7 (In)Conclusive: Thinking the Future of Digital Thinking

A 1998 report by Robert Kraut at the Carnegie Mellon University indicated that the chief reason people turn to social networking on the Internet is because they are "lonely."[1] A few years later, this study was revisited. It turns out that Internet online social networkers are not that lonely after all. Rather, they are people who enjoy communicating with others. They like sharing their specific intellectual or social interests, they like talking about them, and they like meeting people who share these interests, even if they might be far removed from them geographically. They are more interested in creating communities of common concern and interest, and the Internet enables them to ignore physical distance. New studies indicate that Internet use correlates with other forms of sociality and other forms of literacy.[2]

The gap between these two studies is intriguing for the future of learning institutions. It is indubitably the case that many who seek new knowledge networks and virtual affiliations do so because they are isolated—but not in the way that Kraut's 1998 report suggested. They may well be isolated within their disciplines and departments, on their home campuses or more broadly. They may well have few, if any, other colleagues

within their institutions who share their vision. They could be described as "lonely," at least intellectually, but not with the implication of being self-isolating "loners." Quite the contrary, they may well be lonely in the sense of pioneers, lonely because they are staking out a new field.

Such a questing state of intellectual loneliness may be a mark of the early stage of an emergent field. Individuals have insights, work on developments, breaking with the given and well established. They may find their work greeted with skepticism or dismissed as peripheral and their findings rejected as anomalous or irrelevant. Over time, they discover others working in similar directions who find the intellectual lines of development they are pursuing to be productive, and they begin to communicate and then collaborate with these new colleagues. Prior to the availability of social networking tools, and indeed of the Internet in a broader sense, the development of this second phase of intellectual field-building would have taken longer. Their work would first have to appear in journals or be presented at conferences, for others, usually at different institutions, to recognize commonalities.

Social networking applications have now quickened this dynamic of intellectual exchange and perhaps even transformed it. One of the first things inquiring people do is to search out productive lines of investigation by others in the field or area in which they are (or are thinking about) working. Colleagues committed to expanding the ways in which new media technologies could be put to productive purpose in pedagogy and research turn to each other for guidance and for collaborative engagement. The physical and metaphoric walls containing and constraining emergence and development of new intellectual directions are more quickly shattered. Representation is key to recognition; recognition is key to change.

Institutions are mobilizing networks. And, conversely, mobilized networks change institutions.

New digital tools have the potential to make group participation more mobile, global, and powerful than in previous decades. In *Here Comes Everybody*, Clay Shirky notes:[3]

> We are so natively good at group effort that we often factor groups out of our thinking about the world. Many jobs that we regard as the province of a single mind actually require a crowd. Michelangelo had assistants paint part of the Sistine Chapel ceiling. Thomas Edison, who had over a thousand patents in his name, managed a staff of two dozen. Even writing a book, a famously solitary pursuit, involves the work of editors, publishers, and designers; getting this particular book into your hands involved additional coordination among printers, warehouse managers, truck drivers, and a host of others in the network between me and you. . . . The centrality of group effort to human life means that anything that changes the way groups function will have profound ramifications for everything from commerce and government to media and religion.[4]

Shirky's point is that our long history of emphasizing individual achievement can make us blind to all the ways brilliant thinkers have collaborated in the past and make us resistant to all new ways that digital tools offer us for collaborating in the present and anticipated in the future. To Shirky's excellent lists of group social endeavors that stand to be enhanced and even transformed by the new collaborative possibilities of the Internet—commerce, government, media, religion—one must add *learning.* Learning has always been better as a group enterprise. New digital tools promise to make the potential of collective, collaborative learning still greater and more inventive and interesting.

Participatory learning changes not just how we learn but the institutions in our society dedicated to the art and practice of learning. It is not a matter of when such a change will happen.

The change is happening now, everywhere, on small and large levels, and these transformations will no doubt continue, sustained by their own momentum.

Learning happens in many places and in many ways, including but not limited to a conventional classroom in a single, fixed, preidentified, or static institutional setting. This is not new, though the tensions between formal, institutionalized education and the more diverse, distributed, and dispersed practices of learning may have become especially acute and may even have reached a *tipping point*, in Malcolm Gladwell's sense of the term.[5]

That tipping point might be schematized as a shift from older models of nationalist education to a new model of networked education. At least since the time of the American Revolution, American public education has been promoted as a key mechanism for instilling and promoting a national culture, with ideals of citizenship embedded deep within the pedagogy and practice of public schooling.[6] The nationalist imperative in public education, throughout much of the nineteenth and twentieth centuries through the present, concerned itself with establishing a common national culture, supported by basic educational principles, common national expectations, and even a broadly common curriculum. American public education has been heavily concerned with character and moral development, intellectual discipline, civics and citizenship, and universal literacy to enable dissemination of information as the basis for individual and collective decision-making in a democracy. Education for most was centered in public schools, and, later, for the qualified, in public universities, supplemented by after-school character-building activities such as sports, clubs, and scouting arrangements.

Since the late nineteenth century and the emergence of the Humboldtian model of professional education, there has been a

tension between the civic function of national education and the technical, professional, or skills-building function. Educational institutions have become wedded to ensuring technological knowledge and an expanding array of literacies, including linguistic, technical-scientific, cultural, and civic. In many ways, the United States, as elsewhere, still faces a tension between a national educational model and a professional model, a tension exacerbated by a combustible mix of globalizing conditions in economic and sociocultural practices fueled by a deeply transformative technological revolution.

Caught in this complicated mix of objectives, where might learning institutions go next? Available evidence to date points to the fact that a mix of deep cultural and technological change has already begun to presage a shift in learning practices behind which national and local educational institutions are sadly lagging—and in some cases are fiercely resisting. What would it mean to switch the terms of institutional educational culture away from both a national model and skills-based preprofessional model to what we might call *global learning*, global in both literal and metaphoric senses of being international and also intellectually expansive?

Global learning requires both leadership and shaping in its emergence, which, in turn, requires comprehending its conditions, possibilities, and implications. It is global in its reach, both in the sense of learning robustly about the world in its specificities and connectivities, about the deep connectedness of our place to (most) every other place, *our* impact on *them* and *theirs* on *us*. While globalizing economic and cultural conditions are creating commonalities across cultural differences, the generalities of globalizing practice are nevertheless almost always given local resonance, understanding, and expression.

Global learning requires coming to an understanding not just of the general principles but of their local conditions and expression.

Global learning is global through the connectivity and cultural generation that technological developments have produced. It is global both in what the learning is about and in the new media of learning and the media's attendant cultures of practice. Global learning signals that while local educational institutional arrangements are important, indeed crucially so, they can and often do fail to adapt to quickly changing learning practices and learning trajectories across all generations but especially among youth.

As Tara McPherson has argued, it is standard for reformers in any era to comment on the mismatch between the restricted form of learning that occurs within formal institutions and the more creative learning happening beyond the walls of the schoolhouse.[7] Yet, even with this historical caveat in mind, it is nonetheless significant to recognize how the emergence of new digital media and massive, global social networking practices in our era challenge traditional educational forms and purposes. Practices of engagement with the media, as well as civic engagement through new media, of cultural creation and knowledge formation, gathering, and response, not only look dramatically different from even 15 years ago, they have tended to loosen and sometimes to undercut epistemological authority, the traditional sense of expert knowledge, and authoritative sources of reference (see chapter 3). As new digitally-mediated practices have not only quickened but also expanded the sources and reach of communication, they have democratized the production of, access to, and circulation of information. This is not to say that all forms of participation are available to everyone globally. Inequalities most certainly continue to exist, deeply

and profoundly.[8] Nonetheless, learning has become more networked with the networking of knowledge creation, circulation, and accreditation.

As learning is taking place through online facilitation, the shortcomings of public educational institutions become more glaring. Even public higher education has lost some of its sparkle, dulled by the soaring cost of tuition, as well as a shift of resources from public to private institutions as tax reductions have dried up public support.[9] Virtual learning environments—games, social networking sites, and collaborative online and mobile applications, and so forth—increasingly command learners' attention, most notably, but far from only, for youth. Universities are struggling to keep up, even against economic obstacles and shortfalls, as more and more classes become organized around available hardware and software, from academic podcasting to facilitation of collaboration through proprietary instructional software systems such as Blackboard. Universities are attempting to plug students into a world of global learning that is unavailable to students without such technology.

All this is relatively recent. These global learning developments emerged after World War II in a long, slow, steady shift. They exploded into visibility with the advent of the Internet in the 1990s and especially the rapidity of Web 2.0 social networking developments in the past decade.

The potentials for learning and exchange across the bounds of time and space, across the obstacles of discipline and institution, consequently are almost limitless. The limits are largely socially manufactured. One significant concern has to do with the fact that the same networking technology that makes knowledge creation and learning so flexible, appealing, and robust has the potential to circulate more quickly truth claims that turn out to be misguided, socially disturbed, or false. Credibility has

always been a concern of those charged with the instruction of youth, but the ubiquity of information—reliable and not—makes credibility a central concern of responsible pedagogy.[10] It is not just that a free flow of information can turn a virtue into a vice; it is that the vice of unreliable information can take hold of a broad swath of the population quickly and potentially produce serious damage before assessment mechanisms are able either to catch or mitigate the more extreme effects.

At the same time, globally networked and participatory learning does not happen by accident. As a result of all the work in the past decade or so, it may be that a corner has been turned. Universities now see a need to provide learning technologies and instruction to students along with pedagogies designed to make students more canny about issues of reliability, credibility, access, security, privacy, intellectual property, and so forth. Driven by a mix of market demand and comprehension of the learning potential of new media, universities are coming to embrace new modes and forms of learning. National agencies that once might have been skeptical about the impact of technology, such as the National Endowment for the Humanities and the Institute for Museum and Library Services, as well as national foundations such as the MacArthur and Hewlett foundations, have been exemplary in leading the way in technological applications to the fields they serve and to learning and education more generally. But for every visionary, there has also been a skeptic and for every innovator a gatekeeper.

In short, this is a transitional moment. At this particularly crucial transitional moment in global learning, then, it is imperative for those dedicated to the most expansive forms of learning to be critical activists within whatever institutions they occupy. Indeed, this book's definition of institutions as mobilizing networks is intended to offer a challenge to the

insularity of lockbox education, libraries, community centers, or any other civic organizations that define their mission exclusively in terms of their limited, physical turf. It is intended to highlight the possibilities of institutions grounded in distributed and virtual social networks, geographic and national boundaries notwithstanding.[11]

So what is the future of higher learning institutions in a digital age? Learning institutions *should* change and *can* change by building upon the digital affordances of the twenty-first century as well as upon the skills that most students entering universities now have already attained. Will the university survive as a hybrid of medieval structure and national ideological apparatus even in this global, interlinked, participatory digital world of informal and global learning? Or, as has happened so often in the history of technology, will the new digital learning arrangements simply be absorbed into existing and traditional institutions?

No one knows. But what is known is that the virtual and the material both support and destabilize one another. One cannot consider the digital without the real, and vice versa. Even Second Life, among the most virtual of virtual environments, predicates its virtuality on recognizable features of material life, as its name suggests. Studying the digital or the real helps to make visible the hidden or implicit arrangements of the other. That revelation, in itself, is important to the future of participatory learning. But, in any case, digitally-enabled participatory learning has already transformed how we learn and, in many ways, what we learn, and has impacted institutions of learning. There is no going back to the status quo ante.

The challenges to reimagining institutional configurations are considerable. Discovering how to support the imaginative possibilities of smart mobs, as Howard Rheingold insists, and to

avoid merely replicating older, proprietary institutional models is no simple task. Yet, now is the time to do precisely that. As in any transitional moment, any time the paradigms are shifting, *how* one learns becomes as central an issue as *what* one learns.

Will the future of learning occur in virtual spaces or face-to-face, in traditional classrooms? The answer is likely not one or the other but both. Where the learning happens is less important than how and why and, still more important, what one does with what one learns.

The single most important real estate for the future of learning is that of the *imagination*. Larry Smarr, a pioneering figure in the development of the Internet, currently Director of the California Institute for Telecommunications and Information Technology (Calit2) and an early participant in HASTAC activities, poses two insistent questions: How do we "live the future" and "live in the future"?[12] There are no clear, short, or simple answers to those interlinked questions, except to underscore that imagining better worlds, better futures, has to be the ultimate goal of all who are dedicated to and engaged in participatory learning in the digital age. Better futures mean better links, networks, interactions, and engagements with others elsewhere, wherever those elsewheres may be.

To that end, we offer the following 10 principles as foundational to rethinking the future of learning institutions.[13] We see these principles as riders, both as challenges to and as the general grounds upon which to develop creative learning practices, both transformative and transforming as new challenges emerge and new technological possibilities are fashioned.

Ten Principles for the Future of Learning Institutions

1. Self-Learning

Self-learning has bloomed, across all generations, early in childhood until late in life. Both online reading and writing have become collaborative, as has composition—the making of things—more generally. Mash-ups and comments redo texts. Some poets—for example, Millie Niss—compose exactly with this in mind.[14] And the likes of Google Docs encourage collaborative composition, the sharing of products in the process of making them. While common social networking distribution sites like Flickr and YouTube circulate ready-mades, their existence prompts people to post their productions close to instantaneously. The time from manufacture to market and the resources needed to manufacture have shrunk.

2. Horizontal Structures

Learning has become increasingly horizontal, rather than hierarchical. Lateral learning—peer-to-peer rather than teacher to student—requires rearrangement of learning institutions—schools, colleges, universities, and their surrounding support apparatuses. The latter have tended to be authoritative, top-down, standardized, and predicated on individuated assessment measured on standard tests. At the workplace, teamwork today is increasingly valued over spectacular performance, even if our culture rewards the latter disproportionately and (as we have seen in the recent financial debacle) with sometimes disastrous impact. The volume and range of information now available in almost any domain more or less requires collaborative engagement across all performative aspects of work, from decision-making to actual production. Learning strategy thus commands shifts from information acquisition—it is

widely available to anyone who knows how to look and comprehend—to judgment concerning reliable information, from memorizing information to how to find reliable sources—in short, from learning *that* to learning *how*, from knowledge content to the processes of its formation.

3. From Presumed Authority to Collective Credibility

Learning is shifting from issues of authoritativeness to those of credibility. A major part of the future of learning is in developing critical methods, often collective, for distinguishing sources of good knowledge from those that for a variety of reasons are problematic. What experienced knowers have to offer those less experienced or less in the know are the subtleties in what knowing—the process—involves and entails; it is the making of wise judgments and choices—about sources, information architecture, and who and what to trust, especially in robustly interdisciplinary and multidisciplinary environments.

4. A Decentered Pedagogy

Many education administrators and individual teachers have taken to limiting or restricting use of collectively and collaboratively crafted knowledge sources to complete formal assignments. Such restrictions have focused especially on Wikipedia. This is a deeply misguided reaction to networking knowledge making in a global era.

To ban or even vigorously to restrict sources such as Wikipedia is to miss the importance of a collaborative knowledge-making impulse in humans who are willing to contribute, correct, and collect information without remuneration: Definitionally, this *is* education. To miss how much such collaborative, participatory learning underscores the foundations of learning is defeatist, unimaginative, even self-destructive.[15]

The opportunity and challenge now exist for leaders at learning institutions to adopt a more inductive, collective pedagogy that takes advantage of the extraordinary range of technological resources that are available. John Seely Brown has noted that it took professional astronomers many years to realize that the benefits to their field of having tens of thousands of amateur stargazers reporting on celestial activity far outweighed the disadvantages of unreliability. This was a colossal commitment, a leap of scientific faith into what could have turned into a proverbial black hole, given that among the cohort of amateur astronomers were some who believed it was their duty to save the earth from martians. In other words, professional astronomers faced large issues of credibility that had to be counterpoised to the compelling issue of wanting to expand the knowledge base of observed celestial activity.[16] In the end, it was thought that "kooks" would be sorted out through Web 2.0 participatory and corrective learning.

The result has been a far more robust and expansive body of knowledge, amassed by means of this participatory method, than anyone had dreamed possible. Faith in networking paid off and then some! Amateur publics have long participated in data collection in the expansion of scientific knowledge. Tidal data, for example, were long collected by local publics, such as fishermen, before such data collection became an institutionalized, professionalized activity. Such more or less informal data collection has long been balanced by collective and professional procedures for sorting through the data for obviously wrong or misguided reportings. If professional astronomers can adopt such a decentered method for assembling information, certainly college and high school teachers as well as collective encyclopedias can develop reliable methods based on collective checking, inquisitive skepticism, group assessment, best

community practices, and informed instruction in what wise decision-making amounts to.

5. Networked Learning

In a world increasingly ordered by complex, multifaceted problems, the likelihood of working out solutions, resolutions, or work-arounds is heightened by drawing on the intersection of different specializations and forms of expertise rather than on the brilliance of a single know-all individual. This is the case no matter the field or domain—from the natural sciences to computing technology, from social and political issues to humanistic challenges. The complex, invariably multidimensional nature of the issues confronting us scientifically and politically today call for multiple modes of expertise to address them successfully. But networked learning is not just about a number of discrete contributors arithmetically adding their contributions to solving problems, challenges, or even threats. Networked knowledge, by contrast, takes the power of its interactive engagements around any issue from the algorithmic, multiplier impact working together contributes to resolving any issue.

So it is with learning. One can learn alone, seeking out solutions through solitary effort. Invariably that will overlook key dimensions to addressing issues. Individuals learn not only content from others but process. Another's insight or explanation reveals, opens one up to a different way of looking not only at this but at a range of other issues, too. Interaction with others teaches how to ask revealing questions, how to address features of the general question hitherto hidden from view. The enthusiasm of others in one's learning circle is likely to rub off, too. As trust builds up, one hesitates less in asking help or for an explanation, or indeed offering it when in a position to do so.

In that sense, networks are synergistic, as much for learning as for doing. They challenge as they support. Members who take without contributing will soon develop a reputation for not pulling their weight; those who are rude or arrogant or unhelpful will likely be shunned. So learning networks contribute to lessons in civility and sociality alongside those in process and content. Networked learning operates on the logic of participation, expecting interaction, correcting through exchange, deepening knowledge through extended engagement. Networked learning likewise offers lessons in negotiating complexity. Thus, they are likely to promote nonauthoritarian modes of knowledge formation, nuance over dogmatic assertion, critical challenge over blind or even rote acceptance of authority.

6. Open-Source and Open-Access Education

Networked learning and, open-source and open-access culture are mutually reinforcing. The drive to produce and promote freely available applications, tools, and learning resources encourages their circulation and use. The more information that can be easily accessed, the more likely it is to be vetted, tested, revised, and remixed to collective benefit. Applications and information that prove most successful and reliable are likely to be most widely circulated, shared, applied, and improved. Their availability and popularity become virally self-promoting; their shortcomings and failures are quickly discovered. This can apply to applications and programs that may involve distasteful elements also. But openness is more likely to reveal the shortcomings, and to do so more quickly, than imposing top-down applications and programs.

Open-source learning trades on the *many-to-multitudes model*. A group that has access to resources, including information, makes it virally available to widening circles of engagement.

The many feed the multitudes, some subset of whom, in turn, take up the baton of informational and resource provision, of the nourishing of learning. Many international social movements—such as those focused on Darfur or Tibet—operate from this many-to-multitudes interactivity, where financial resources on one end are balanced by local expertise and human investment and labor on the other, for interchanges that are rich and socially valuable for all participants. Many-to-multitudes does not erase the digital divide but, rather, acknowledges its material reality and provides a more collective model of economic and human capital to promote interchange. The desire (on all sides) for interactivity fuels this digitally driven form of social networking, as much in learning as in economic practices, enlarging the possibilities of successful innovation and the circles of those likely to learn from the inevitable, necessary, and, in the end, productive failures.

There are challenges, magnified as they are by the relational, interactive commitments of digital, of participatory learning and an inordinate expansion of scope and reach. Just as the challenges can make spectacular the successes, they have the possibility to magnify dramatically if not disastrously the potential failures. They are better weathered together, interactively, with the experience of working collectively and in participatory fashion rather than discretely, individually, and separately.

7. Learning as Connectivity and Interactivity

Notwithstanding open source and access, digitally enabled social networking applications make possible increasingly robust connectivities and interactivities not otherwise available and are enlarging and expanding them as well. They serve to produce learning environments and ensembles in which participants both enable and elaborate each others' learning inputs,

practices, and products. Participatory learning ecologies establish environments, virtual and face-to-face, that dispose participants to support and sustain contributions from others. Learning challenges and problems are faced collectively and collaboratively, not simply individually. This tends to undercut frustrations, encouraging the development of work-arounds where direct resolutions seem distant or impossible. The challenges tend to be mutually shared and distributed across the learning community. Accordingly, they are faced, redefined, solved, resolved, or worked around—together.

There are a growing range of applications now enabling users to unite and synchronize their devices and applications into a seamless web of interactivity. We are able not only to share work instantaneously with others at a distance but to work with them simultaneously on a common, mutually shared document. File and data sharing with other users in remote locations is now more or less matter of course and increasingly gravitating to the ubiquity of mobile devices. Massively multiplayer online games have made possible robust interactivity, sharing decision-making, online communication, and movement, and exchange and conjoint creation. Working environments are no different. Technological architecture thus is fast making net-*working* the default, rather than isolated, individualized working. The organizational architecture of educational and learning institutions and pedagogical delivery should be no different and are just awakening to that fact. The administration of President Barack Obama in the United States promises surer and swifter developments along these fronts.

8. Lifelong Learning

Participatory learning suggests a different disposition to knowledge making, acquisition, and sharing. It means that there is no

finality to learning. We learn throughout life, through formal institutions or, far more readily and repeatedly, informally, from each other. The new technological developments and the rapid transformation in knowledge across almost every field as a result makes lifelong learning all the more a condition of contemporary life, whether it concerns staying healthy, physically and financially, comprehending the quickly shifting world politically, addressing the profound social or environmental challenges globally, considering the recreational options available, or simply for the sheer pleasure of it.

Institutions of higher learning, especially in the United States, have seen the average age of their students increase. This has been fueled in considerable part by the interests of 40- and 50-year-olds to improve their employment prospects and earning power. It has been driven, in part, by retirees pursuing areas of knowledge they discover to be fascinating but never quite had the time to attend while balancing busy working lives and child-raising or parental care. Networked culture afforded by plugging in digitally has made so much more readily possible not just informing oneself on one's own but fashioning virtual learning communities, drawing on expertise and companionship virtually, and transforming the social conditions of ongoing knowledge development as it shifts the grounds of sociality.

With this developing self-consciousness about lifelong learning, there have emerged opportunities alongside it to contribute to knowledge formation across all sorts of even more traditional knowledge domains. Thus, formal university-based knowledge communities have begun to draw on the affordances of digital technology and new media to engage interested parties across the population, locally and globally, to contribute to the development of expanding and important data sets in well-established and academically grounded domains. Thus, publics, young and

old, can contribute to developing data sets on all of life's species, or to those on every known bird species sighted, or to astronomical observations. Johannes Kepler's formalization of tidal readings made so painstakingly in the early seventeenth century are now potentially the contributions of everyman across many, if not all, domains. Lifelong learning is also now lifelong contribution to knowledge production and expansion, collaboratively conceived. Means and ends are mutually remaking.

9. Learning Institutions as Mobilizing Networks

Collaborative, networked learning consequently alters also how one thinks about learning *institutions*, and network culture alters how to conceive of institutions more generally. Traditionally, institutions have been thought about in terms of rules, regulations, and norms governing interactivity, production, and distribution within the institutional structure. Network culture and associated learning practices and arrangements suggest that one thinks of institutions, especially those promoting learning, as mobilizing networks. The networks enable mobilization that stresses flexibility, interactivity, and outcome. And mobilizing, in turn, encourages and enables networking interactivity that lasts as long as it is productive, opening up or giving way to new interacting networks as older ones ossify or emergent ones signal new possibilities. Institutional culture thus shifts from the weighty to the light, from the assertive to the enabling. With this new formation of institutional understanding and practice, the challenges faced include such considerations as reliability and predictability alongside flexibility and innovation.

10. Flexible Scalability and Simulation

Finally, networked learning both makes possible and must remain open to various scales of learning possibility, from the

small and local to the widest and most far-reaching constituencies capable of productively contributing to a domain, subject matter, and knowledge formation and creation. New technologies allow for small groups whose members are at considerable physical distance from each other to learn collaboratively, together and from each other; but they also enable larger, more anonymous yet equally productive interactions. They make possible, through virtual simulation for instance, to learn about large-scale processes, life systems, and social structures without either having to observe or recreate them in real life.

The scale is driven by the nature of the project or knowledge base. The scope may range from a small group of students working on a specific topic together to open-ended and open-sourced contributions to the Encyclopedia of Life, Wildlab (a comprehensive database of bird life based at Cornell University), Digital Oceans (a comprehensive database of ocean life based at the University of California at Santa Barbara), or to Wikipedia. Learning institutions must be open to flexibility of scale at both ends of the spectrum. The most effective institutions will acknowledge and reward appropriate participation in and contributions to such collective and collaborative contributions, on scales small and large, rather than too readily dismissing them as easy, secondary, or insufficiently individualistic or idiosyncratic to warrant merit.

Challenges from Past Practice, Moving Fast Forward

The range of opportunities and the transformative possibilities for learning at all levels as a result of readily available and emergent digital technologies are broad. The transformation in knowledge conception and production as a result of these new technological practices must be considered.

There are challenges, limitations, and misdirections—in short, opportunity costs—resulting from these developments. Some of the concern no doubt relates to technological overreach, underdevelopment, or underperformance. But some anxiety results inevitably from the unsettlement of long-established ways of doing things. When well-established modes of knowledge making and acquisition stagnate, they can become restrictive, if not unproductive. As new modes emerge, those responsible for sustaining traditional institutional structures can either dig in and refuse to respond other than to dismiss the new modes, or they can seek to work out renewed and renewing regimes to take advantage of new productive elements and possibilities.

The challenges offered by digitally enhanced participatory learning to institutional order in higher education (and in other educational levels and formations) range from the banal to the constitutive. They reach likewise from the disciplining of behavioral breaches of protocol and expectation to normative conceptions of what constitutes knowledge and how it is authorized. In short, the challenges posed by participatory, global learning threaten established orders and practices as well as settled modes of being and doing. They portend significant shifts of authority, credibility, individuality, and hierarchy. Their promise is discounted by the attendant costs, their benefits discounted by the losses following from practices taken for granted, and the advantages from innovative modes of thinking and execution discounted by the drawbacks always attendant to the novel and insurgent.

That is not a good argument to dismiss the innovative, to ignore its developmental possibilities, or even to be driven by a cost-benefit calculus. Quite the contrary, it is to recognize that the enormously productive power of participatory and collaborative work will be uncontained and, in the end, unbounded

by the individualizing boundaries of the given and established. Rather than dismiss the shortcomings as the inevitable cost of innovation, the shortcomings should encourage us to pay special attention to failures, to learn how they occur, to learn what we can from their occurrence.

The source of failure may vary. Is it a failure of the technology as such, of the incapacity to address the problem at hand, or is it a failure resulting from the overreaching of an application unintended for that technology? Is it a failure from underestimating the projected attendant costs demanded by the application or the ongoing commitment to service the infrastructure or human attention to sustain it? Or, yet again, is it a failure to have thought about the technological–human interface, the ways human beings interact with hardware or software, that the design has ignored or inadequately attended?

The failure in the latter case may have to do with the inability of the technology in question to deliver the kind of knowledge needed or sought or to frame that knowledge in ways deemed difficult to use. It may turn out that the application is more time-consuming than older modes of knowledge creation, or less enlightening, or more awkwardly framed. Implementing a technological solution, for example, may require a greater commitment to new modes of social networking than one finds productive. It may require practices less pleasing or more demanding than is acceptable. Each of these possible modes of failure informs us, makes us less likely to simply give in to a technological determinism or a naïve idea that the most technologically complex solution is the best solution. To fully radicalize learning in a digital age requires serious, creative, and sustained comprehension of the outcomes one wishes and the pedagogical process one desires, and then a realistic accounting of all of the available

learning possibilities—virtual, real, or in some visionary (because appropriately circumspect) combination.

Conclusion: Yesterday's Tomorrow

It would be easy to fall into hand-wringing, to say that our institutions of education are antiquated and, therefore, doomed. In fact, their persistence suggests that, outmoded as they may be, they are not only not doomed—they are thriving. At present, the baby boom of the baby boom, makes admission to a college or university more competitive than it has ever been. A college degree is still the key to success as all comparative studies of income levels and educational attainment attest. Rather than dismiss, excoriate, or condemn our learning institutions, this book examines sites where institutions *are* and inventively *could be* changing in order to provide examples for those innovative educators, administrators, students, and parents who wish to promote productive change and seek models to guide the process and support their endeavor.

Digital learning pioneer Henry Jenkins has argued for the importance of the convergence resulting from networking a culture of new models, forms, and contributions with older models. The convergence is not just the new working on and around older forms but thoroughly remixing and modding them, transforming them piecemeal, and expanding and enlarging access to them.[17] So, too, is the charge and challenge to the immediate future of learning institutions. Remix learning institutions may well be the model of the future. Modding and remix are the moving modalities of institutions as mobilizing networks.

This book's portfolio of models for institutional remix (laid out at the close of chapter 2), in both practice and form, allows one to imagine anew what remix educational enterprises might

aspire to, what practices they might draw on, and what trajectories of being and doing they might take up and push. One must challenge institutional changes not just in the tools of the trade of education—but to the trade itself. How successful these experiments in new institutional formations will be remains in question. The following concluding examples are included to provoke thought, not to foreclose it, to prod imagination, and to refuse to accept the given as the limit of the possible.

The dominant disposition in modern higher education has been to center the individual as the problem solver. Technology labs are now drawing on more collective modes of working toward problem solving. Someone facing a significant problem poses it to the relevant network to which she or he is connected. Others in the network suggest possible responses, solutions, or productive ways to address the problem. Out of the ensuing discussion, a working group of interested contributors forms and starts working together to resolve the problem posed. Knowledge networking tools make it highly likely that the working group will be physically distributed. The group remains open enough that others may keep abreast of the progress in resolving the challenge and be called on where their expertise might be needed. This way of working suggests, in turn, different work virtues and values to be inculcated in the learning process. The transformation of learning institutions likewise will involve their practical inculcation.

Similarly, a social networking tool such as Twitter can be put to brainstorming use. Instead of social twittering, the tool can be used for idea or concept twittering. Promising suggestions can be quickly migrated or hyperlinked to a more sustaining application such as a wiki more conducive to sustained exploration or development. It also allows those with access to institu-

tionalized forms of learning to share that knowledge more broadly with those who cannot afford formal education. In short, ubiquitous computing suggests the instantaneous capacity both to generate and develop germinal ideas in or across any field, within communities and to more general, distributed publics. There are downsides: the instant "tweet" can stall out, just as the romance with novelty and the next cool application can push users to ignore deeper development and more sustained or more subtle spirals of knowledge formation. Yet, the sociality of networking dimensions suggests that brakes will be built into even the most headlong push into innovation for its own sake.

The proliferation of collective learning applications, practices, and communities signal an emergent mode of knowledge production called *networking knowledge*. Networking knowledge, as the ambiguity is intended to suggest, includes two considerations. It involves knowledge of how networks and networking tools operate. At the same time, it conveys the possibilities and the profile that these new applications give to knowledge itself, shaping knowledge in genuinely innovative ways, and stressing the relational and social dimensions to the process of knowledge making.

The pressing question is how educational institutions self-consciously embed these new applications and practices and new epistemologies and pedagogies and how they institutionalize these new modes of learning and are remade in so doing.

In thinking together, we engage a process, together, of envisioning better ways to rethink the future of learning institutions in our digital age.