Transforming Schooling through Technology: Twenty-First-Century Approaches to Participatory Learning

Craig A. Cunningham

The fifty years since the 100th anniversary of John Dewey's birth have marked the emergence of new technologies that afford a wealth of previously unknown approaches to learning, making it not only possible but practicable for Dewey's educational vision of participatory learning to be realized on a mass scale. This chapter discusses these possibilities and their implications for learning in the twenty-first century.

A Brief History of Deweyan Participatory Learning

In *The School and Society* (1899), John Dewey writes that the best learning occurs when students participate in what he calls an occupation: "a mode of activity on the part of the child which reproduces, or runs parallel to, some form of work carried on in social life."[1] Such participation touches children's "spontaneous" and "worthy" interests while organizing such interests into "regular and progressive" modes of action such as those carried out in contemporary social life. Occupations "furnish the ideal occasions for both sense-training and discipline in thought,"[2] because they grant students "an opportunity for acquiring and testing ideas and information in active pursuits typifying important social situations."[3] Working with his colleagues at the University of Chicago Laboratory School, Dewey developed this idea into a new theory of education that would come to be known as progressive education.[4] However, because the phrase "progressive education" has multiple meanings and so much historical baggage,[5] this chapter will refer to Dewey's conception of learning through occupations as "participatory learning," a phrase used recently by Speaker, Reingold, and others.[6]

In framing his participatory approach to learning, Dewey looked primarily backwards to a time when people allegedly lived in more direct interrelationship

with nature and with the basic tools necessary to harness and shape its potentialities. Dewey and his colleagues placed students in situations similar to those of laborers, farmers, and do-it-yourselfers from an earlier time so that the students could experience first-hand the building of a house, the spinning of thread, and the making of candles. This approach acknowledged that life at the turn of the twentieth century was increasingly disconnected from nature and that direct participation in contemporary industrial practices was increasingly out of reach for children. Not only wasn't it safe for children to be roaming around a factory floor, but the science or knowledge underlying modern industrial processes was often beyond the children's understanding. Making candles or spinning thread, Dewey wrote, "engages the full spontaneous interest and attention of the children. It keeps them alert and active, instead of passive and receptive; it makes them more useful, more capable, and hence more inclined to be helpful at home; it prepares them to some extent for the practical duties of later life"[7]—without exposing them to the hazards or conceptual confusions they might experience if they were asked to generate electricity or work with the tools of large-scale textile production.

Dewey did not consider these activities to be preparation for a job; rather, the purpose was to build the habits and skills of life-long learning. "The problem of the educator is to engage pupils in these activities in such ways that while manual skill and technical efficiency are gained and immediate satisfaction found in the work, together with preparation for later usefulness, these things shall be subordinated to *education*—that is, to intellectual results and the forming of socialized dispositions."[8] Such activities, Dewey believed, presented "plenty of opportunities and occasions for the necessary use of reading, writing (and spelling), and number work,"[9] plus had the corollary benefit of providing "training in habits of order and of industry, and in the idea of responsibility, of obligation to do something, to produce something, in the world [and] . . . of observation, of ingenuity, constructive imagination, of logical thought, and of the sense of reality acquired through first-hand contact with actualities."[10] In theory, this participation in what might be called "historically situated" occupations could also be used as the basis for teaching related subject-matter in history, geography, and science, fostering mental quickness, "sense-training," and "discipline in thought,"[11] achieving "continuing purposes and well-planned social action,"[12] and building lifelong habits of teamwork, persistence, and organization.[13] What's more, such participation would build among the privileged students of the Laboratory School a greater sense of social solidarity with the working class.[14]

One hundred years later, at the beginning of the twenty-first century, the gap between young peoples' daily lives and industrial processes has only accelerated. The likelihood that a student could participate directly or safely in nuclear power generation, for example, or the manufacture of polyester, is significantly lower than that they could render fat for candles or use a card to clean cotton of its seeds. In addition, the underlying knowledge of nuclear power or polyester manufacturing is much more complicated than that involved in getting light from candles or weav-

ing natural fibers into textiles. Thus, the primary motivations for Dewey to take a retrospective approach to framing appropriate activities for participation remain true—even more so.

However, while some teachers today involve students in historically situated occupations as a way to fostering active participatory learning, schools have for the most part rejected Dewey's participatory approach to learning,[15] preferring the de-contextualized, nonexperiential, generalized knowledge found in textbooks.[16] There are several reasons for this. One is that hands-on experiences take a lot more time than reading about such processes in a book. Another is that newer standards of safety and concerns about liability mandate against direct participation in some activities that might have been deemed acceptably safe in Dewey's time—such as melting wax or carding wool—but that could potentially expose children to hazardous conditions such as heat or allergens. A third, perhaps more important, argument is that contemporary educational objectives are quite different than what Dewey might have wanted for the early grades of his Laboratory School. Not only are young people expected to master more "basic skills," but the sheer volume of desired outcomes across the curriculum makes time more precious. Contemporary life, it seems, requires both much more knowledge and much more complex knowledge than it did in the past. Many aspects of that knowledge—the behavior of economic systems or the mechanisms of radioactive decay, for example—aren't open to direct participation by young students. When you combine concerns about time, safely, and new or more complex objectives for learning, it becomes increasingly hard for many teachers to justify projects such as those envisioned by Dewey and his colleagues.

The contemporary focus on explicit, measurable learning outcomes—often described in isolation from interdisciplinary contexts of practice[17]—turns attention away from participation as a core educational goal. Academic standards statements tend to favor abstracted, decontextualized, learning goals[18] that are generic and therefore allegedly more transferrable than experiences situated in very specific occupational contexts.[19] It is much easier to justify direct academic instruction in the skills and content that are measured on standardized tests. What, after all, do students learn from an experience of spinning and weaving natural wool into fabric that can be correlated directly to academic standards? Who uses candles for light or makes their own fabric anymore, anyway?

Direct participation in historically situated occupations suffers, then, from taking too much time, being potentially unsafe, and not leading efficiently toward desired outcomes, partly because the activities involved seem increasingly irrelevant to the modern world. In the face of these objections, is there any future for direct participation as a method of education in schools? Should there be?

Why Participatory Learning?

After he left the University of Chicago in 1904, Dewey increasingly turned away from explicit attention to schooling and focused instead on developing a wider philosophy of experience.[20] His specifically educational writings—most notably *De-*

mocracy and Education (1916) and Experience and Education (1938)—were, for the most part, further elaborations of the ideas he had laid out at the beginning of the century. However, the philosophy that Dewey developed in his Ethics (1908, 1932), Human Nature and Conduct (1922), Experience and Nature (1925, 1929), and Art as Experience (1934) has a direct relevance to education and provides additional support for participatory learning. Indeed, these later books can be seen in part as heroic attempts to explain why participatory learning is superior to academic learning, despite the objections that were raised in his time and continue to be raised in ours. The conclusions that Dewey drew from these philosophical investigations have been surprisingly resilient, and continue to be affirmed by more recent commentators on education from both the perspective of meaningful learning[21] and from psychological understandings of how students learn.[22]

Participatory learning, Dewey believed, builds effectively upon the two dimensions of experience—interaction and continuity.[23] These two dimensions may be summarized as "Every experience both takes up something from those which have gone before and modifies in some way the quality of those which come after"[24] and "Every genuine experience has an active side which changes in some degree the objective conditions under which experiences are had."[25] Experience is educative to the extent that it takes these dimensions into account.

In participatory learning, students and their environments change together as they "transact" in a cyclical process of action, reflection, and reaction. "An experience is always what it is because of a transaction taking place between an individual and what, at the time, constitutes his environment."[26] Participatory learning activities generate transactions (or transformative interactions) by setting up problematic situations that students, working collaboratively, must resolve. As the students recognize and work to resolve a problem, they experience "cognitive disequilibrium"[27] while learning to use language as a tool to make "socially situated" choices.[28] If the problem has been well designed, taking "into account adaptation to the needs and capacities of individuals"[29] and challenging students without exceeding their capacity to learn,[30] students become actively engaged.[31] When the problem is real from the students' perspective (that is, not just academic), the choices they make are experienced as authentic and are motivated by real concerns. The consequences that ensue from their choices are experienced as real consequences. With "the perception of the connection between something tried and something undergone in consequence,"[32] students gain deep understanding of the significance or meaning of their ideas.[33] In short, the ideas and habits gained as a result of direct participation are tethered by—and continuous with—direct experience. "What is learned are not isolated qualities, but the behavior which may be expected from a thing, and the changes in things and persons which an activity may be expected to produce."[34] The students own the ideas, understand them, have begun to test them out in ongoing experience, and are prepared to incorporate them into further experience as working principles (intelligence) and routine practices (habits).

Because participatory learning is by its nature collaborative, it directly fosters democracy, by "making the individual a sharer or partner in the associated activity so that he feels its success as his success, its failure as his failure. . . . As soon as he is possessed by the emotional attitude of the group, he will be alert to recognize the special ends at which it aims and the means employed to secure success. His beliefs and ideas, in other words, will take a form similar to those of others in the group."[35] In "sharing in an activity of common concern and value,"[36] students learn from each other through a process known as "reciprocal teaching,"[37] and come to recognize their common humanity as they form a "miniature social group in which study and growth are incidents of present shared experience," involving "intercourse, communication, and cooperation"[38] in what might be called embryonic "communities of practice."[39] Like inductees into a new profession, students immerse themselves in a socially mediated context or situation in which meaning is constructed.[40] Social participation then mediates the process of turning students into responsible citizens, with the priorities, values, and "intellectual and emotional disposition"[41] necessary for ongoing democratic participation.

In *Art as Experience*, Dewey offers a comprehensive and explicit philosophical statement of what experience can and should be at its best, providing still more support for participatory learning. When students participate in resolving problematic situations, they imaginatively co-construct solutions that result in either immediate discomfort or satisfaction, thus experiencing both longing and the consummatory experience that provides the primary motivation for further social participation and lifelong learning[42] as they learn to distinguish the desired from the desirable. Direct participation thus affects the passions and inspires imagination, educating desire[43] while teaching practical reasoning.[44]

For Dewey and many more recent commentators, then, participatory learning is the most effective means of fostering intrinsic motivation, intelligence, the disposition for social cooperation, and an appreciation of aesthetic experience, and for helping students develop the habits of mind necessary to continually reconstruct their understanding and to direct the course of subsequent experience. These outcomes seem quite valuable, especially compared to the isolated basic skills and decontextualized knowledge gained when "studies are treated as mere instruments for entering upon a gainful employment or of later progress in the pursuit of learning."[45] Yet even if schools accept that Dewey's preferred approach to education is more effective, the question still remains: given the issues of time, safety, conformity to changing standards, and relevance to contemporary life that were raised above, is there a future for participatory learning in schools?

Towards a Technological Solution

Advances in digital technology during the past fifty years have opened up many new ways to structure learning experiences around direct participation. With new technologies, it is now possible for young people to participate in a wide variety of socially mediated learning activities that could never be imagined in Dewey's day.

These new forms of participation do not rely as much on the retrospective historically situated approach taken by Dewey and his colleagues. Instead, students can participate in collaborative activities that reflect current knowledge and contemporary situations and yet are sufficiently scaffolded to allow for meaningful and safe participation by a wide variety of learners in a limited amount of time. While the possibilities afforded by these new technologies have yet to be fully explored, Deweyan educators should acquaint themselves with these possibilities, if only to see what might be learned from them about the prospects of participatory learning for the twenty-first century.

The technological advances that make new participatory learning activities possible can be roughly categorized as practical computing, distant communications, personal computing, simulations, multimedia, and social networking. These categories represent new technologies available to education during the decades since the 100th anniversary of Dewey's birth in 1959. Computing became practical for nonmilitary applications in the 1960s; distant communications for educational purposes became possible with the rise of global wide-area computer networks and personal computing in the 1970s; technologically supported simulations were possible in schools by the mid-1980s; digital multimedia including sophisticated graphics and animations became widely available in the 1990s; and social networking took over from static Web-based content in the first decade of the twenty-first century.[46] At the beginning of the second decade, virtual reality environments, which combine aspects of all of the previous advances, are likely to become the most important educational technology. Each of these technological achievements provided new opportunities or affordances for education—but each also brought certain constraints. While some of the challenges of using technology to support learning remain, it can be fairly said that the fifty years since 1959 have marked the emergence of a universe of previously unknown possibilities for learning—making it not only possible but practicable for Dewey's educational vision to be realized on a mass scale.

The emergence of new technologies has an obvious but not always noted aspect: they are generally additive. Improvements in one area do not remove previous improvements in other areas. Indeed, often multiple improvements are more than additive: they are synergistic, so that the combination of improvements in two or more areas has a more dramatic effect than any of the individual improvements by itself. Thus, for example, the development of a high-speed network of university computers in the 1960s (ARPANet) made it possible for multiple users in distant places to participate in complex computer modeling and educational simulations; yet, this development had little real effect on the larger culture of education until the availability of personal computers in the 1980s broadened participation to all users of what became the Internet. For another, the development of a graphical user interface for the original Apple Lisa (and then Macintosh) computer in the early 1980s was a dramatic improvement over the command-line interfaces that were seen previously; yet this new interface didn't affect the typical user's access to the resources of the Internet until hypertext transfer protocol and Web browsers were

developed in the early 1990s. A third, particularly important, example of the synergistic effects of multiple technological improvements is the way that widespread broadband Internet connections combined with the development of new approaches to social networking as well as better graphics technologies, making possible the "first-person" perspective of sophisticated online multi-user gaming. By 2009 there was a "perfect storm" of technological improvements converging to afford amazing opportunities for participatory learning in virtual participatory environments.

This convergence is seen most clearly in massively multiplayer online role-playing games (MMPORGs) such as EverQuest and World of Warcraft, which attract millions of gamers worldwide. The engaging, lifelike quality of these games, and their capacity to foster social knowledge construction, especially those relying on cooperation with others to achieve goals[47]—have led more and more people to realize that these games aren't just recreational, but potentially educational as well.[48] While research into the educational possibilities of "digital game-based learning" (DGBL) is still in its "infancy" and "various issues relating to perceptions of games, relevance to curriculum, accuracy of content and suitability for use in timetabled classroom environments have so far prevented this becoming a mainstream activity in schools,"[49] DGBL potentially fosters the kinds of situated cognition and communities of practice that Dewey advocated, and some games have been shown to "promote learning and/or reduce instruction time across multiple disciplines and . . . learners."[50]

The technologies that make MMORPGs possible also allow the development of Multi-User Virtual Environments (MUVEs), which bring users together in a variety of "worlds" affording a huge variety of interactive possibilities beyond gaming. The most sophisticated MUVE, Second Life, offers users the capability to construct objects in accordance with almost whatever they can imagine, leading to representations of real-world environments such as Amsterdam, the Louvre, a tornado, and Mars, as well as participatory simulations of historical scenarios like ancient Greece, Renaissance Europe, and precolonial America, scientific experiments such as Genome Island and the Island of Svarga (a simulation of a natural environment), as well as imaginary scenarios like the planet of Gor (portrayed in a series of books by John Norman), the "The Pot Healer Adventure" on Numbakulla Island, and the medieval fantasy world of Avilion, involving knights, princesses, chivalry, and a pecking order determined through the fulfillment of quests and missions.[51]

Those who have not participated in such environments have difficulty understanding quite how engaging they can become, or they view deeper levels of engagement with intense suspicion.[52] If these environments are "virtual," it is thought, they cannot be "real." What is missing from such reactions is the understanding that for participants in such environments, the experience *is* real,[53] and as virtual environments become more realistic, and the effects of such experiences on the participant—including the learning effects—are potentially as important and meaningful as any real-world experience, both in terms of the ideas and habits of the participants and in terms of social relationships.[54]

As Dewey wrote, "The only way in which adults consciously control the kind of education which the immature get is by controlling the environment in which they act, and hence think and feel. We never educate directly, but indirectly by means of the environment."[55] This applies to virtual environments as well as real ones. Almost any situation can be designed in a virtual world, including what I've been calling participatory learning, involving an endless variety of problematic aspects tweaked for any given audience or learning outcome. Certainly, a virtual world can present a venue for engaging in historically situated occupations such as making candles or weaving fabric. But the real value of virtual worlds is to support activities that cannot easily be replicated in a typical school classroom because of issues of cost, safety, availability of particular environmental features, equipment or human resources, or because the activity would normally be too difficult for the students.

Imagine almost any potentially educative scenario, and a virtual environment could be built to support it. This does not remove the educator's "duty of instituting a much more intelligent, and consequently more difficult, kind of planning," as Dewey wrote. "He must survey the capacities and needs of the particular set of individuals with whom he is dealing and must at the same time arrange the conditions which provide the subject-matter or content for experiences that satisfy these needs and develop these capacities."[56] Such conditions include making it clear to students what is expected of them, both in terms of next steps and in terms of the larger situation in which they are involved, helping them to learn the language involved in the game through immersion in socially situated discourse, and providing explicit ways for students to connect what they are asked to do in the game with knowledge of academic disciplines.[57]

While the military and multinational corporations have taken the lead in using virtual environments for training, more and more universities are finding that virtual environments offer desirable alternatives (for some purposes) to the typically text-based and much more common experiences offered in online learning management systems such as BlackBoard or DesireToLearn. Some K-12 educators are using virtual environments—either relatively open "worlds" such as Second Life or explicitly educational worlds such as River City[58] and QuestAtlantis[59]—to support student learning. The possibilities afforded by such "synthetic immersive environments," in which virtual reality is combined with goal-directed scenarios aiming at specific learning objectives, are just beginning to be explored.[60]

In QuestAtlantis, a MUVE designed for students in the fifth to ninth grades, students interact with each other and with automated (prescripted) avatars as they pursue solutions to complex problems involving science, math, or language arts content. The system keeps track of each student's progress in solving the problem, and the responses of the automated avatars change over time, so different clues or informational content (or different perspectives on that information) are offered in different situations. Thus both the context and the content change as the student's interaction with these other elements of the system progresses. Sasha Barab, devel-

oper of QuestAtlantis, speaks of "systems of transactivity" to capture the idea that a learning environment includes learners, contexts, and content—each involved in multiple transactions with the others and each evolving simultaneously with the others. Barab et al. (2008) say that this improves learning in at least the following ways: it allows intentionality to have real consequences; it creates real—or legitimate—dilemmas for the students that motivate them to engage directly with disciplinary content and skills; it dynamically changes contexts in response to student actions such that content and skills becomes progressively necessary to transform problematic situations into resolved situations (which then pose new problems, until the entire scenario is resolved); and it fosters student reflexivity by drawing attention to the ways that student choices lead to various consequences, and the possibly different consequences of different choices. These transformations have at least three major effects. First, students are no longer passive recipients of knowledge and skills, but agents of change. Second, content is no longer merely an item to be exchanged for grades or other indications of approval from the teacher, but something with real value in a given situation. Third, the context of learning is no longer projective (that is, a preparation for a possible future), but a here-and-now experience of real choices that have real consequences. These are shifts very much in harmony with Dewey's conceptions of participatory learning.

Indeed, the work that Barab and others are doing carries on the legacy of Dewey's "laboratory school." Rather than deciding what students should do based upon tradition or institutional demands, they are using their theories about student learning, and about the affordances of new technologies, to create new environments in which to study both learning and technological affordances, to develop new and better theories about each.[61] With the help of the MacArthur Foundation and others, they are now scaling up these experiments to also learn about how schools must adapt to incorporate these new approaches into their routines. While it is premature to predict exactly how such experiments will result in large-scale transformations of schooling, it is not too early to say that such transformations are coming—at least in some schools willing to embrace the change.

Conclusion

In this chapter, I have suggested that some of the reasons that schools have not embraced Deweyan participatory learning activities may be obviated by new technologies that can potentially make such activities more efficient, safer, and more specifically relevant to evolving educational goals. Yet there are hidden dangers both in the notion that technology can transform schooling on its own and in the notion that the application of technologies to create participatory learning experiences is merely a question of choosing the best means to reach a given end.

While I strongly believe that new technologies offer tremendous possibilities for transforming learning in schools, these possibilities do not in themselves guarantee that more uses of technology will improve schooling or that these uses will foster the kind of democratic society that Deweyans want. On the contrary, if

schools become more oriented around technology, they are just as likely to be further "geared to make the existing social order operate more efficiently, not to produce citizens who would challenge prevailing social norms"[62] or coopted into the corporate hegemonic agenda of what George Ritzer calls McDonaldization: efficiency, calculability, predictability, and control.[63] Virtual environments can be—and indeed have been—designed to support any kind of values, including those that are most destructive of democracy, including atomistic individualism, fascistic nationalism, rampant xenophobia, and narcissistic consumerism.[64] Overuse of sophisticated synthetic immersive environments also has the danger of taking young people out of their local contexts and problems in favor of completely decontextualized or generic "situations" not local to any time or place.[65]

Technology has a way of focusing attention on means rather than ends, whereas the choice of ends is the key to building a better society. Technology can help build engaging and effective participatory learning activities. But what kind of participation? And in what types of activities? And "effective" for what? These eternal questions require more than facility with new technologies or the possibilities they afford. They require critical consciousness, something that is acquired with a rare and particular kind of education, technologically afforded or not.

As Dewey wrote in *Democracy and Education*:

> Since the curriculum is always getting loaded down with purely inherited traditional matter and with subjects which represent mainly the energy of some influential person or group of persons in behalf of something dear to them, it requires constant inspection, criticism, and revision to make sure it is accomplishing its purpose. Then there is always the probably that it represents the values of the adults rather than those of children and youth, or those of pupils a generation ago rather than those of the present day. Hence a further need for a critical outlook and survey.[66]

With the increasing speed of technological change, this need remains greater than ever.

Notes

1. MW 1: 92.
2. MW 1: 93.
3. MW 9: 169.
4. Tanner, *Dewey's Laboratory School*; Mayhew and Edwards, *The Dewey School*.
5. See Null, "Education and Knowledge" and Norris, *The Promise and Failure of Progressive Education*.
6. Speaker, "Interactive Exhibit Theory" and Rheingold, *Smart Mobs*.
7. MW 1: 9.
8. MW 9: 204.
9. EW 1: 78.
10. EW 1: 7-8.
11. MW 1: 93
12. Mayhew and Edwards, *The Dewey School*, 249.

13. It is important to acknowledge that Dewey did not suggest that direct participation in occupations was the only educational approach that should be used, at all levels of education. Rather, he intended that it would be the primary approach used in elementary school, "where the demand for the available background of direct experience is most obvious," but that "the principle applies to the primary or elementary phase of every subject" (MW 9: 242). Dewey believed in starting with "active occupations having a social origin and use" but then proceeding "to a scientific insight in the materials and laws involved, through assimilating into their more direct experience the ideas and facts communicated by others who have had a larger experience" (MW 9: 201; see also LW 13: Ch. 7 and Kliebard, "Dewey's Reconstruction," 125).

14. MW 9: 269.

15. Kliebard, *The Struggle for the American Curriculum* and "Dewey's Reconstruction."

16. Barab and Roth, "Curriculum-Based Ecosystems"; Barab et al., Conceptual Play Spaces.

17. Schmelzkopf, "Interdisciplinarity, Participatory Learning."

18. Null, "Education and Knowledge."

19. Lipman, *Thinking in Education*.

20. Martin, *The Education of John Dewey*.

21. Lebow, "Constructivist Values"; Ashburn, "Attributes of Meaningful Learning."

22. Grabinger et al., "Rich Environments"; Grabinger and Dunlap, "Applying the REAL Model"; Bransford et al., *How People Learn*; Driscoll, "How People Learn"; Barab and Roth, "Curriculum-Based Ecosystems."

23. O'Neill, "From Fallacy to Integrity."

24. LW 13: 19.

25. LW 13: 22.

26. LW 13: 25.

27. Joyce, "Dynamic Disequilibrium."

28. MW 10: 146; Lave, "Situating Learning"; Daniels, *Literature Circles*; Smith and Semin, "Situated Social Cognition"; Gabora, "The Cultural Evolution."

29. LW 13: 27.

30. Vygotsky, *Mind and Society*.

31. Csikszentmihalyi, "Education for the Twenty-First Century."

32. MW 9: 173.

33. MW 9: 34.

34. MW 9: 280.

35. MW 9: 18.

36. MW 9: 44.

37. Palincsar and Klenk 1992, "Fostering Literacy Learning"; Collins, Brown and Holum, "Cognitive Apprenticeship."

38. MW 9: 368.

39. Wenger, *Communities of Practice*.

40. Warhurst, "We Really Felt Part of Something."

41. MW 9: 52.

42. Jackson, *John Dewey and the Lessons of Art*.

43. Garrison, *Dewey and Eros*.

44. Waks, "The Means-Ends Continuum."

45. MW 9: 266.

46. Cruickshank, "Classroom Games and Simulations"; Cortada, *A Bibliographic Guide*; Computer History Museum, Timeline of Computer History.

47. Steinkuehler and Duncan, "Scientific Habits of Mind."

48. Prensky, *Digital Game-Based Learning* and *"Don't Bother Me Mom"*; Gee, *What Video Games Have to Teach Us* and *Good Video Games*; Aldrich, *Simulations and the Future of Learning*; Gibson, Aldrich and Prensky, *Games and Simulations in Online Learning*.

49. Kirriemuir and McFarlane, *Report 8*, 27-28.

50. Van Eck, "Digital Game-Based Learning," 17; see also Bransford et al., *How People Learn*; Barab, Kling and Gray, *Designing Virtual Communities*.

51. Cunningham and Harrison, "Philosophical Questions about Learning Technologies."

52. Bricken, "Virtual Reality Learning Environments."

53. Gee, *What Video Games Have to Teach Us*; Barab et al., Conceptual Play Spaces.

54. Kurzweil, *The Singularity is Near*; Miller, "The Art of Virtual Persuasion."

55. MW 9: 23.

56. LW 13: 36.

57. Gee, *Good Video Games*.

58. Galas and Kettlehut, "River City, the MUVE."

59. Barab et al., "Making Learning Fun."

60. Sykes, Oskoz, and Thorne, "Web 2.0."

61. Nelson et al., "Design-Based Research Strategies."

62. Kliebard, "Dewey's Reconstruction of the Curriculum," 126.

63. Ritzer, *Explorations in Social Theory*.

64. Cunningham and Allen, "Philosophical Questions about Learning Technologies."

65. Barab et al., Conceptual Play Spaces.

66. MW 9: 250.

References

Aldrich, Clark. *Simulations and the Future of Learning : An Innovative (and Perhaps Revolutionary) Approach to e-Learning*. Hoboken: John Wiley & Sons, 2003.

Ashburn, Elizabeth A. "Attributes of Meaningful Learning Using Technology (MLT)." In *Meaningful Learning Using Technology: What Educators Need to Know and Do*, 8-25. Edited by E. A. Ashburn and R. E. Floden. New York: Teachers College Press, 2006.

Barab, Sasha and Wolff-Michael M. Roth. "Curriculum-Based Ecosystems: Supporting Knowing From an Ecological Perspective." *Educational Researcher* 35, no. 5 (2006): 3-13.

Barab, Sasha, Tyler Dodge and Adam Ingram-Goble. Conceptual Play Spaces and Transactive Engagement: A Twenty-First Century Pedagogy. Unpublished manuscript. 2008. Also available online at http://inkido.indiana.edu/research/onlinemanu/papers/rps_barab29.pdf/.

Barab, Sasha, Rob Kling, and James Gray. *Designing Virtual Communities in the Service of Learning*. Learning in doing. Cambridge: Cambridge University Press, 2004.

Barab, Sasha, Michael Thomas, Tyler Dodge, Robert Carteaux and Hakan Tazun. "Making Learning Fun: Quest Atlantis, a Game without Guns." *Educational Technology Research and Development* 53 (1): 86–107.

Bransford, John D., Ann L. Brown, and Rodney R. Cocking, eds. *How People Learn: Brain, Mind, Experience, and School.* Committee on Developments

in the Science of Learning, Commission on Behavioral and Social Sciences and Education of the National Research Council. Washington, DC: National Academy Press, 2000.

Bricken, Meredith. "Virtual Reality Learning Environments: Potentials and Challenges." *Computer Graphics: SIGGRAPH 91* 25 (3): 178-84.

Collins, Allan, John Seely Brown, and Ann Holum. "Cognitive Apprenticeship: Making Thinking Visible." *American Educator* (Winter 1991): 6-11, 38-46.

Computer History Museum. Timeline of Computer History. 2006. http://www.computerhistory.org/timeline/.

Cortada, James W. *A Bibliographic Guide to the History of Computer Applications, 1950-1990.* Bibliographies and Indexes in Science and Technology 10. Westport, Conn: Greenwood Press, 1996.

Cruickshank, Donald R. "Classroom Games and Simulations." *Theory into Practice* 19 (1): 75-80.

Csikszentmihalyi, Mihaly. "Education for the Twenty-First Century." *Daedalus: Proceedings of the American Academy of Arts and Sciences* 124, no. 4 (1995): 107.

Cunningham, Craig A. and Briana Allen. "Philosophical Questions about Learning Technologies: A Ground-Map." In *The SAGE Handbook of Philosophy of Education*. Edited by Richard Bailey, David Carr, Robin Barrow and Christine McCarthy. London: SAGE, 2010.

Cunningham, Craig A. and Kim Harrison. "The Affordances of Second Life for PreK-12 Education." In *Teaching through Multi-User Virtual Environments: Applying Dynamic Elements to the Modern Classroom*. Edited by Giovanni Vincenti and James Braman. Hershey PA: IGI Global, 2010.

Daniels, Harvey. Literature Circles: Voice and choice in the student-centered classroom. Markham: Pembroke Publishers, 1994.

Dempsey, John V., Barbara A. Lucassen, Linda L. Haynes, and Maryann S. Casey, M. S. An Exploratory Study of Forty Computer Games (COE Technical Report No. 97-2). Mobile, AL: University of South Alabama, 1997.

Driscoll, Mary P. How People Learn (and What Technology Might Have To Do with It). ERIC Digest. Syracuse NY: ERIC Clearinghouse on Information and Technology, 2002. http://www.ericdigests.org/2003-3/learn.htm.

Dusick, Diane M. 1998. "The Learning Effectiveness of Educational Technology: What Does That Really Mean?" *Educational Technology Review* 10 (Autumn): 10-12.

Gabora, Liane. 2008. "The Cultural Evolution of Socially Situated Cognition." *Cognitive Systems Research* 9 (1/2): 104-14.

Galas, Cathleen, and Diane Jass Ketelhut. "River City, the MUVE." *Learning and Leading with Technology* 33 (7): 31–32.

Garrison, Jim. *Dewey and Eros: Wisdom and Desire in the Art of Teaching*. New York: Teachers College Press, 1997.

Gee, James Paul. *Good Video Games and Good Learning*. NY: Peter Lang, 2007.

___. *What Video Games Have to Teach Us about Learning and Literacy*. New York: Palgrave, 2003.

Gibson, David, Clark Aldrich, and Marc Prensky. *Games and Simulations in Online Learning: Research and Development Frameworks*. Hershey PA: Information Science Pub, 2007.

Grabinger, R. Scott and Joanna C. Dunlap. "Applying the REAL Model to Web Based Instruction." In *Proceedings of World Conference on Educational Multimedia, Hypermedia and Telecommunications*, 447-52. Edited by P. Barker & S. Rebelsky. Chesapeake, VA: AACE, 2002.

Grabinger, R. Scott, Joanna C. Dunlap, and J. A. Duffield. "Rich Environments for Active Learning in Action: Problem-Based Learning." *ALT Journal* 5 (2): 3-17.

Jackson, Philip W. *John Dewey and the Lessons of Art*. New Haven: Yale University Press, 1998.

Joyce, Bruce R. "Dynamic Disequilibrium: The Intelligence of Growth." *Theory into Practice* 23 (1): 26-34.

Kirriemuir, John and Angela McFarlane. *Report 8: Literature Review in Games and Learning.* Bristol UK: Futurelab, 2006. Available online at http://www.futurelab.org.uk/research/lit_reviews.htm.Kliebard, Herbert M. "Dewey's Reconstruction of the Curriculum: From Occupations to Disciplined Knowledge." In *John Dewey and Our Educational Prospect: A Critical Engagement with Dewey's* Democracy and Education, 113-127. Edited by David T. Hansen. Albany: SUNY Press, 2006.

___. *The Struggle for the American Curriculum, 1893-1958.* New York: Routledge, 1995.

Kurzweil, Ray. *The Singularity is Near: When Humans Transcend Biology*. New York: Viking, 2005.

Lave, Jean. "Situating Learning in Communities of Practice." In *Perspectives on Socially Shared Cognition*, 63-82. Edited by Lauren Resnick, John M. Levine and Stephanie D. Teasley. Washington: American Psychological Association, 1991.

Lebow, David G. "Constructivist Values for Instructional Systems Design: Five Principles toward a New Mindset." *Educational Technology Research and Development* 41, no. 3 (1993): 4-16.

Lipman, Matthew. *Thinking in Education*. New York: Cambridge University Press, 2003.

Martin, Jay. *The Education of John Dewey: A Biography*. New York: Columbia University Press, 2002.

Mayhew, Katherine Camp and Anna Camp Edwards. *The Dewey School: The Laboratory School of the University of Chicago, 1896-1903*. New Brunswick, NJ: Aldine Transaction Publishers, 2007.

Miller, Greg. "The Art of Virtual Persuasion." *Science* 317 (5843): 1343.

Nelson, Brian, Diane Jass Keteihut, Jody Clarke, Cassie Bowman, and Chris Dede. "Design-Based Research Strategies for Developing a Scientific Inquiry Curriculum in a Multi-User Virtual Environment." *Educational Technology* 45 (1): 21-28.

Norris, Norman Dale. *The Promise and Failure of Progressive Education*. Lanham, Md: ScarecrowEducation, 2004.

Null, J. Wesley. "Education and Knowledge, Not 'Standards and Accountability': A Critique of Reform Rhetoric through the Ideas of Dewey, Bagley, and Schwab." *Educational Studies* 34(4): 397-413.

O Neill, L. "From Fallacy to Integrity: Dewey's Call for a Philosophy of Experience." *Journal of Thought*. 41(3): 73-78.

Palincsar, Annemarie Sullivan and and Laura Klenk. "Fostering Literacy Learning in Supportive Contexts." *Journal of Learning Disabilities* 25, no. 4 (1993): 211-25, 229.

Prensky, Marc. *Digital Game-Based Learning*. New York: McGraw-Hill, 2001.

___. *"Don't Bother Me Mom, I'm Learning!": How Computer and Video Games are Preparing your Kids for Twenty-First Century Success and How You Can Help!* St. Paul, Minn: Paragon House, 2006.

Rheingold, Howard. *Smart Mobs: The Next Social Revolution*. Cambridge, MA: Perseus, 2003.

Ritzer, George. *Explorations in Social Theory*. London: Sage, 2001.

Schmelzkopf, Karen. "Interdisciplinarity, Participatory Learning and the Geography of Tourism." *Journal of Geography in Higher Education* 26, no. 2 (2002): 181-95.

Smith, Eliot R. and Gün Semin. "Situated Social Cognition." *Current Directions in Psychological Science* 16, no. 3 (2007): 132-35.

Speaker, Katrynne Mcgrath. "Interactive Exhibit Theory: Hints for Implementing Learner-Centered Activities in Elementary Classrooms." *Education* 121, no. 3 (2001): 610-14.

Steinkuehler, Constance and Sean Duncan. "Scientific Habits of Mind in Virtual Worlds." *Journal of Science Education and Technology* 17, no. 6 (2008): 530-43.

Sykes, Julie M., Ana Oskoz, and Steven L. Thorne. "Web 2.0, Synthetic Immersive Environments, and Mobile Resources for Language Education." *CALICO Journal* 25, no. 3 (2008): 528-46.

Tanner, Laurel N. *Dewey's Laboratory School: Lessons for Today*. New York: Teachers College Press, 1997.

Van Eck, Richard. "Digital Game-Based Learning: It's Not Just the Digital Natives Who Are Restless." *EDUCAUSE Review* 41 (2): 16–30.

Vygotsky, Lev S. *Mind and Society: The Development of Higher Psychological Processes*. Cambridge, MA: Harvard University Press, 1978.

Waks, Leonard. "The Means-Ends Continuum and the Reconciliation of Science and Art in the Later Works of John Dewey." *Transactions of the Charles S. Peirce Society* 35, no. 3 (1999): 595-611.

Warhurst, Russell P. 2006. "'We Really Felt Part of Something': Participatory Learning among Peers within a University Teaching-Development Community of Practice." *International Journal for Academic Development* 11 (2): 111–22.

Wenger, Etienne. *Communities of Practice: Learning, Meaning, and Identity.* Cambridge, U.K.: Cambridge University Press, 1998.

Craig A. Cunningham is Associate Professor in the Department of Integrated Studies in Teaching, Technology, and Inquiry at National-Louis University in Chicago.