CHAPTER ONE

BEYOND THE VIRTUAL CLASSROOM

"For on-line education to become mainstream is kind of a depressing thought, because it is such a crappy experience. The bottom line is that learning on-line is a soul-destroying experience. It really, really stinks. It's always second best" (Hamilton, 2001, p. R32). These words, published recently in the *Wall Street Journal,* were not spoken by an irate faculty member or a closet Luddite. The speaker, Marc Eisenstadt, is the chief scientist of the Knowledge Media Institute of the United Kingdom's Open University. The Open University has used on-line education to supplement its extension courses and correspondence programs since the mid-1990s, and Eisenstadt's institute conducts research on distance education and virtual classrooms. His blunt assessment is part of the larger reassessment of the Internet that has been taking place since the fall of the NASDAQ in April 2000 and the dot-com meltdown that followed. The business community, confronting the sobering reality of stock valuations that have fallen to sub-basement levels, is returning to the old-fashioned virtue of economic performance over market potential. E-learning must be scrutinized with the same healthy skepticism. Will e-learning really deliver, or will it turn out to be just another casualty of the overblown expectations of the late 1990s?

This book is about a simple idea. Technology should enrich the experience of learning. E-learning technologies may save some costs and add a measure of convenience, but if they do not deepen the learning experiences of students, they are not worth much.

John Chambers, CEO of Cisco Systems, the company most responsible for supplying the electronic plumbing that runs the Internet, hails e-learning as "the next big wave in Internet-based applications" (D'Amico, 1999). More recently, Sean Maloney, executive vice president of Intel, proclaimed that e-learning "will be the killer application over the next two to three years" (Mannion, 2001). They may be right. But e-learning will fall far short of its potential if it merely repackages our current educational models in digital format. Instead, it should enable students to become more proficient learners.

Nearly all varieties of distance education have failed to bring depth and dimensionality to the experience of learning. With the exception of a few innovative firms like Cognitive Arts and UNext.com, most distance education providers are serving up variants of a "post-a-lecture" and "host-a-discussion" approach. The differences between them are not worth mentioning. The basic idea is to port the classroom to the Internet in the most efficient way possible—not unlike software engineers porting software programs to different operating environments. One company even promises to put entire campuses on-line in sixty business days! Could something that is really valuable be accomplished that quickly? One suspects that many distance education initiatives are the result of little more than an impulsive game of keeping up with the Joneses—motivated more by the primordial fear of being left behind than by a desire to apply sound pedagogical method.

Even popular classroom-based instructional technologies (the ubiquitous PowerPoint presentation, for example) have treated the computer as little more than an overhead projector with bells and whistles. It may be argued that compelling graphics and arresting slide transitions help keep the attention of students in a lecture hall (unless they are sitting in a darkened classroom right after lunch). But if a technology can secure a student's heightened interest in a lecture, does it also enhance his or her ability to learn? That student may have more accurate and well-organized lecture notes or be better able to recall material during an exam, but is this what learning is all about?

Deep Learning and the Construction of Knowledge

Deep learning finds its inspiration in a school of educational thought known as constructivism, and in particular, the branch of constructivist thought known as *social constructivism.*[1]

Stemming from the work of Jean Piaget and Lev Vygotsky, and drawing inspiration from John Dewey's focus on active learning, constructivism holds that all knowledge is constructed based on the experiences and cognitive structures that are available to us. Reality becomes sensible and coherent because we construct it. Knowledge is not something that bombards our consciousness and is absorbed; rather, it is something that we actively construct to make the world meaningful. Learning involves a search for new knowledge—or "new territory"—that is strongly related to the activities of play, discovery, and problem solving. According to the constructivist standpoint, instructors cannot walk into the classroom and presume anything like a preexisting thirst for knowledge. Instead, they must create a discovery-based learning environment that launches students on a search for new territory.

The best place to see constructivist thinking at work is not in the classroom but in those high-tech firms that encourage playfulness to induce creativity. In a survey of the work environments of high-tech firms that he carried out for the *Washington Post,* Dale Russakoff (2000) observed that from "workers sprawled on their stomachs using laptops, to employee playrooms full of Legos and easels, to the rebellion against hierarchy, the culture of the new economy makes work feel unmistakably like play. Consciously or unconsciously, it recalls the atmosphere of early childhood—the stage of human life when the learning curve is the steepest and the pace of learning is unrivaled."

Knowledge constructions, or what Piaget called *schema,* are the central building blocks of constructivism. They refer to ways of perceiving and thinking that make the world meaningful to us. Our knowledge of the world is based entirely on these knowledge constructions; we have no other avenue for accessing information about the world. Because each person's experiences are unique, the knowledge constructions that each person creates to bring understanding and coherence to the world may differ significantly from the knowledge constructions of others. For example, people who speak the same language and have received formal training in mathematics may have similar knowledge constructions when it comes to the ordering of words or manipulation of numbers. But such similarities fade quickly when the discussion turns to spiritual experience or moral obligation.

Constructivism, therefore, presumes that people will process new information differently and places great value on dialogical processes. Differences in perspectives are approached with a presumption of humility. In this respect, there are many similarities between constructivism as an educational philosophy and postmodernist thought.[2]

Learning, according to Piaget (1970), takes place through the interplay of two polar forces: assimilation and accommodation. These forces are kept in balance by an adaptive and dynamic process of equilibration (Piaget, 1977). *Assimilation* refers to the process by which the learners incorporate new information and experiences into the framework of their preexisting knowledge constructions, thereby rendering the unfamiliar familiar. When learners have new experiences or are exposed to ideas that cannot be squared with their knowledge constructions, they must explore new territory in an effort to resolve the dissonance or contradiction in their minds. Doing this requires some thought. *Accommodation* takes place when learners accommodate these new experiences or ideas by bringing their knowledge constructions in line with the new information.

Lev Vygotsky (1978, 1986), a Russian developmental psychologist, brought a distinct social dimension to constructivism. Vygotsky focused on the way that language, culture, and social interactions affect learning processes. He distinguished between what he called spontaneous and scientific concepts. *Spontaneous concepts* are similar to Piaget's notion of knowledge structures. These ideas and understandings bubble up spontaneously from the learner's own reflections on everyday life. *Scientific concepts*, by contrast, are more formal and abstract in character and can be conveyed through classroom instruction. Scientific concepts work their way down into the learner's consciousness by supplying the learner with conceptual resources that assist him or her in constructing spontaneous knowledge structures that are more comprehensive and adequate.

The meeting place between spontaneous and scientific concepts is what Vygotsky referred to as the *zone of proximal development*. Because each learner brings different sets of spontaneous concepts into the classroom, this zone will vary from one individual to the next. It is in this zone that the learner's ability to solve problems independently is enhanced through "collaboration with more able peers" (Vygotsky, 1978, p. 86). Hence, Vygotsky recognized the important contributions of both teacher and learning community in intellectual development.

It is hardly a coincidence that the ancient model of apprenticeship not only relies on the observation of expert performance by the novice but also rests upon considerable interactions among peers. As Barbara Rogoff (1990, p. 39) notes, "The apprenticeship model has the value of including more people than a single expert and a single novice; the apprenticeship system often involves a group of novices (peers) who serve as resources for one another in exploring the new domain and aiding and challenging one another. . . . Hence the model provided by apprenticeship is one of active learners in a community of people who support, challenge, and guide novices as they increasingly participate in skilled, valued sociocultural activity."

The familiar debate over process versus content loses relevance in a constructivist perspective (Marlowe and Page, 1998). Content is the medium for knowledge construction and the springboard for learning. But merely possessing information does little to advance the goals of education. Learning, from the standpoint of constructivism, takes place when students act on content, when they shape and form it. Content is the clay of knowledge construction; learning takes place when it is fashioned into something meaningful. Creativity, critical analysis, and skillful performance are inextricably linked to the process of creating more viable and coherent knowledge structures.

Defining Deep Learning

The broad concepts of constructivism have gained ample support through research over the past thirty years in developmental psychology, cognitive psychology, and more recently, neuroscience. It is now possible to speak credibly of an emergent science of learning. The Committee on Developments in the Science of Learning of the National Research Council has assembled and analyzed the primary conclusions of this research in an elegant volume entitled *How People Learn,* published by National Academy Press (Bransford, Brown, and Cocking, 1999).

The recent developments in neuroscience are particularly striking. Technologies such as positron emission tomography (PET) and functional magnetic resonance imaging (fMRI) have extended our understanding of some of the brain's learning mechanisms. Because of this work, we now know that learning actually modifies the physical structure of the brain. Among the most basic rules of learning is that "practice increases learning and that there is a corresponding relationship between the amount of experience in a complex environment and the amount of structural change in the brain" (Bransford, Brown, and Cocking, 1999, p. xvi; see also pp. 102–115).

Drawing on the core themes of *How People Learn*, I define deep learning as *learning that promotes the development of conditionalized knowledge and metacognition through communities of inquiry.* Throughout this book I use the term *depth education* to refer to the particular model of deep learning developed in this book.[3] Table 1.1 presents a brief comparison of deep versus surface learning.

Although there is no intrinsic connection between deep learning and e-learning, the two are intertwined in the depth education model presented here. From a practical standpoint, deep learning and e-learning are inseparable. It is simply not economically feasible to provide a broad cross section of students with depth educational curricula unless Internet technologies are used. If medical schools and top-tier Ph.D. programs are seen as examples of how deep learning can be successfully embedded into a traditional academic curricula, then our experience to date is that deep learning does not come cheap. Hence, technology becomes a critical factor.

Deep learning is rooted in the formation of conditionalized knowledge, metacognition, and communities of inquiry.

Table 1.1. DEEP LEARNING VERSUS SURFACE LEARNING

Attributes of Deep Learning	Attributes of Surface Learning
Learners relate ideas to previous knowledge and experience.	Learners treat the course as unrelated bits of knowledge.
Learners look for patterns and underlying principles.	Learners memorize facts and carry out procedures routinely.
Learners check evidence and relate it to conclusions.	Learners find difficulty in making sense of new ideas presented.
Learners examine logic and argument cautiously and critically.	Learners see little value or meaning in either courses or tasks.
Learners are aware of the understanding that develops while learning.	Learners study without reflecting on either purpose or strategy.
Learners become actively interested in the course content.	Learners feel undue pressure and worry about work.

Source: Adapted from Entwistle, 2001.

Conditionalized Knowledge

Conditionalized knowledge refers to knowledge that specifies the contexts in which it is useful. It is knowledge that recognizes its own limitations. Students gain conditionalized knowledge only when they have the opportunity to apply disciplinary concepts and methodologies to varied contexts and knowledge domains.

Surface learning, by contrast, focuses on mere description and textbook application of disciplinary concepts and methodologies. It offers little opportunity for students to discern when those concepts and methodologies are relevant to more realistic problems and other knowledge domains. The authors of *How People Learn* note, "Many forms of curricula and instruction do not help students conditionalize their knowledge. . . . It is left largely to students to generate the condition-action pairs required for solving novel problems" (Bransford, Brown, and Cocking, 1999, p. 31).

Problem-based learning is a key instructional strategy for the development of conditionalized knowledge. It not only has the advantage of introducing ideas "when students see a need or reason for their use" (Bransford, Brown, and Cocking, 1999, p. 127) but also emphasizes the relevance of course content to real life, thus imbuing instructional objectives with instant credibility. For example, the physician's ability to diagnose medical problems is enhanced when medical students are exposed to problem-based learning, in place of traditional lectures, during the first year of medical school (Hmelo, 1995). It is no coincidence that forward-looking distance learning initiatives—like Cognitive Arts (working with Columbia and Harvard) and UNext.com (involving Carnegie Mellon University, Columbia University, the London School of Economics and Political Science, Stanford University, and the University of Chicago)—use a problem-solving format for their courses instead of traditional lectures and readings (Carr, 2000d; Gajilan, 2001; McCormick, 2000).

If faculty understand their teaching responsibilities primarily in terms of "covering the material," that leaves them with little time and energy to help students to conditionalize their knowledge of a discipline. This sacrifice of depth for breadth is a prominent characteristic of most higher education curricula. Textbook publishers who seek to differentiate their offerings in the marketplace by adding new and more advanced topics to each successive edition exacerbate this problem. Even sensible instructors who respond to this kind of content inflation by making selective use of textbook material do not have the advantage of building out from a depth treatment of a discipline.

Metacognition

Metacognition refers to the ability to think about thinking—the art of thinking. It involves being able to monitor and reflect on one's level of understanding, to know when this understanding is not adequate, and to know how to remedy this inadequacy (Bransford, Brown, and Cocking, 1999). Metacognition is about developing students' own self-awareness as learners and empowering them to manage their own development as learners—learning how to learn. The development of critical thinking skills and the ability to articulate and reflect on ideas are foundational to the art of thinking. Furthermore, students who develop their metacognitive skills are better able to transfer learning that takes place in one knowledge domain to other domains.

Communities of Inquiry

I use the term *communities of inquiry* to refer to communities of practice (or learning communities) in academic settings (see Wenger, 1998). Much learning in everyday life takes place in communities of practice (Lave and Wenger, 1993; Wenger, 1998; Wenger and Snyder, 2000). These formal and informal communities crisscross the entirety of social life and are particularly important for the experience of learning (Brown and Duguid, 1996).

One could argue that the genius of the residential college experience is that it places students in a rich array of intersecting communities of practice organized around the themes of intellectual, social, and personal development. As Gregory Farrington (1999), the president of Lehigh University, notes:

> Undergraduate life at a residential college is as much about learning to live as it is about learning from books. What is most impressive about the residential college experience is that it works so well and achieves both goals so effectively. Eighteen-year-old students nervously tiptoe onto campus at the start of their first year, and four years later they march out—sometimes after a bit of prodding, to be sure, but generally with the motivation, education, and confidence needed to take on the world. The transformation is remarkable and is as much the product of the general intellectual and social experience on-campus as the result of what goes on formally in the classroom. For these students, late-night discussions are much of what college is about, and the role of the football team is truly important.

Although older students in traditional graduate programs or nontraditional adult education programs hardly require the diverse array of communities of practice that are found in an undergraduate environment, it would be a serious mistake to discount the value of more focused *communities of inquiry* for their educational experience. From graduate students debating an arcane disciplinary issue over a pitcher of beer to a close-knit cohort of working professionals in an accelerated MBA program, communities of inquiry play an important role in adding depth to and contextualizing an academic curriculum.

As Brown and Duguid (2000) emphasize, learning involves a process of "enculturation" that engages students with concepts and communities of practice. "Teaching and education, from this perspective, are not simply matters of putting students in touch with information. . . . Rather, they are matters of putting students in touch with particular communities. The university's great advantage is that it can put learners in touch with communities that they don't know about" (p. 220).

It is interesting that Carole Fungaroli, author of *Traditional Degrees for Nontraditional Students* (2000), urges working adults to attend college but warns students against distance education. The on-line students whom she has encountered report an educational experience marked by discouragement and isolation: "They hated what they were doing, but they just wanted to get those three credit hours" ("New Book Says," 1999, p. A47). The virtual campus, according to Fungaroli, fails to deliver the most important aspect of higher education—inspiration.

"At its best, the traditional campus can make you fall in love with something. One of the things missing from the distance learning area is passion. . . . When you get on campus, you might find out that you're all fired up about something that you might not have thought about before. Distance learning allows you to stay in your rut" (p. A47).

Deep Learning and Cognitive Apprenticeship

Cognitive apprenticeship is the learning methodology best suited to achieve the aims of deep learning. This approach attempts to integrate the salient features of the apprenticeship model—which has proven so effective in transmitting skills down through the generations—into the structure of a formal curriculum. From the perspective of cognitive apprenticeship, the art of thinking is no different than the art of becoming a musician or a surgeon.

In their seminal article on cognitive apprenticeship, John Seely Brown, Allan Collins, and Paul Duguid (1989) observe that the development of knowledge proficiencies is very similar to the manner in which artisans learn to use a tool. One does not become an artisan by merely possessing a tool and being acquainted with its function, and the same is true for those who acquire knowledge (that is, facts, definitions, concepts, and methodologies) but really cannot use it.

> People who use tools actively rather than just acquire them . . . build an increasingly rich implicit understanding of the world in which they use the tools and of the tools themselves. The understanding, both of the world and of the tool, continually changes as a result of their interaction. . . .
>
> Learning how to use a tool involves far more than can be accounted for in any set of rules. The occasions and conditions for use arise directly out of the context of activities of each community that uses the tool, framed by the way members of that community see the world. . . . Because tools and the way they are used reflect the particular accumulated insights of communities, it is not possible to use a tool appropriately without understanding the community or culture in which it is used. [p. 33]

The concept of cognitive apprenticeship modifies the traditional apprenticeship model in three important respects. First, cognitive apprenticeship is focused on the development of cognitive skills, or the art of thinking, and not on skills associated with a specific craft or attached to particular roles in the workplace. Second, cognitive apprenticeship encourages the application of knowledge and skills in a variety of contexts, enabling students to abstract general principles from their experiences of learning by doing. Third, unlike the traditional apprenticeship model, the elements of cognitive apprenticeship can be integrated into a formal curriculum and are not confined to workplace exigencies or the latest fashion in business trends (Collins, Brown, and Newman, 1989). Graduate programs in the sciences are perhaps the closest approximation of the cognitive apprenticeship model in higher education (Brooks, 1996).

Collins, Brown, and Newman (1989) have identified six teaching methods that facilitate cognitive apprenticeship: modeling, coaching, scaffolding, articulating, reflecting, and exploring (see also Collins, 1991; Jonassen, 1996; and Teles, 1993).

Modeling

Modeling is the externalization of internal cognitive processes. Essentially, the teacher puts her mind on display, walking her students through her approach to a problem and making explicit the internal steps she took and strategies she used along the way. Modeling is about teaching students how to think, by means of observation, in order to disclose patterns of thinking and approaches to problem solving. Modeling need not be confined to the teacher's own problem-solving approaches; it should also highlight successful problem-solving approaches developed by students. One might think of modeling as storytelling about problem solving, critical analysis, or the creative development of alternatives.

Coaching

When coaching, the teacher becomes the classroom observer. Whereas modeling emphasizes the student's role as observer, coaching requires teachers to observe students in the performance of some task or skill (usually in the context of problem solving) and to ask questions or to offer feedback on the student's performance. Coaching resembles Socrates' dialogical method in that the teacher adapts her approach based on something that is said or done by the student.

Scaffolding

Scaffolding is a concept drawn from constructivism.[4] It refers to the supporting roles of the teacher and the student's learning community in facilitating the construction of knowledge. This can take the form of a teacher helping a student complete a task that he is unable to perform or building a structure for hints and helps in the curriculum. Scaffolding can also take the form of participating in a community of inquiry that supports the student in the knowledge construction process (Hogan and Pressley, 1997). In this respect, scaffolding can be thought of as building opportunities for student-to-student modeling and coaching in the curriculum.

Articulating

The process of articulation allows students to practice their skills in converting tacit knowledge to explicit knowledge. The effect is to draw out the internal reasoning processes of students by encouraging them to articulate their response to an idea or their approach to a problem. Articulation has other benefits besides the intrinsic rewards of learning how to make tacit knowledge explicit; for example, it makes knowledge more readily available so that it can be employed in different tasks, it helps students apply similar problem solving strategies in different contexts, and it encourages students to see an idea from the perspective of another student (Collins, 1991). Articulation also allows the teacher to draw on the thinking of students to serve as a model for their classmates. In this way, the students' own knowledge contributions become a subject for classroom analysis.

Reflecting

The process of reflection is essentially a debriefing process that can take the form of comparing notes or conducting an "abstracted replay" of one's thought processes. Because reflection encourages students to note the ways in which their performance differs from other students, it helps them compare their own approaches to critical analysis and problem solving with those of other students, as well as the teacher. It is a highly beneficial teaching tool because it makes what the student says or does the object of instruction.

Exploring

Exploring, the final method of cognitive apprenticeship, encourages students to tackle new knowledge domains and problems on their own. One can think of exploration in terms of the progressive withdrawal of the scaffolding intended to support the students. The teacher's role is to encourage students to set achievable goals, to form and test hypotheses, and to make discoveries on their own (Collins, 1991). This responsibility of educators to set students on the search for new territory—in Piaget's words—requires us to reexamine the important role of curiosity in learning.

Deep Learning and Intellectual Curiosity

Curiosity is a fundamental learning skill. Yet it is perhaps the most underrepresented skill in higher education curricula.

It may seem odd to consider curiosity a skill, and yet it is certainly no less a skill than listening, speaking, or writing. Intellectual curiosity—like skills in articulation, reflection, and critical thinking—is learned through observation and practice. One learns (or more accurately, relearns) curiosity by being in the company of the curious. No lecture, textbook, computer program, or Web site can impart this skill. It is learned only through apprenticeship experiences with skillful thinkers and through participation in a community of inquiry.

The lecture, an exceptionally efficient mechanism for conveying information, has many liabilities when it comes to developing the skill of intellectual curiosity. Content is usually presented in pre-packaged doses in a take it or leave it fashion. Consequently, learning in class often becomes little more than an information transaction, where the teacher deposits information into the accounts of students (Freire, 1995).

The use of multimedia technologies in the classroom, like PowerPoint presentations, has only intensified the perception that knowledge is neatly portioned and served up in small bulleted points. The instructor's desire to get through the slides can easily crowd out opportunities to engage students in critical dialogue about the material. Students usually ask questions of clarification instead of probing the overall relevance or adequacy of the discussion at hand. More often than not, the question What will be on the exam? overshadows the larger questions: Why is this material important to me? What are the built-in limitations of this material? How will this material enhance my current skills and knowledge base?

It could be argued that Internet services that pay students to take extensive notes on a professor's lecture in order to make them available to other students on their Web site are responding to a situation created by educators themselves. The furor over posting lecture notes on Web sites is probably related more to the frustration that students can pass a course without attending class than to concerns over theft of intellectual property.[5] Unlike the medieval scholars who lectured in darkened rooms so that their students could not take notes, in order to protect their intellectual property (Shapiro and Varian, 1999), contemporary professors are rarely concerned with students stealing their ideas. Most feel deeply flattered by assiduous note-takers—at least until now.

If class attendance is merely about an information transaction between teacher and student, then posting lecture notes on the Internet makes perfect sense. Students' skipping class and getting notes from the Internet is more intellectually honest than the teacher force-feeding information to students and looking the other way while students multitask the classroom environment.

Multitasking means doing several things at once. One has to spend only a few minutes in a typical lecture class—particularly a large one—to observe that attentive listeners and note-takers are in short supply. Daydreaming, reading assignments for other classes, writing notes to friends, and catching up on needed sleep are more common classroom activities. High-tech classrooms may be more appealing, but they also provide more sophisticated multitasking opportunities. For example, it is not unheard of for students at Columbia University's School of Business to interrupt a lecture with whoops of joy or anguished sighs. Yet the content of the professor's lecture has nothing to do with these outbursts. Instead, students are responding to the stock trades they are conducting on their computers (Wilgoren, 2000). A professor at Yale Law School recently lamented in the editorial pages of the *New York Times* that his students "went ballistic" when he requested that laptop computers be used for note-taking and not for playing video games or surfing the Web (Ayres, 2001).

Often the only real opportunity to set one's curiosity free in the traditional college classroom is while writing a research paper. Although most professors welcome papers that are creative, innovative, and show some risk-taking, the die is cast by the time the student gets around to choosing a topic and writing the paper. All the incentives are in place to reward those who pick manageable topics—which translates roughly to "It's been done hundreds of times before" and "It's best to play it safe."

It is not surprising that such research exercises have become so superficial that it is easy to get prepackaged research papers over the Internet from term paper mills. These sites allegedly offer materials for background research, but Internet URLs like www.schoolsucks.com and www.cheater.com leave nothing to the imagination. There are even Web-based services, like Plagiarism.org or IntegriGuard (www.integriguard.com), that analyze student papers against a broad database of sample research papers for the purpose of alerting professors to plagiarized material (Carnevale, 1999c; Guernsey, 1998b).

What is remarkable about all this is not that some students seek the easy way out but rather the pronounced lack of imagination in the design of research assignments, which permits the recycling of the same material year after year with little difficulty. Educators' attempts to cope with the problem by using electronic plagiarism services will ultimately have a corrosive effect by extending the hermeneutic of suspicion to the teacher-student relationship.

Deep Learning and Embedded Assessment

A robust assessment strategy is required in order to build vital communities of inquiry. Apart from the process of honest and constructive feedback, talk of learning community is vacuous, amounting to little more than a support group of the ten-steps variety. An assessment strategy that focuses on summative evaluation, rather than formative assessment, denies students meaningful opportunities for intellectual challenge and growth.

Depth education uses an assessment model that I call *embedded evaluation*.[6] Embedded evaluation proceeds from three foundational principles: (1) learning to assess others can be just as helpful as receiving assessment; (2) assessment should have both a private and a public dimension; and (3) evaluations should not be anonymous.

First Principle

The first principle of embedded evaluation emphasizes the value of giving and getting criticism in a respectful and gracious manner. This is no small task! There is an abundance of anecdotal evidence that electronic exchanges of a critical nature between students often appear harsh and inconsiderate. The emotional restraints built into face-to-face communication are largely absent from such exchanges, and in addition, the resources of gesture, voice, and inflection are not there to soften the rough edges of critical words. Because no one cares to be insulted, individuals who are adept at using words to convey both the intended meaning and a respectful tone will have a better than even chance of succeeding in the collaborative atmosphere of the twenty-first-century workplace. Gartner predicts that by 2004, virtual teams will be doing 80 percent of the knowledge-related work in the world's 2000 largest companies (Prencipe, 2001). Even if videoconferencing becomes widespread, it will only supplement—not supplant—text-based electronic communication. The ability to use text-based communication to assert opinion, offer recommendations, and convey nuance will only grow in importance in the coming years.

Second Principle

The second principle of embedded assessment is that assessment should have both a private and a public dimension. The evaluation of individual work must necessarily be "for your eyes only"—accessible only to the instructor and the student who is being evaluated. By contrast, the evaluation of collaborative work products should be a kind of community property of the entire class. Such a peer-to-team assessment model also facilitates the use of guest evaluators (for example, selected alumni, faculty from other departments) to add depth and diversity to the evaluation process.

Third Principle

The third principle of embedded assessment is that neither individual nor group evaluations should be anonymous. The primary failing of anonymous evaluations is that they do not facilitate responsible feedback and prepare students for performance evaluations in the real world. In addition, they limit the instructor's ability to factor the quality of a student's evaluation of others into his or her own course grade. In order to reduce the natural discomfort associated with submitting an evaluation with one's name on it, the instructor should emphasize the importance of constructive feedback in the learning process and the need to balance negative assessments with positive comments and suggestions.

The Shortcomings of Standard Assessment

Because embedded evaluation seeks to measure a student's progress in developing conditionalized knowledge and metacognitive skills, it places considerable weight on the student's ability to articulate and reflect on his own developing knowledge base. This is quite different from standard assessment tools, such as the multiple choice exam, that are inherently indifferent to how and why students arrive at a particular answer. Although well-designed multiple choice exams occasionally succeed in evaluating the reasoning behind an answer, the strategic focus of most students in taking such exams is to stimulate recall and eliminate options. This approach rewards those who are able to absorb and recall information quickly. Such tests send the message to students that the important thing is to recognize the correct answer. This is the "payoff" of a student's toolbox of skills and concepts. Hence, the process of evaluation seems more like a contrived game than an invitation for growth. From this perspective, the well-known tendency of students to forget information quickly after a test is perfectly rational. Why clutter your mind with details whose usefulness largely disappears once you take the exam?

One could argue that distance education programs are well positioned to lead the way in developing effective mechanisms for assessment—particularly project-based assessment tools (Carnevale, 2001a). Yet a pronounced bias in favor of standard assessment tools is evident among distance education providers who boast about the array of nifty tools to create and grade exams of the true-false, multiple choice, matching, and fill-in-the blank varieties. These tools are really only viable for developing practice tests. Graded tests must necessarily be administered in a proctored environment; otherwise, there is nothing to prevent students from keeping their textbook or lecture notes right in front of them when they take the exam.[7] While there is no doubt that practice tests are helpful in preparing for a graded exam, is this really what we mean by formative assessment? Should formative assessment be focused on enhancing a student's exam-taking skills? Or should the focus be placed on how well a student understands a particular knowledge domain and manages the process of learning?

Transforming the Classroom into Knowledge Rooms

The centerpiece of the depth education model presented here is the *knowledge room*—a virtual and collaborative space where students gather for research projects, skill development, seminar discussions, formal debates, and creative expression. This collaborative and project-based approach enables students to hone their skills in research, reflection, analysis, communication, and leadership—skills that are important for many different careers and are necessary in the twenty-first-century workplace. Above all, the knowledge room is a place where the practice of inquiry takes shape. It is designed to supplement, not supplant, the classroom.

Depth education uses five types of knowledge rooms in addition to face-to-face classrooms. Readers are invited to visit www.knowledgeroom.com and to try their hand at constructing their own knowledge rooms. The five knowledge rooms are these: the Research Center, the Skill Workplace, the Conference Center, the Debate Hall, and the Portfolio Gallery.

These primary knowledge rooms may be supplemented with two other rooms: the Map Room, which contains the course syllabus and consolidates in one place all of the "navigational" information needed for the course, including student and faculty bios and an advising area for rapid-response feedback from students concerning the course, and the Assessment Suite, which houses a set of secure spaces, assigned individually to each student, for performance reviews and grade reports.

Knowledge rooms can be thought of as versatile and miniature think tanks that may be active for just a few days or have an effective life span of several years. They may be configured for any number of students. Most knowledge rooms, though, will have fewer than twenty-five students. These virtual spaces may be used as stand-alone components in a course or be assembled in a mix-and-match fashion to fit the instructional aims of the course (see Chizmar and Williams, 2001). Furthermore, a single course can incorporate multiple constructions of each knowledge room type (for example, six Research Centers, eight Skill Workplaces, one Conference Center, six Debate Halls).

The knowledge room framework developed here uses a "self-service" collaboration tool from IBM and the Lotus Development Corporation called QuickPlace. QuickPlace is one of the leading representatives of a software genre called teamware. Teamware is browser-based software that allows end users to build and maintain a secure virtual space for collaborative work, without the intervention of technical staff (Coopee, 2000; Gaskin, 2000; Gillmore and Angus, 1999a). The end user needs only a standard Web browser and an e-mail client.

Using QuickPlace, nontechnical users can create and customize a self-administered, password-protected Web site on the fly, in less than one minute. Faculty and students can create discussion groups, develop Internet slide shows, host real-time conferences, develop a project plan using a group calendar and a Gantt chart,[8] download or upload documents by dragging their mouse across the desktop, or directly edit and track revisions of any Microsoft Office '97 or 2000 document posted to the site. Because each site is automatically assigned its own e-mail address, instructors and students can e-mail updates directly to it. In addition, students can receive regular newsletters from the site (on a daily or weekly basis), alerting them to new material or special announcements.

Over the next few years, there will likely be a proliferation of collaboration tools such as QuickPlace, so each institution must come to its own decision about which software package best suits its own needs. In particular, institutions should monitor the progress of an interesting peer-to-peer collaboration tool that has just been released, named Groove (www.groove.net), developed by Ray Ozzie, the creator of Lotus Notes (Alwang, 2001, McDougall, 2000, Scannell and Harreld, 2001). Although it is not my intention to promote any particular software package, I selected QuickPlace to develop the knowledge room concept for four reasons.

First, QuickPlace is based on the same proven architecture as Lotus Notes—an application widely viewed as the leading collaboration tool for large corporations. The benefit of QuickPlace is that it retains most of the collaborative functions of Lotus Notes without the administrative overhead of the Notes or Domino environment. This is no small benefit. Institutions of higher education must compete with corporations and government agencies to secure needed technical staff. Based on the current and expected demand for computer professionals in the corporate and government sectors, most institutions of higher education will find themselves at a disadvantage in their quest for technical personnel.

Second, QuickPlace is a software package built primarily for collaboration in a corporate setting and is not designed exclusively for educational institutions (although its customization features make this adaptation easy). It may seem odd to consider this an asset, but it is a very important point. Learning experiences in higher education should be as close to real life as possible. This is particularly important today, with the skill sets demanded by the information-based New Economy. Only a handful of students will ever use Blackboard, WebCT, or some other dedicated e-learning package following graduation. But teamware applications such as QuickPlace will likely be ubiquitous fixtures in the workplace. General Electric, for example, will be using QuickPlace as one of the key components of a companywide collaboration project among its 340,000 employees (Drucker, 2000). In addition, Lotus and IBM's next-generation knowledge management application, consisting of the K-station portal and the Discovery Server, has incorporated QuickPlace directly into the application (Copeland, 2001; Heck, 2001).

It only makes sense to educate students with the tools they are likely to use in the workplace.

Third, QuickPlace is currently the least expensive teamware product when compared with others that offer a similar range of features. At the time of this writing, QuickPlace 2.0 costs $39 per user per year for corporations and just $17 per user per year for academic institutions (with no additional fees per installed server). If schools purchase two-year licenses, the cost per year goes down to $10.50 per student! By comparison, eRoom 5.0 from eRoom Technology, Inc., a teamware application similar to QuickPlace, is priced at $9,995 per server and $199 per user.[9]

Finally, QuickPlace currently supports fifteen languages, including French, German, Spanish, Japanese, Korean, and simplified Chinese, and the list is likely to grow over the next few years. The fact that QuickPlace can be easily installed and administered locally makes it particularly attractive internationally because the application does not need to be run across heavily trafficked overseas Internet connections. Moreover, the off-line capability of QuickPlace makes the application well suited for intermittent or slower Internet connections.

Let us now take a brief look at each of the knowledge room types. Chapter Three will outline each one in detail, and Chapter Four will discuss some of the infrastructure issues associated with depth education.

The Research Center

The Research Center is a place of inquiry and discovery where students can develop skills in research and critical thinking. Each Research Center is built around a specific problem related to the course material (for example, applying a particular field of knowledge to the real world, a point of controversy in an academic discipline, a social dilemma that emerges as a result of new knowledge). A course may feature any number of Research Centers, with the proviso that each one be designed to accommodate groups of three to six students.

Because it is structured around the model of virtual teams (see Lipnack and Stamps, 1997), the Research Center becomes a primary vehicle for the formation of communities of inquiry and functions like a developmental incubator for skills in problem solving, planning, and communication. Moreover, because students are assigned a project leadership role on a rotating basis, it is a place where individual leadership skills can be nurtured. These skills not only are foundational for the New Economy but also prepare students for educational programs that they may pursue later in their careers.

Above all, the Research Center gets students used to a lifestyle of active learning in which education is a process of discovery, challenge, and inquiry—not absorption and recall. The significance of this, from a pedagogical standpoint, cannot be overstated. Much of the content that is currently delivered in the form of lectures can be readily incorporated as part of a resource library that is built into each Research Center, along with other materials (for example, articles, book excerpts, and guest lectures). Because students must use these materials to respond to a particular problem, content that was previously imprisoned in the lecture format can be liberated as a knowledge asset for research.

It is likely that liberal arts courses in the humanities and social sciences will make extensive use of Research Centers because of the more interpretative and expansive nature of these disciplines.

The Skill Workplace

The Skill Workplace provides students with the opportunity to acquire and practice a set of integral skills that are necessary to grasp a knowledge domain and complete the course successfully. Because these skills are discipline-specific and provide the foundation necessary for acquiring further knowledge in the discipline, the Skill Workplace is required of all students (although a fully articulated curriculum would be well served by a menu of specialized skill areas from which students could select). Each workplace includes an Office, which houses all the content resources for a particular skill (for example, lectures, textbook excerpts, articles, narrated PowerPoint presentations), and a suite of Exercise Rooms, designed for skill development and practice, which are assigned to each virtual team in the class. Only that group of students assigned to an Exercise Room may gain access to it. In addition, each Skill Workplace includes a help desk for peer-to-peer support (under the supervision of the instructor) and a skill gallery that gives the instructor the opportunity to spotlight exceptional work by specific virtual teams. Both the help desk and the skill gallery reinforce a key insight of the New Economy—it is important to take advantage of every opportunity to learn from one's peers. Developing a culture that supports knowledge sharing is just as important for educational institutions as it is for technologically advanced corporations competing in the global marketplace.

One important issue associated with the Skill Workplace is how to define integral skills for a particular discipline. Often the term *skill* is taken to mean the application of a particular piece of knowledge toward some practical end—in effect, conjuring up a skill for every parcel of knowledge learned. Much of the blame for the trivialization of skills should be laid at the doorstep of the behaviorist tradition in education. Behavioral psychology, when translated into the classroom, encourages teachers to segment learning into bite-size, discrete components that are often taught in isolation from one another (Walker and Lambert, 1995). With few exceptions, students are rarely given the opportunity to practice bringing these components together outside of contrived, made-to-order, textbook situations.

The effect of this is to diminish the integrative and empowering dimensions of the skill concept. Although certainly any skill relies on a baseline threshold of knowledge, a skill is something that empowers the learner to unlock new knowledge vistas; it is not an ad hoc collection of applied knowledge nuggets. Integral skills are basic proficiencies for working in a discipline—relating to its core concepts and methodologies. Defining such basic skills is no easy task. It can only be done on a course-specific basis for each discipline. More will be said about this in Chapter Four in relation to the knowledge management matrix.

Presumably, a course in organic chemistry or finance would be strongly weighted toward more Skill Workplaces than the other knowledge room components, given the pronounced investment that students must make in learning the methods of these disciplines.

The Conference Center

The Conference Center can be thought of as a kind of incubator for the development of critical thinking skills and the formation of communities of inquiry. The Conference Center features a suite of Seminar Rooms and builds on the tried-and-true success of the seminar format.

Each Seminar Room is devoted to a specific topic. Although some instructors may wish to run these seminars concurrently, normally they would be held in a predefined sequence that dovetails with the unfolding themes of the course. In addition, students can be given the opportunity to develop and facilitate their own seminars on topics of interest throughout the course—either for extra credit or as part of the course assignments.

The primary benefit of the seminar format is that it gives students the opportunity to develop the habit of inquiry and extend their skills in critical thinking. Although these seminars do not rely on the preparation, presentation, and critique of student papers, as in traditional graduate seminars, they do require a *content centerpiece* for the discussion. This content centerpiece may be a case study, article, student paper, lecture, video clip, or book excerpt—anything that brings focus to the discussion and stimulates reflection and critical appraisal. Thus, these seminars are not simply free-form discussion strings built on stream-of-consciousness responses. They are focused opportunities for exploration and critique that replicate something of the roundtable ethos of the graduate seminar.

Because each Conference Center—and the seminar discussions contained in it—can be archived for future use, it is possible over time to build a rich repertoire of discussion material that could be reviewed and critiqued by future students.

This introduces some interesting possibilities for incorporating a kind of intergenerational aspect to the knowledge room structure, as students can benefit from the contributions of previous generations of students. For example, a professor could make a point of recycling a few standard seminar topics each time the course is taught. When the class has completed one of these standard discussions, the professor could give students access to an archived seminar held by a previous class. The current class would then be asked to compare their own performance to the archived discussion, noting, for instance, particular strengths or weaknesses in critical thinking or how each class developed different themes or approaches to the material. This process exposes students to a wider range of thinking and a richer idea environment than would be possible in a onetime seminar discussion.

This intergenerational potential of the Conference Center could be developed further if there are also guest respondents, particularly alumni, in connection with specific seminar topics. Because of the common association between academic community and the physical college campus, it is tacitly assumed that when one departs from the college campus, one leaves an academic community. This makes no sense in the Internet age. We need a broader definition of instructional faculty that incorporates the important contributions of alumni and retired professionals (see Hamilton, 2001). Why not have volunteer coeducators serve alongside faculty members? Depending on their interest and expertise, these volunteer coeducators could serve alongside faculty in specific segments of the course.

Indeed, a key strength of e-learning is its ability to leverage the knowledge assets of alumni and retired professionals for the benefit of students. With the continuing trend of people living longer and using their retirement years to explore alternate careers and avenues of service, educational institutions would really be remiss if they did not exploit this opportunity. Individuals who agreed to serve in this capacity could be e-mailed when a seminar discussion that matches their own interests and expertise will take place. This not only would bring a great wealth of knowledge and experience to the classroom but also would enhance the diversity and "reflective capacity" of individual communities of inquiry.

The Debate Hall

The Debate Hall is a virtual environment where students can participate in a formal debate (hosted in an asynchronous or an "anytime, anywhere" format) and benefit from constructive criticism from other members of the class. Like a traditional debate, each virtual debate is structured around a debate proposition and features both initial presentations and rebuttals by the affirmative and negative teams.

Educators who already incorporate formal classroom debates in their courses are well aware of how they can enliven class discussions and underscore the relevance of course content. One of the virtues of the debate structure is that the teams on both sides of the issue must be conversant with the evidence and arguments that support the opposing position. Debates also highlight important points of internal dissent in a particular discipline, focusing on how a different set of assumptions and methodologies can produce dramatically different conclusions. This moves students away from the homogenous orientation of textbook-based surface learning toward an in-depth understanding of a discipline and its own particular set of conceptual dilemmas and methodological problems.

It may seem odd or counterproductive to hold debates in an anytime, anywhere virtual environment, if you think about how real-time debates lend considerable energy to classroom interactions. Yet three factors argue in favor of virtual debates.

First, a virtual debate places the emphasis squarely on content—exactly where it should be. It is often quite difficult to evaluate live debates strictly on the merits of content, particularly when students have either exceptionally strong or weak presentation skills. Matters of style invariably affect the degree to which a position is perceived as compelling and coherent. This fact is not lost on the conscientious student who prepares carefully for a debate yet worries that much of his or her hard work will go unnoticed if the oral presentation is weak. Although the development of oral presentation skills is an important curricular outcome for higher education, the ability to write a persuasive and compelling argument is equally important. In fact, one could argue that a well-written memo often carries more weight than a memorable presentation in many organizational settings.

Second, much material that could be included in a written argument, particularly sources, cannot be easily included in an oral argument. Although instructors can always collect and evaluate the debate notes of each team, this is an immensely time-consuming process that leaves the rest of the class out of the loop when it comes to their evaluation of the debate. Also, one can more fully assimilate and reflect on a written argument than an oral argument, as with legal briefs submitted in advance of court proceedings, because one can reread and reevaluate the argument without the distractions of the classroom environment or the pressure of completing a debate evaluation. This is particularly useful in encouraging high-quality debate evaluations from each of the students.

Third, instructors can structure more debates in a course than would be possible with in-class debates alone simply because of the time involved. Because all students in the class have the benefit of viewing and evaluating each debate, a rich range of disciplinary issue areas can be addressed during a single course. Moreover, collaboration in a virtual environment is easier because each debate team has its own document repository, group calendar, and task assignment facility. These features, along with the ability to set up a real-time conference and to edit a presentation cooperatively, allow students to collaborate on debate preparations more efficiently.

The Portfolio Gallery

The Portfolio Gallery is a knowledge room devoted to creative expression and project presentation. Students, working either individually or with one or two other students, can use the Portfolio Gallery to exhibit their work and receive reviews from their student colleagues, which are e-mailed directly to the site (see Lange, 2000). In effect, this enables students to develop their own secure Web site for a single project, or perhaps, a constellation of course assignments. Because the emphasis of the Portfolio Gallery is on creativity, students are encouraged to customize the look and feel of their site, organizing material as they see fit. The exceptionally intuitive structure of QuickPlace makes it possible for students to build an elaborate on-line portfolio with little instruction from the faculty member.

One of the signal benefits of the Portfolio Gallery is that it can serve as a vehicle for multicourse integration in a particular program or department or as a device for interdisciplinary "capstone" work in a liberal arts setting. Furthermore, there is no reason why a portfolio must remain active only during a student's tenure. Ideally, it could become an important resume-building resource for a graduate's ongoing career development. This aspect of the Portfolio Gallery will be discussed in Chapter Five.

Depth Education: A "Bricks-and-Clicks" Model

Depth education is a hybrid or blended approach to e-learning that combines the best features of the brick-and-mortar classroom with virtual environments. In contrast to approaches that use e-learning technologies as another delivery system for traditional education, depth education can be implemented in a holistic fashion across the disciplinary span of college and university curricula, thereby placing e-learning at the core of the curriculum.

A distinct advantage of the knowledge room approach is that educators can contextualize and control the extent to which knowledge rooms are integrated in the classroom experience. This not only facilitates a graduated approach to technology integration but also, more importantly, promotes the development of an ethos of classroom experimentation. There is no sense that one must leap off a cliff with the knowledge room concept. A minimalist implementation of knowledge rooms—deploying, for example, a Conference Center or a few Research Centers in a course—will lay a foundation for more extensive integration in subsequent semesters.

Although depth education involves additional costs associated with the campus library, faculty development, technical support, and network capacity, the knowledge room model has the potential to reduce costs in other areas—savings primarily associated with the more intensive use of classroom space. Depending on the configuration selected by the institution or instructor, students would need to meet in a physical classroom only 25 to 33 percent of the time normally spent on traditional classroom-based instruction (for example, one hour a week for a three-credit course). The effect of this would be to increase existing classroom capacity by 200 to 300 percent without building any additional classrooms (see Bleed, 2001; Carnevale, 1999a). Furthermore, depth education does not require schools to build expensive high-tech classrooms.

In the lingo of e-commerce, depth education is built on a *clicks-and-mortar* or *bricks-and-clicks* model. With the demise of so many dot-com firms following the precipitous fall of the NASDAQ in April 2000, there is growing recognition of the inherent limitations of enterprises that have only a virtual existence. Amazon.com, for example, has survived in an increasingly competitive marketplace by developing a large brick-and-mortar distribution network. E*Trade, the immensely successful on-line brokerage firm, one of the few to prosper from advertising during Super Bowl 2000 and make a return engagement for Super Bowl 2001, has now adopted a bricks-and-clicks strategy by beginning to establish physical branch offices (Forster, 2001).

There are indications that a bricks-and-clicks orientation to e-learning—one that does not accept the either-or dichotomy between classroom-based and distance education—is beginning to take shape. Such evidence comes from recent developments in the arenas of both corporate training and higher education.

For example, a white paper from International Data Corporation (2000a) entitled "eLearning in Practice: Blended Solutions in Action" concludes that a blended solution consisting of live training and "self-paced training and technology delivery offers an effective, convenient and flexible solution to a wide range of training needs" (p. 13).[10] Countrywide Home Loans, ExecuTrain, Ford, and Intel have already put such blended solutions into practice (International Data Corporation, 2000b; McGee, 2001; Swanson, 2001).

In higher education, Carnegie Mellon University is on the leading edge of using technology to enhance classroom-based learning. Students, enjoying the benefits of a wireless campus network, use a collaboration application known as TeamCMU to work on class projects with other students at all hours of the day or night (Hamm, 2000). Traditional liberal arts schools are also taking steps to infuse technology into their curricula. For example, Wake Forest University is providing its faculty and students with Macromedia's Dreamweaver, one of the industry's premiere Web-authoring applications, and providing training in how to use it ("Students Weave," 1999).

Another promising instance of using the Internet to add richness to the curriculum was described at the Summit on Technology in Liberal Arts Colleges, held at Middlebury College in June 2000. Thirteen out of fifteen institutions in the Associated Colleges of the South have formed a virtual classics department—one of the largest classics departments in the United States. Their first course—Advanced Latin—was offered in fall 2000. The course, team-taught by six professors, is being implemented in the following manner:

> At the appointed time, the professors and about 30 students—a few from each of the six campuses—will tune in to an on-line audio broadcast of a lecture. During the lecture, they can pose questions and make comments in a live chat room. The six professors will take turns lecturing each week. To supplement the on-line lectures, students from each campus will meet for a second time each week in a tutorial session with their own professor; those sessions are scheduled at different times on different campuses. All of the students and professors will also participate in an ongoing on-line discussion. [Young, 2000d, p. 34]

The purpose of such a blended approach is not to boost course enrollments or economize on faculty resources but rather to enhance the quality of education.

Perhaps the most notable example of a blended solution for higher education comes from the Wharton School at the University of Pennsylvania. Beginning with a pilot program during fall 1998, Wharton was an early pioneer of a bricks-and-clicks approach to e-learning. Instead of using the Internet as a tool for delivery of course content, the faculty and administration wanted a collaboration tool that would facilitate group work on course projects outside the classroom as well as promote better communication with teachers. Toward this end, Wharton selected a proven collaboration tool, eRoom, instead of using an application designed specifically for education. The school went about the task of adapting eRoom to its undergraduate and graduate programs. The result was webCafé.

WebCafé has been an unqualified success. During the fall 1998 pilot program, it was rolled out to five classroom-based courses. By spring 1999, it was integrated into twenty-one courses. A year later, in the spring 2000 semester, the number of courses that used webCafé increased to fifty-three. By fall 2000, that number reached sixty. When one factors in Wharton's executive education seminars, more than ninety courses have integrated webCafé into their classes (Agnew, 2000; Drucker, 1999; Rob Ditto, e-mail correspondence with the author, July and October 2000). Anne Greenhalgh, codirector of Wharton's undergraduate Management 100 course, and associate professor of management, describes webCafé as the place "where the lecture hall, the boardroom, and the student café converge. As a virtual meeting place for teams, it offers busy people a great opportunity to make team decisions and continue progress on important projects. From an academic standpoint, webCafé provides a new avenue of exchange outside of the class meeting times. It lessens the barriers between teacher and student, facilitates peer advising and strengthens the community" ("Wharton's Undergrads," 1999).

Wharton's blended approach to e-learning reveals a key insight about the Internet: interaction across time can be just as important as or more important than interaction across distance. Using digital technologies to add dimensionality to face-to-face communities is likely to be considerably more successful than trying to create digital communities from scratch. For this reason, as Brown and Duguid (2000, pp. 226) note, "Technologies may do a better job on the conventional campus than on the virtual one." Given the success of webCafé in their curriculum, Wharton is marketing its adaptation of eRoom as part of a service to other educational institutions ("Wharton Earns an ASP Degree," 1999; Berinato, 2000).

Discovery, Discernment, and the Classroom

Discovery and discernment are cornerstone skills for the New Economy. The Old Economy, with its assembly line mentality, placed a premium on absorbing information and recalling it. This approach has been rendered obsolete by the explosion of information and the dynamic behavior of networks. Accordingly, classrooms should no longer serve as information depots, where lectures are stacked ready for delivery on the loading dock and exams function as little more than signed bills of lading.

Depth education frees up space in the classroom for the important work of stimulating intellectual curiosity and fostering critical thinking skills. One day, perhaps in the not-too-distant future, it may be possible to dispense entirely with the face-to-face classroom. That will depend on how compelling the videoconferencing applications of the next-generation Internet (or Internet2) will be. In the meantime, two vital ingredients of physical classroom environments will be very difficult to duplicate in virtual space. The first is a teacher's passion for intellectual inquiry and love for his or her subject. The second is the unique chemistry of each class. Both qualities are best experienced in real time (see Traub, 2000).

Good classes and good theater have much in common. Just as the audience's composition and demeanor influence a live dramatic presentation, every teacher knows that each class is unique. The same material evokes different responses from one class to the next. Body language, voice intonation, the way questions are asked, the classroom setting, the responses of others—all of these factors affect the student's learning experience.

In the model of depth education, the purpose of classroom meetings will necessarily vary from course to course. For example, much of the time allocated for face-to-face interactions in science courses would likely be devoted to labs. Courses in the humanities and social sciences might use a portion of class time for student presentations, role-play exercises, impromptu case studies, guest speakers, or field trips. Certainly some portion of each class should be devoted to reflective discussion about the students' interactions in each of the course knowledge rooms.

Also, the geographic flexibility made possible by e-learning can be used to good advantage when it comes to providing students with discovery-laden experiences. For example, colleges and universities could incorporate a wide spectrum of cross-cultural experiences and ecotourism in their curricula. There is no compelling reason why, for example, college classes could not be held in national parks or exotic venues around the world, particularly because faculty members would not have to be physically present (although they may wish to be). Dormitories and classroom buildings have their limitations—even on the quaintest of college campuses. One fine example of how such geographical flexibility can add richness to a curriculum comes from the master's degree program in conflict analysis and management at Royal Roads University in Victoria, British Columbia. This two-year distance education program features weeklong missions to Bosnia and the United Nations in New York City. Students use this opportunity to do firsthand research on peacekeeping (Paskey, 2000).

The Academy and Technological Resistance

Depth education will fall flat on its face if one factor is missing—a spirit of experimentation in the classroom. Neither the mix-and-match flexibility of the knowledge room concept nor the intuitive design of teamware applications like QuickPlace will be of much value if the old ways of teaching, which have served faculty so well, reign supreme.

Tradition is a core value for most academics—and for good reason. Of all contemporary social institutions, colleges and universities are the most enduring. As Clark Kerr (1995, p. 115) notes:

> About eighty-five institutions in the Western world established by 1520 still exist in recognizable forms, with similar functions and with unbroken histories, including the Catholic Church, the Parliaments of the Isle of Man, of Iceland, and of Great Britain, several Swiss cantons, and seventy universities. Kings that

> rule, feudal lords with vassals, and guilds with monopolies are all gone. These seventy universities, however, are still in the same locations with some of the same buildings, with professors and students doing much the same things, and with governance carried on in much the same ways. There have been many intervening variations on ancient themes, it is true, but the eternal themes of teaching, scholarship, and service, in one combination or another, continue.

The aura of institutional resilience surrounding higher education is strengthened by the fact that the colleges and universities have been exceptionally successful in providing venues for transformation and growth for generations of young people. Educators have the privilege of personally witnessing this growth and transformation with the passing of each academic year. It is no wonder that many would resist the introduction (or, worse yet, imposition) of some new learning technology or method that will allegedly "revolutionize" the classroom experience.[11] The potential success of e-learning in higher education has been seriously impeded by overeager vendors who overstate the benefits of the latest technology or overzealous administrators who—with dollar signs in their eyes—have suspended their disbelief (see Feenberg, 1999).

The title of a recent book on computer-mediated education nicely captures the sentiment shared by many academics when it comes to technology and the classroom—*Dancing with the Devil*. Although the authors of the book (Katz and Associates, 1999) are decidedly upbeat about the prospects of computer-mediated education, they harbor no illusions that it will be anything but an uphill struggle. Some may suspect that faculty resistance to new technologies is much like a repeat performance of the medieval crafts guilds' resistance to the technological developments that launched the Industrial Revolution.

Yet such resistance is more likely to come from pragmatists than closet Luddites. There are striking parallels, for example, between the extravagant enthusiasm associated with the classroom use of instructional television during the 1960s (some proponents predicted that 50 percent of each college class would be occupied by viewing instructional television) and the current hype about distance education (Neal, 1998). Good teachers—not technological tools—open up new worlds for students.

A basic fact of life in academia is that nothing will change unless faculty are behind it. As A. W. Bates (2000, p. 95) emphasizes, "Presidents may dream visions, and vice presidents may design plans, and deans and department heads may try to implement them, but without the support of faculty members nothing will change." Ultimately, change will come if e-learning provides a demonstrable improvement in the academic quality of life for both students and faculty. The virtue of depth education in this regard is that it approaches e-learning as a process initiated "from below." Programs that are mandated on a top-down basis or segregated in separate (but rarely equal) institutional units will be inevitably pushed to the fringes of campus life, serving no one well. Students deserve much more than this.

Certainly, fear is the most formidable barrier to change (Bates, 2000). Although administrators may be tempted to chalk faculty fears up to a generalized fear of change, they should not dismiss these concerns in this manner. The fact is that there are objective grounds for concern about the institution of tenure, the disconnect between faculty efforts to improve teaching and the rewards structure for professional advancement, the growing prominence of part-time faculty, and the long-term economic viability of many academic institutions. Such fears are not figments of the imagination; it is dishonest to maintain that they are.

Yet no real progress can be made if fear occupies a place of prominence in academic life. Fear paralyzes imagination, raises suspicions, and shuts down opportunities. Strong academic leadership can make the difference here—addressing, not dismissing, such concerns by bringing them into the light of day.