The Internet and related technologies have sparked the information age, in which the power of computing, digital storage, and communication have been increasing exponentially so as to allow an ever-growing amount of information to be distributed quickly and widely. How can we make sense of this flood of information and use it to enhance our lives rather than overwhelm them? John Seely Brown, chief scientist of Xerox Corporation, describes the tunnel vision that so often limits our view of a technological future by overlooking the social periphery of information—that is, the communities, organizations, and institutions that frame human activity. This social context helps us to better understand both information and how society might move forward with it into an age of knowledge.

"Sea View, New England,“ Marsden Hartley. The Phillips Collection, Washington, DC
INFORMATION AND KNOWLEDGE

The terms information and knowledge are often used interchangeably, yet key distinctions between the two help to illuminate the importance of the social context of learning. First, whereas information is usually considered independent of any particular individual—it can be looked up in a book or retrieved online—knowledge is usually associated with a knower, that is, it resides in someone’s mind. Second, given this personal attachment, knowledge appears more difficult to detach than information. It is more difficult, for example, to pick up, write down, and transfer than information. Third, one reason knowledge may be so difficult to give and receive is that it seems to be acquired more by way of assimilation. Knowledge is something we digest rather than merely hold; it entails the knower’s understanding.

In light of these differences, it is clear that circulating human knowledge is more than merely a matter of search and retrieval. The acquisition of knowledge—that is, learning—is what makes information, intellectual property, capital, and assets usable. The resources for learning lie not simply in information, but in the practice that allows people to make sense of it and in the practitioners who know how to use that information. In these circumstances, knowledge can move with remarkable ease.

IMPLICATIONS FOR LEARNING

The importance of people as creators and carriers of knowledge suggests that where knowledge really counts, people count more than ever. This view contrasts with the modern world, where interaction and the acquisition of information are increasingly impersonal. When we look beyond teaching as the mere delivery of information, we see a rich picture of learning—one that embraces the social context, resources, background, and history within which information resides and where learning can flourish.

Learning is a remarkably social process, one very much influenced by the social groups that provide the resources to learn and by the identity of the learner, who develops as he or she assimilates knowledge and information. What people learn about is always refracted through who they are and what they are learning to be. Information, although a critical part of learning, is only one among many forces at work. Moreover, learning is more demand-driven than is usually recognized. People learn most effectively and quickly in response to need. In contrast, when people cannot see the need for what’s being taught, they tend to ignore it, reject it, or fail to assimilate it in any meaningful way.

Today’s technologically savvy students herald important shifts in learning, as illustrated in Figure 1.

The first dimensional shift concerns the evolving nature of literacy, which today involves not only text but also image and screen literacy. Beyond imagery, information navigation is perhaps the key component of the new literacy. The next dimension moves learning from an authority-based lecture model to the investigation and discovery that characterize surfing the World Wide Web, which, indeed, fuses learning and entertainment. The third
shift, pertaining to reasoning, connects to discovery-based learning in an extremely important way. Classically, reasoning is linked with the deductive and abstract. Yet young learners working with digital media seem to focus more on the concrete, suggesting a form of *bricolage*, a concept having to do with one’s abilities to find something—perhaps a tool, an object, or a document—that can be used or transformed for building something new. Web-smart kids hone their judgment skills through experience and triangulation as they surf the sheer scope and variety of resources the Web presents, the magnitude of which largely befuddles the nondigital adult.

The final dimensional shift has to do with a bias to action, to try new things without reading the manual or taking a course. This tendency shifts the focus to learning in situ with and from each other. Learning becomes situated in action; it becomes as much social as cognitive, it is concrete rather than abstract, and it intertwines with judgment and exploration.

Universities can transform themselves into social learning organizations that foster students’ progression from the explicit to the tacit by using virtual, Web-based learning opportunities to augment, but not replace, the physical. The Web presents a medium that honors multiple forms of intelligence—abstract, textual, visual, musical, social, and kinesthetic. As educators, our challenge and opportunity is to create new learning environments that use the unique capabilities of the Web to leverage the natural ways that humans learn.

An on-campus social learning environment ideally offers both extensive and intensive learning experiences. The extensive entails exposure to multiple communities of scholars and practice, giving students broad access to people from different fields, different backgrounds, and different expectations, all of which combine to form a creative tension that spawns new ideas and perspectives. The extensive experience often results in learning that students would not have independently chosen to focus on but from which they nevertheless gain considerably. Furthermore, it also helps to develop the ability to judge what is worthwhile and what is worthless—an increasingly important skill in an age of ubiquitous and often unreliable information.

The intensive learning experience centers on in-depth enculturation into a particular practice, where one learns *to be*, for example, a physicist, social scientist, or historian, in contrast to simply learning about such professions. Students shift from learning about several communities to learning to be a member of one. At this point, they need opportunities for full, in-depth access that allows them to undergo a *cognitive apprenticeship*. Graduate education today, which usually culminates in a form of apprenticeship, resembles this model.

Online activities such as collaborative science experiments or Webcast lectures annotated by a community of students can strengthen both extensive and intensive learning. Such activities foster the conversational inquiry that...
builds the cognitive scaffolding underlying knowledge.

Off campus, the 21st-century university can extend its reach dramatically through space by using technology to help weave a regional learning ecology that is dynamic, diverse, and interdependent. A regional learning ecology builds on the strengths of the institutions within it—universities, libraries, museums, and so forth—as well as the equally important contributions of the region’s citizens, students, firms, and government. Effectively linked, these resources build a learning ecology that brings increasingly rich intellectual and educational opportunities to their region. Universities can use the Web to maintain vital alumni networks as well. Such networks can offer highly valued lifelong learning opportunities and, likewise, provide an opportunity for the university to learn from the alumni and their experiences.

**CONCLUSION**

The view of conventional universities as delivering information to comparatively passive learners is outdated and simply wrong. (This is the sort of thinking that has hampered development of viable for-profit alternatives to universities.) The changes envisioned here will neither occur nor be fruitful until we look beyond the simplicities of information and individuals to the complexities of learning, knowledge, judgment, communities, organizations, and institutions. Only then will it become more likely that change will reorganize the higher education system, rather than simply disorganizing it.

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