Peter Senge, in *The Fifth Discipline*, a book about applying systems theory to organizational learning, observes that institutions and their leaders rarely focus their attention on systemic structures. They seldom think, he says, to alter basic structures in order to improve organizational performance, even though those structures generate the patterns of organizational action and determine which activities and results are possible. Perhaps the recent talk about restructuring, re-engineering, and reinvention in higher education reflects a change in focus and a heightened awareness of both the constraining and liberating power of organizational structures.

There is good reason to attend to structure. First, restructuring offers the greatest hope for increasing organizational efficiency and effectiveness. Structure is leverage. If you change the structure in which people work, you increase or decrease the leverage applied to their efforts. A change in structure can either increase productivity or change the nature of organizational outcomes. Second, structure is the concrete manifestation of the abstract principles of the organization's governing paradigm. Structures reflecting an old paradigm can frustrate the best ideas and innovations of new-paradigm thinkers. As the governing paradigm changes, so likewise must the organization's structures.

In this section, we focus on the main structures related to the teaching and learning process; funding and faculty role structures are discussed later under separate headings.

The teaching and learning structure

of the Instruction Paradigm college is atomistic. In its universe, the "atom" is the 50-minute lecture, and the "molecule" is the one-teacher, one-classroom, three-credit-hour course. From these basic units the physical architecture, the administrative structure, and the daily schedules of faculty and students are built. Dennis McGrath and Martin Spear, professors at the Community College of Philadelphia, note that "education proceeds everywhere through the vehicle of the three-credit course. Faculty members [and everyone else, we might add] have so internalized that constraint that they are long past noticing that it is a constraint, thinking it part of the natural order of things."

The resulting structure is powerful and rigid. It is, of course, perfectly suited to the Instruction Paradigm task of offering one-teacher, one-classroom courses. It is antithetical to creating almost any other kind of learning experience. A sense of this can be obtained by observing the effort, struggle, and rule-bending required to schedule even a slightly different kind of learning activity, such as a team-taught course.

In the "educational atomism" of the Instruction Paradigm, the parts of the teaching and learning process are seen as discrete entities. The parts exist prior to and independent of any whole; the whole is no more than the sum of the parts, or even less. The college interacts with students only in discrete, isolated environments, cut off from one another because the parts—the classes—are prior to the whole. A "college education" is the sum the student's experience of a series of discrete, largely unrelated, three-credit classes.

In the Instruction Paradigm, the teaching and learning process is governed by the further rule that time will be held constant while learning varies. Although addressing public elementary and secondary education, the analysis of the National Commission on Time and Learning nonetheless applies to colleges:

> Time is learning's warden. Our time-bound mentality has fooled us all into believing that schools can educate all of the people all of the time in a school year of 180 six-hour days . . . If experience, research, and common sense teach nothing else, they confirm the truism that people learn at different rates, and in different ways with different subjects. But we have put the cart before the horse: our schools...are captives of clock and calendar. The boundaries of student growth are defined by schedules... instead of standards for students and learning.

Under the rule of time, all classes start and stop at the same time and take the same number of calendar weeks. The rule of time and the priority of parts affect every instructional act of the college.

Thus it is, for example, that if students come into college classes "unprepared," it is not the job of the faculty who teach those classes to "prepare" them. Indeed, the structure of the one-semester, three-credit class makes it all but impossible to do so. The only solution, then, is to create new courses to prepare students for the existing courses; within the Instruction Paradigm, the response to educational problems is always to generate more atomized, discrete instructional units. If business students are lacking a sense of ethics, then offer and require a course in business ethics. If students have poor study skills, then offer a "master student" course to teach such skills.

Instruction Paradigm colleges atomistically organize courses and teachers into departments and programs that rarely communicate with one another. Academic departments, originally associated with coherent disciplines, are the structural home bases for accomplishing the essential work of the college: offering courses. "Departments have a life of their own," notes William D. Schaefer, professor of English and former executive vice chancellor at UCLA. They are "insular, defensive, self-governing, [and] compelled to protect their interests because the faculty positions as well as the courses that justify funding those positions are located therein."

Those globally applicable skills that are the foundation of meaningful engagement with the world—reading, writing, calculating, reasoning—find a true place in this structure only if they have their own independent bases: the English or math or reading departments. If students cannot reason or think well, the college creates a course on reasoning and thinking. This in turn produces pressure to create a corresponding department. "If we are not careful," warns Adam Sweeting, director of the Writing Program at the Massachusetts School of Law at Andover, "the teaching of critical thinking skills will become the responsibility of one university department, a prospect that is at odds with the very idea of a university."

Efforts to extend college-level reading, writing, and reasoning "across the curriculum" have largely failed. The good intentions produced few results because, under the Instruction Paradigm, the teacher's job is to "cover the material" as outlined in the disci-

plinary syllabus. The instructor charged with implementing writing or reading or critical thinking "across the curriculum" often must choose between doing her job or doing what will help students learn—between doing well, as it were, or doing good.

From the point of view of the Learning Paradigm, these Instruction Paradigm teaching and learning structures present immense barriers to improving student learning and success. They provide no space and support for redesigned learning environments or for experimenting with alternative learning technologies. They don't provide for, warrant, or reward assessing whether student learning has occurred or is improving.

In a Learning Paradigm college, the structure of courses and lectures becomes dispensable and negotiable. Semesters and quarters, lectures, labs, syllabi—indeed, classes themselves—become options rather than received structures or mandatory activities. The Learning Paradigm prescribes no one "answer" to the question of how to organize learning environments and experiences. It supports any learning method and structure that works, where "works" is defined in terms of learning outcomes, not as the degree of conformity to an ideal classroom archetype. In fact, the Learning Paradigm requires a constant search for new structures and methods that work better for student learning and success, and expects even these to be redesigned continually and to evolve over time.

The transition from Instruction Paradigm to Learning Paradigm will not be instantaneous. It will be a process of gradual modification and experimentation through which we alter many organizational parts in light of a new vision for the whole. Under the Instruction Paradigm, structures are assumed to be fixed and immutable; there is no ready means for achieving the leverage needed to alter them. The first structural task of the Learning Paradigm, then, is to establish such leverage.

The key structure for changing the rest of the system is an institutionwide assessment and information system—an essential structure in the Learning Paradigm, and a key means for getting there. It would provide constant, useful feedback on institutional performance. It would track transfer, graduation, and other completion rates. It would track the flow of students through learning stages (such as the achievement of basic skills) and the development of in-depth knowledge in a discipline. It would measure the knowledge and skills of program completers and graduates. It would assess learning along many dimensions and in many places and stages in each student's college experience.

To be most effective, this assessment system would provide public institutional-level information. We are not talking about making public the status of individual students by name, but about making the year-to-year graduation rate—or the mean score of graduating seniors on a critical thinking assessment, for example—"public" in the sense that they are available to everyone in the college community. Moreover, in the Learning Paradigm college, such data are routinely talked about and acted upon by a community ever dedicated to improving its own performance.

The effectiveness of the assessment system for developing alternative learning environments depends in part upon its being *external* to learning programs and structures. While in the Instruction Paradigm students are assessed and graded within a class by the same instructor responsible for teaching them, in the Learning Paradigm much of the assessment would be independent of the learning experience and its designer, somewhat as football games are independent measures of what is learned in football practice. Course grades alone fail to tell us what students know and can do; average grades assigned by instructors are not reliable measures of whether the institution is improving learning.

Ideally, an institution's assessment program would measure the "value-added" over the course of students' experience at the college. Student knowledge and skills would be measured upon entrance and again upon graduation, and at intermediate stages such as at the beginning and completion of major programs. Students could then be acknowledged and certified for what they have learned; the same data, aggregated, could help shift judgments of institutional quality from inputs and resources to the value-added brought to student learning by the college.

The college devoted to learning first identifies the knowledge and skills it expects its graduates to possess, without regard to any particular curriculum or educational experiences. It then determines how to assess them reliably. It assesses graduating students, and the resulting information is then used to redesign and improve the processes and environments leading to such outcomes. In this manner, enhancing intellectual skills such as writing and problem solving and social skills such as effective team participation become the project of *all* learning programs and structured experiences. The whole would govern the parts.

Information from a sophisticated assessment system will gradually lead to the transformation of the college's learning environments and supporting structures. Such a system seeks out "best practice" benchmarks against which improvements in institutional performance can be measured in learning terms. It is the foundation for creating an institutional capacity to develop ever more effective and efficient ways of empowering learning. It becomes the basis for generating revenue or funding according to learning results rather than hours of instruction. Most importantly, it is the key to the college's and its staff's taking responsibility for and enjoying the progress of each student's education.

Instead of fixing the means—such as lectures and courses—the Learning Paradigm fixes the ends, the learning results, allowing the means to vary in its constant search for the most effective and efficient paths to student learning. Learning outcomes and standards thus would be identified and held to for all students—or *raised* as learning environments became more powerful—while the time students took to achieve those standards would vary. This would reward skilled and advanced students with speedy progress while enabling less prepared students the time they needed to actually master the material. By "testing out," students could also avoid wasting their time being "taught" what they already know. Students would be given "credit" for degree-relevant knowledge and skills regardless of how or where or when they learned them.

In the Learning Paradigm, then, a college degree would represent not time spent and credit hours dutifully accumulated, but would certify that the student had demonstrably attained specified knowledge and skills. Learning Paradigm institutions would develop and publish explicit exit standards for graduates and grant degrees and certificates only to students who met them. Thus colleges would move away from educational atomism and move toward treating holistically the knowledge and skills required for a degree.

Learning Theory

The Instruction Paradigm frames learning atomistically. In it, knowledge, by definition, consists of matter dispensed or delivered by an instructor. The chief agent in the process is the teacher who delivers knowledge; students are viewed as passive vessels, ingesting knowledge for recall on tests. Hence, any expert can teach. Partly because the teacher knows which chunks of knowledge are most important, the teacher controls the learning activities. Learning is presumed to be cumulative because it amounts to ingesting more and more chunks. A degree is awarded when a student has received a specified amount of instruction.

The Learning Paradigm frames learning holistically, recognizing that the chief agent in the process is the learner. Thus, students must be active discoverers and constructors of their own knowledge. In the Learning Paradigm, knowledge consists of frameworks or wholes that are created or constructed by the learner. Knowledge is not seen as cumulative and linear, like a wall of bricks, but as a nesting and interacting of frameworks. Learning is revealed when those frameworks are used to understand and act. Seeing the whole of something—the forest rather than the trees, the image of the newspaper photo rather than its dots—gives meaning to its elements, and that whole becomes more than a sum of component parts. Wholes and frameworks can come in a moment—a flash of insight—often after much hard work with the pieces, as when one suddenly knows how to ride a bicycle.

In the Learning Paradigm, learning environments and activities are learner-centered and learner-controlled. They may even be "teacherless." While teachers will have designed the learning experiences and environments students

Instead of fixing the means—such as lectures and courses—the Learning Paradigm fixes the ends, the learning results, allowing the means to vary in its constant search for the most effective and efficient paths to student learning.

Under the Learning Paradigm, the faculty and the institution take an R. Buckminster Fuller view of students: human beings are born geniuses and designed for success. If they fail to succeed, it is because their design function is being thwarted.

use—often through teamwork with each other and other staff—they need not be present for or participate in every structured learning activity.

Many students come away from college with a false notion of what learning is and come to believe falsely that learning—at least for some subjects—is too difficult for them. Many students cruise through schools substituting an ersatz role-playing exercise for learning.

The first time I (Barr) studied calculus as a college freshman, I did well by conventional standards. However, while I could solve enough problems to get A's on exams, I really didn't feel that I understood the Limit Theorem, the derivative, or much else. But 15 years later, after having completed college and graduate school and having taught algebra and geometry in high school, I needed to relearn calculus so that I could tutor a friend. In only two, albeit intense, days, I relearned—or really learned for the first time, so it seemed—two semesters of calculus. During those days, I wondered how I ever thought calculus was difficult and why I didn't see the Limit Theorem and derivative for the simple, obvious things they are.

What was the difference between my first learning of calculus and the second? It certainly wasn't a higher IQ. And I don't think it was because I learned or remembered much from the first time. I think it was that I brought some very powerful intellectual frameworks to the learning the second time that I didn't have the first time. Having taught algebra and geometry, I had learned their basic structure, that is, the nature of a mathematical system. I had learned the lay of the land, the whole. Through many years of schooling and study, I had also learned a number of other frameworks that were useful for learning calculus. Thus learning calculus the second time within these "advanced" frameworks was easy compared to learning, or trying to learn, calculus without them as I did as a freshman.

So much of this is because the "learning" that goes on in Instruction Paradigm colleges frequently involves only rudimentary, stimulus-response relationships whose cues may be coded into the context of a particular course but are not rooted in the student's everyday, functioning understanding.

The National Council on Vocational Education summarizes the consequences in its 1991 report, *Solutions:* "The result is fractionation, or splinting into pieces: having to learn disconnected sub-routines, items, and sub-skills without an understanding of the larger context into which they fit and which gives them meaning." While such approaches are entirely consistent with educational atomism, they are at odds with the way we think and learn. The same report quotes Sylvia Farnham-Diggory's summary of contemporary research: "Fractionated instruction maximizes forgetting, inattention, and passivity. Both children and adults acquire knowledge from active participation in holistic, complex, meaningful environments organized around long-term goals. Today's school programs could hardly have been better designed to prevent a child's natural learning system from operating."

The result is that when the contextual cues provided by the class disappear at the end of the semester, so does the learning. Howard Gardner points out that "researchers at Johns Hopkins, MIT, and other well-regarded universities have documented that students who receive honor grades in college-level physics courses are frequently unable to solve basic problems and questions encountered in a form slightly different from that on which they have been formally instructed and tested."

The Learning Paradigm embraces the goal of promoting what Gardner calls "education for understanding"—"a sufficient grasp of concepts, principles, or skills so that one can bring them to bear on new problems and situations, deciding in which ways one's present competencies can suffice and in which ways one may require new skills or knowledge." This involves the mastery of functional, knowledge-based intellectual frameworks rather than the short-term retention of fractionated, contextual cues.

The learning theory of the Instruction Paradigm reflects deeply rooted societal assumptions about talent, relationships, and accomplishment: that which is valuable is scarce; life is a win-lose proposition; and success is an individual achievement. The Learning Paradigm theory of learning reverses these assumptions.

Under the Instruction Paradigm, faculty classify and sort students, in the

worst cases into those who are "college material" and those who cannot "cut it," since intelligence and ability are scarce. Under the Learning Paradigm, faculty—and everybody else in the institution—are unambiguously committed to each student's success. The faculty and the institution take an R. Buckminster Fuller view of students: human beings are born geniuses and designed for success. If they fail to display their genius or fail to succeed, it is because their design function is being thwarted. This perspective is founded not in wishful thinking but in the best evidence about the real capabilities of virtually all humans for learning. As the Wingspread Group points out, "There is growing research evidence that all students can learn to much higher standards than we now require." In the Learning Paradigm, faculty find ways to develop every student's vast talents and clear the way for every student's success.

Under the Instruction Paradigm, the classroom is competitive and individualistic, reflecting a view that life is a win-lose proposition. The requirement that the students must achieve individually and solely through their own efforts reflects the belief that success is an individual accomplishment. In the Learning Paradigm, learning environments—while challenging—are win-win environments that are cooperative, collaborative, and supportive. They are designed on the principle that accomplishment and success are the result of teamwork and group efforts, even when it appears one is working alone.

Productivity and Funding

Under the Instruction Paradigm, colleges suffer from a serious design flaw—they are structured in such a way that they cannot increase their productivity without diminishing the quality of their product. In the Instruction Paradigm, productivity is defined as cost per hour of instruction per student. In this view, the very quality of teaching and learning is threatened by any increase in the student-to-faculty ratio.

Under the Learning Paradigm, productivity is redefined as the cost per unit of learning per student. Not surprisingly, there is as yet no standard statistic that corresponds to this notion of productivity. Under this new definition, however, it *is* possible to increase outcomes without increasing costs. An abundance of research shows that alternatives to the traditional semester-length, classroom-based lecture method produce more learning. Some of these alternatives are less expensive; many produce more learning for the same cost. Under the Learning Paradigm, producing more with less becomes possible because the more that is being produced is learning and not hours of instruction. Productivity, in this sense, cannot even be measured in the Instruction Paradigm college. All that exists is a measure of exposure to instruction.

Given the Learning Paradigm's definition, increases in productivity pose no threat to the quality of education. Unlike the current definition, this new definition requires that colleges actually produce learning. Otherwise, there is no "product" to count in the productivity ratio.

But what should be the definition of "unit of learning" and how can it be measured? A single, permanent answer to that question does not and need not exist. We have argued above that learning, or at least the effects of learning, can be measured, certainly well enough to determine what students are learning and whether the institution is getting more effective and efficient at producing it.

The Instruction Paradigm wastes not only institutional resources but the time and energy of students. We waste our students' time with registration lines, bookstore lines, lockstep class scheduling, and redundant courses and requirements. We do not teach them to learn efficiently and effectively. We can do a lot, as D. Bruce Johnstone, former chancellor of SUNY, suggests, to reduce the false starts and aimless "drift" of students that slow their progress toward a degree.

Now let's consider how colleges are funded. One of the absurdities of current funding formulas is that an institution could utterly fail its educational mission and yet its revenue would remain unaffected. For example, attendance at public colleges on the semester system is measured twice, once in the fall and again in the spring. Normally, at California community colleges, for example, about two-thirds of fall students return for the spring term. New students and returning stop-outs make up for the one-third of fall students who leave. Even if only half—or none at all—returned, as long as spring enrollments equal those of the fall, these institutions would suffer no loss of revenue.

There is no more powerful feedback than revenue. Nothing could facilitate a shift to the Learning Paradigm more swiftly than funding learning and learning-related institutional outcomes rather than hours of instruction. The initial response to the idea of outcomes-based funding is likely to be "That's not possible." But, of course, it is. As the new paradigm takes hold, forces and possibilities shift and the impossible becomes the rule.

If the Instruction Paradigm faculty member is an actor—a sage on a stage—then the Learning Paradigm faculty member is an inter-actor—a coach interacting with a team.

Nature of Roles

With the shift to the Learning Paradigm comes a change in roles for virtually all college employees.

In the Instruction Paradigm, faculty are conceived primarily as disciplinary experts who impart knowledge by lecturing. They are the essential feature of the "instructional delivery system." The Learning Paradigm, on the other hand, conceives of faculty as primarily the designers of learning environments; they study and apply best methods for producing learning and student success.

If the Instruction Paradigm faculty member is an actor—a sage on a stage—then the Learning Paradigm faculty member is an inter-actor—a coach interacting with a team. If the model in the Instruction Paradigm is that of delivering a lecture, then the model in the Learning Paradigm is that of designing and then playing a team game. A coach not only instructs football players, for example, but also designs football practices and the game plan; he participates in the game itself by sending in plays and making other decisions. The new faculty role goes a step further, however, in that faculty not only design game plans but also create new and better "games," ones that generate more and better learning.

Roles under the Learning Paradigm, then, begin to blur. Architects of campus buildings and payroll clerks alike will contribute to and shape the environments that empower student learning. As the role structures of colleges begin to loosen up and as accountability for results (learning) tightens up, organizational control and command structures will change. Teamwork and shared governance over time replace the line governance and independent work of the Instruction Paradigm's hierarchical and competitive organization.

In the Learning Paradigm, as colleges specify learning goals and focus on learning technologies, interdisciplinary (or nondisciplinary) task groups and design teams become a major operating mode. For example, faculty may form a design team to develop a learning experience in which students networked via computers learn to write about selected texts or on a particular theme.

After developing and testing its new learning module, the design team may even be able to let students proceed through it without direct faculty contact except at designated points. Design teams might include a variety of staff: disciplinary experts, information technology experts, a graphic designer, and an assessment professional. Likewise, faculty and staff might form functional teams responsible for a body of learning outcomes for a stated number of students. Such teams could have the freedom that no faculty member has in today's atomized framework, that to organize the learning environment in ways that maximize student learning.

Meeting the Challenge

Changing paradigms is hard. A paradigm gives a system integrity and allows it to function by identifying what counts as information within the infinite ocean of data in its environment. Data that solve problems that the paradigm identifies as important are information; data that are irrelevant to those problems are simply noise, static. Any system will provide both channels for transmitting information relevant to the system and filters to reduce noise.

Those who want to change the paradigm governing an institution are—from the institution's point of view—people who are listening to the noise and ignoring the information. They appear crazy or out of touch. The quartz watch was invented by the Swiss. But the great Swiss watchmakers responded to the idea of gearless timepieces in essentially the same way that the premiere audience responded to Stravinsky's *The Rite of Spring*. They threw tomatoes. They booted it off the stage.

The principle also operates in the other direction. From the point of view of those who have adopted a new paradigm, the institution comes to sound like a cacophony-generating machine, a complex and refined device for producing more and louder noise. From the perspective of the governing paradigm, the advocates of the insurgent paradigm seem willing to sacrifice the institution itself for pie-in-the-sky nonsense. But from the perspective of the insurgents, the defenders of the present system are perpetuating a system that no longer works.

But paradigms do change. The Church admits Galileo was right. *The Rite of Spring* has become an old warhorse. Paradigms can even change quickly. Look at your watch.

Paradigms change when the ruling paradigm loses its capacity to solve problems and generate a positive vision of the future. This we very much see today. One early sign of a paradigm shift is an attempt to use the tools and ideas of a new paradigm within the framework provided by the old, or to convey information intelligible in the new paradigm through the channels of the old. This, too, is now happening.

In our experience, people will suffer the turbulence and uncertainty of change if it promises a better way to accomplish work they value. The shift to the Learning Paradigm represents such an opportunity.

The Learning Paradigm doesn't answer all the important questions, of course. What it does do is lead us to a set of new questions and a domain of possible responses. What knowledge, talents, and skills do college graduates need in order to live and work fully? What must they do to master such knowledge, talents, and skills? Are they doing those things? Do students find in our colleges a coherent body of experiences that help them to become competent, capable, and interesting people? Do they understand what they've memorized? Can they act on it? Has the experience of college made our students flexible and adaptable learners, able to thrive in a knowledge society?

How do you begin to move to the new paradigm? Ultimately, changing paradigms means doing everything differently. But we can suggest three areas where changes—even small ones—can create leverage for larger change in the future.

First, you begin by speaking. You begin to speak *within* the new paradigm. As we come to understand the Learning Paradigm, we must make our understanding public. Stop talking about the "quality of instruction" or the "instructional program." Instead, talk about what it takes to produce "quality learning" and refer to the college's "learning programs." Instead of speaking of "instructional delivery," speak about "learning outcomes."

The primary reason the Instruction Paradigm is so powerful is that it is invisible. Its incoherencies and deficiencies appear as inherent qualities of the world. If we come to see the Instruction Paradigm as a product of our own assumptions and not a force of nature, then we can change it. Only as you begin to experiment with the new language will you realize just how entrenched and invisible the old paradigm is. But as you and your colleagues begin to speak the new language, you will then also begin to think and act out of the new paradigm.

Second, if we begin to talk about the "learning outcomes" of existing programs, we'll experience frustration at our nearly complete ignorance of what those outcomes are—the Learning Paradigm's most important category of information is one about which we know very little now. The place to start the assessment of learning outcomes is in the conventional classroom; from there, let the practice grow to the program and institutional levels. In the Learning Paradigm, the key structure that provides the leverage to change the rest is a system for requiring the specification of learning outcomes and their assessment through processes external to instruction. The more we learn about the outcomes of existing programs, the more rapidly they will change.

Third, we should address the legally entrenched state funding mechanisms that fund institutions on the basis of hours of instruction. This powerful external force severely constrains the kinds of changes that an institution can make. It virtually limits them to changes within classrooms, leaving intact the atomistic one-teacher, one-classroom structure. We need to work to have state legislatures change the funding formulas of public colleges and universities to give institutions the latitude and incentives to develop new structures for learning. Persuading legislators and governors should not be hard; indeed, the idea of funding colleges for results rather than seat time has an inherent political attractiveness. It is hard to see why legislators would resist the concept that taxpayers should pay for what they get out of higher education, and get what they pay for.

Try this thought experiment. Take a team of faculty at any college—at your college—and select a group of students on some coherent principle, any group of students as long as they have something in common. Keep the ratio of faculty to students the same as it already is. Tell the faculty team, "We want you to create a program for these students so that they will improve significantly in the following knowledge and cognitive skills by the end of one year. We will assess them at the beginning and assess them at the end, and we will tell you how we are going to do so. Your task is to produce learning with these students. In doing so, you are not constrained by any of the rules or regulations you have grown accustomed to. You are free to organize the environment in any way you like. The only thing you are required to do is to produce the desired result—student learning."

We have suggested this thought experiment to many college faculty and asked them whether, if given this freedom, they could design a learning environment that would get better results than what they are doing now. So far, no one has answered that question in the negative. Why not do it?

The change that is required to address today's challenges is not vast or difficult or expensive. It is a small thing. But it is a small change that changes everything. Simply ask, how would we do things differently if we put learning first? Then do it.

Those who say it can't be done frequently assert that environments that actually produce learning are too expensive. But this is clearly not true. What we are doing now is too expensive by far. Today, learning is prohibitively expensive in higher education; we simply can't afford it for more and more of our students. This high cost of learning is an artifact of the Instruction Paradigm. It is simply false to say that we cannot afford to give our students the education they deserve. We can, but we will not as long as we allow the Instruction Paradigm to dominate our thinking. The problem is not insoluble. However, to paraphrase Albert Einstein, we cannot solve our problem with the same level of thinking that created it.

Buckminster Fuller used to say that you should never try to change the course of a great ship by applying force to the bow. You shouldn't even try it by applying force to the rudder. Rather you should apply force to the trim-tab. A trim-tab is a little rudder attached to the end of the rudder. A very small force will turn it left, thus moving the big rudder to the right, and the huge ship to the left. The shift to the Learning Paradigm is the trim-tab of the great ship of higher education. It is a shift that changes everything.