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How Blogs, Social Media, and Video Games Improve Education

Darrell M. West

The appearance of collaboration tools such as blogs, wikis, social media, and video games has altered the way individuals and organizations relate to one another.[1] There is no longer any need to wait on professionals to share material and report on new developments. Today, people communicate directly in an unmediated and unfiltered manner.

These developments have lowered information costs and altered the dynamics of information dissemination. On some platforms, communications costs have dropped virtually to zero. No longer are communications one way or based on organizational hierarchies. Rather, organizational expression moves in many directions at once and interacts with a wide range of personnel involved in the process.[2]

The emergence of new platforms has been particularly dramatic in classroom transmissions. As Stanford University communications professor Howard Rheingold notes, "Up until now, 'technology' has been an authority delivering the lecture which [students] memorized. If there is discussion, it's mostly about performing for the teacher. Is it possible to make that more of a peer-to-peer activity? Blogs and forums and wikis enable that. So a lot of this is not new, but it's easier to do [and] the barriers to participation are lower now."[3]

Alan Daly, at the University of California at San Diego, predicts that education innovation "will shift away from experts and capacity building to focus on networks. The budget crisis will continue indefinitely. We have to start thinking about the expertise that resides in the system, and we have to be connected in order to make use of it."[4] Daly believes education "is moving away from large-scale prescriptive approaches to more individualized, tailored, differentiated approaches."

Yet despite the wealth of communications opportunities offered by these changes, their impact on learning and instruction is still not clear. How do these technologies affect students, teachers, parents, and administrators? Do they enable new approaches to learning and help students master substantive information? In what ways have schools incorporated electronic communications in the learning process and messages to external audiences?

Blogs

Many contemporary schools do not encourage two-way communications, student collaboration, or global networking. Alan November, a senior partner and the founder of November Learning, notes that "we currently block schools from connecting globally, yet it is amazingly important. Teaching children to have global empathy is to allow them to work with people all over the world."[5]

Yet weblogs represent a way for people to share information, convey material, and express their views. Many Internet sites currently offer features that allow individuals to write opinions, make comments on daily events, and provide news coverage of breaking developments.[6] These opportunities are not restricted to

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professional journalists but rather are open to anyone interested in the subject.

The interactive quality of posts contributes to the dynamic nature of the web and enables multidirectional communications among educators, students, and parents. New types of communicators are empowered by digital technology, and this has altered the way in which people access and share information.

No surprise, then, that the popularity of blogs has grown enormously. The marketing research company Nielsen estimates that there are over 156 million blogs on the Internet.[7] This form of communication is now one of the most prevalent contemporary mechanisms for personal expression. Indeed, blogs have democratized the flow of information around the world.

In the area of education, blogs are deployed in several different ways. They provide a mechanism for the dissemination of education-related news. When schools need to announce news or face particular problems or encounter major crises, officials and community members can offer their own perspectives on what the issue is and how it should be addressed.

In addition, these communications devices give parents, students, and people from the wider community an opportunity to express opinions on developments within the school district. They provide a platform for general expression and feedback that can be very important to public officials. They allow people to complain about problems, offer solutions, or otherwise convey their feelings.

It is estimated that there are more than 5,000 education blogs in the United States.[8] The blogs cover a wide range of topics, from school finance and education news to instructional technology and pedagogical techniques. Bloggers contextualize information and provide a narrative for the interpretation of particular events. One of their most important functions is putting discrete bits of material in a broader narrative and expressing a point of view.

Increasingly, blogs are being incorporated into the classroom for instructional purposes. They allow collaboration between students and teachers and among students themselves. Students can pose questions and get answers, which are then shared with others in the network.[9]

Alternatively, students can read books and share their overall impressions with teachers and external mentors.[10] Students can write their own views of the volume and then see what others have to say. In organizations such as In2Books.org, teachers and mentors pose questions and encourage students to think more deeply about the book's content and value.

Research on class-related blogs suggests they can be effective for instructional purposes. A British teacher uses blogs to "showcase the work of the children." He says that "in the best of the class blogs I've seen, there's an opportunity for everyone to learn and everyone to teach—and there's built-in feedback and assessment."[11]

In other research, students enjoyed the software program called Blogger, which allowed students and teachers to share their reactions to course materials and activities. For example, the instructor used that platform to make weekly posts

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regarding progress to date in the class, issues that needed to be addressed, and feedback on student presentations. This promoted an interactive atmosphere in the course and provided timely feedback at weekly intervals in the class.[12]

Some instructors use Twitter as a "microblogging" tool for college students. Just before class, they use the Internet site to pose questions designed to stimulate student discussion and correct any prior misunderstandings of course materials. Students then tweet responses and questions back to the instructor and fellow students. Preassessment and postassessment data analysis has found that "students had an 87 percent mastery of questions which were Tweeted compared to a 43 percent mastery of those which were not." Interviews conducted after the course ended further revealed that "82 percent of the participants self-reported they felt more accessible to the university professor through instant feedback for questions regarding classroom projects."[13] This suggests the possible value of blogging and tweeting for instructional purposes.

A meta-analysis of ten blogging research projects found that the use of blogs encouraged reflection, critical thinking, enhanced writing skills, and collaboration. In general, the authors report, "the empirical evidence supports the educational value of blogging activities."[14] However, in looking across studies, they also note the importance of structured learning. For effective teaching, instructors need to provide clear guidelines and explain the rationale for pedagogic activity. Failure to do so undermines student motivation and complicates task completion.

One study at the Vienna University of Technology in Austria examined why students did not blog. As part of a pilot project, this institution set up free blog accounts for all students, faculty, and staff at the university. These were not attached to any particular course or program of study but were freestanding platforms.

However, only 7.5 percent of Vienna University students wrote blogs, and 79 percent of the entries were posted by a mere 20 percent of the bloggers. This suggests that a relatively small number of college students used the blogs.[15] When asked why they did not take advantage of this digital platform, those who did not blog stated that they preferred to communicate online through one-on-one means and that they feared loss of privacy from open-platform blogging.

Wikis

Wikis are a type of website that can be edited on a platform by multiple numbers of users.[16] Wikis allow individuals from varying backgrounds and viewpoints to work together to accumulate knowledge and offer opinions on everything from encyclopedia entries to federal regulations and legislative provisions.[17] Participant comments are shared collectively and are subject to group editing.[18]

Wiki interactions are based on a type of collaboration known as *crowd-sourcing,* a term originally coined by Jeff Howe of *Wired* magazine. Crowd-sourcing suggests that knowledge can best be created by vetting discrete bits of information through

"crowds" and taking their collective judgment as the best wisdom.[19] Howe argues that group intelligence represents a more effective filter than the viewpoints of particular individuals or experts.

Matt Evans notes that "crowdsourcing taps into the global world of ideas, helping companies work through a rapid design process."[20] Those with relevant knowledge in a particular area can work together, compare notes, argue with one another, and ultimately arrive at a collective sense of the subject being discussed.

Many schools have developed wikis for educational purposes. Teachers in Canada and the United Kingdom have experimented with wikis as a way to teach poetry writing. Interviews with fifty-six English and language instructors indicated that many found wikis helpful as a pedagogic tool. Those who were trained in wiki instruction said that they felt more confident and appreciate the collaborative platform for sharing ideas about poetry instruction.[21]

An Australian instructor found that wikis were useful for distance education and social work courses. This was particularly the case with group projects that involved sharing views regarding applied practice experiences. Students reported that they were pleased with the experience, felt they generated a "broader and deeper understanding of the material," and enjoyed the ability to include external links and graphics through a collaborative interface.[22]

Professors at Northeastern Illinois University have developed Chem-Wiki, which covers online lab reports for organic chemistry courses. This enables students to collaborate on research projects, share observations with one another, add references, multimedia, or visual features to the report, and file a comprehensive report about each experiment. Based on the pilot project, instructors found that the new platform "enhances the learning experience of students through opportunities for increased group collaboration. This format is endlessly flexible as it can be organized and reorganized in a countless number of ways. This makes the wiki format a powerful tool for learning, as students' different viewpoints are shared and a deeper understanding is integrated into the report."[23]

Professors at Old Dominion University use a Wikibook project that allows students to assemble relevant course materials through a wiki interface. Professors become the "guide on the side" as opposed to the "sage on the stage" and move past the hierarchical, one-way relationship with faculty compiling the readings and students reviewing the texts.[24] This pilot project enables students to collaborate with faculty and other students on course readings and write essays on various aspects of the course materials.

One of the virtues of this approach is that students have some part in deciding what materials are covered in the course and have the chance to update reading lists over the course of the semester. Unlike reliance on outdated textbooks or course materials not of great interest to students, student participation in reading selection adds relevance and immediacy to course texts. This helps engage students in course materials and overall instructional activities.

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Social Media and Mobile Devices

Social media include communications outlets that connect sets of people around collective interests and allow for the sharing of ideas and observations. These platforms knit together discrete individuals and enable them to communicate recommendations, reactions, or remedies to others who have signed up at that site.[25]

According to researchers, the virtues of social media and mobile devices include "allowing multiple entry points and learning pathways, supporting multi-modality, enabling student improvisation, and supporting the sharing and creation of student artifacts on the move."[26] Students can interact with one another and take handheld devices into the field for data gathering and hypothesis testing.

However, many elementary and secondary schools ban mobile devices, arguing that they are not helpful to the education process. According to Scott McLeod, of Iowa State University, numerous educators at various levels see handheld devices as "distractions and problems" that distract from pedagogical opportunities.[27]

Despite this resistance, social media have become a larger part of higher education instruction. Alan Daly thinks that "the role of social media is to make boundaries irrelevant between ages and disciplines."[28] Finding interconnections and building collaboration are crucial to future education processes.

A recent online survey of 1,920 U.S. faculty members found that "nearly two-thirds of all faculty have used social media during a class session, and 30 percent have posted content for students to view or read outside class. Over 40 percent of faculty have required students to read or view social media as part of a course assignment, and 20 percent have assigned students to comment on or post to social media sites."[29]

With the extraordinary interest of young people in social media, these numbers are expected to rise exponentially in the future. Students love the connectivity and interactivity of these kinds of outlets. They enjoy the opportunity to become part of specialized networks based on shared interests. This is especially true in education settings.

However, participating professors worry about two aspects of online sharing: loss of privacy and the integrity of student postings. Among the faculty surveyed, "80 percent report that 'lack of integrity of student submissions' is an 'important' or 'very important' barrier, and over 70 percent say privacy concerns are an 'important' or 'very important' barrier."[30]

In spite of these concerns, though, professors see social media as important tools for instruction. When asked how valuable they are for educational purposes, 70 percent agree that "video, podcasts, blogs, and wikis are valuable tools for teaching." Fifty-eight percent say that "social media can be a valuable tool for collaborative learning."[31]

Facebook is the most popular example of social media. With 800 million users

around the world, it provides a platform for sharing photographs, daily thoughts, friend recommendations, and videos, among other things. It allows people to recommend movies, books, TV shows, videos, and media articles to other people. The platform creates "trusted networks" based on friendship, family ties, and social connections.

According to a new Pew Internet and American Life Project survey, Facebook has become a major source of interactive discussion. Twenty-two percent of its users comment daily on someone else's post during a typical week, and 20 percent comment on somebody's photo. Forty-four percent of social media users say they update their status at least once a week, and among young people aged eighteen to twenty-two, that number rises to 73 percent.[32]

The frequent, personal interactivity demonstrated by this behavior creates an opportunity for school officials, nonprofit organizations, and advocacy groups to engage people and drive civic conversations. Facebook, MySpace, Google+, and other social networking tools make it possible to extend conversations virtually and reach large numbers of individuals.

Because it is based on peer recommendations, social media referrals carry more weight than those given by strangers. Research demonstrates that social media work through "trust filters." In a world of information overflow, it is hard for people to evaluate competing claims. Public officials often disagree not just on interpretations but also on the facts.

Amid political polarization and ideological ferment, people increasingly use their personal networks to fact-check claims, evaluate the quality of information, and alert them to what is going on in the world. As pointed out by Lee Rainie, director of the Pew Internet and American Life Project, these developments allow individuals and their networks to "act like broadcasters and publishers" and thereby transform the nature of online political communications.[33]

According to Rainie, those seeking to engage citizens in the political process must win the trust of specialized social networks to be influential today. Future political influence is going to be network based because those networks are the filters used by many individuals to access and evaluate political information. Officials unable to get past those trust filters will not be able to engage the public and influence the course of electoral events.

In the area of education, there are several mobile applications. Handheld devices allow students and teachers to share classroom material. Sites can be developed around a particular subject, and participants can share thoughts, make recommendations, and react to one another's observations in ways that inform the group discussion.[34]

There are also sites devoted to group projects. Students from different schools or even different countries can come together over the Internet and work on common projects. They can transmit research materials and disseminate papers and analysis to those working on that activity. This allows them to overcome geographic distance and to learn in connected ways.

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Some elementary schools use knowledge-building exercises as a way to build collective responsibility and community knowledge. Teachers focus on developing ideas rather than completing particular tasks. This puts the emphasis on creating knowledge and solving problems. An analysis of log data from student conversations reveals a "significant correlation between note reading and knowledge gained."[35]

Podcasts and file sharing represent still another instructional application. A July 2011 Google search of the phrase *podcasts and education* generated a total of over 34 million examples. According to research by Elizabeth Wilson and her colleagues, the most popular audio or visual resources for the classroom include material from National Public Radio, C-SPAN, Podcast Alley, iTunes, and Gilder Lehrman.[36]

Research on school's social media collaborations reveals that they do a good job of connecting students for instructional purposes. One study of Twitter used for classroom discussion found "broader student participation through Twitter."[37] Unlike class discussions, often dominated by a handful of speakers, use of the social media platform encourages many more students to offer comments. This was particularly the case with shy students.

Some education institutions are using Skype phone-video connections to link students around the world. According to Alan November, a school in Worchester, Massachusetts, runs "five concurrent courses using Skype. Every seventh-grader's lab partner is in England. They design wind turbines through another company in Massachusetts. Each student has a mentor engineer and makes models in the seventh grade."[38]

Video Games

The popularity of video games has grown tremendously in recent years. Consumers spend millions of dollars each year on purchase of these products. Video games have become a billion-dollar consumer business owing to the popularity of interactive digital media. Indeed, games have become one of the most popular forms of mass entertainment.

According to a Pew Internet and American Life Project's survey of American teenagers, the most popular game genres include racing (played by 74 percent of teens), puzzles (72 percent), sports (68 percent), action (67 percent), adventure (66 percent), rhythm (61 percent), strategy (59 percent), simulation (49 percent), fighting (49 percent), first-person shooters (47 percent), role-playing (36 percent), survival (32 percent), massively multiplayer online games (21 percent), and virtual worlds (10 percent).[39] World of Warcraft has 12 million users who have logged over 50 billion hours.[40]

In the education area, teachers are incorporating video games to teach basic skills and concepts. Among popular products are Electronmagnetism Supercharged, Betty's Brain, Quest Atlantis, Whyville, BioLogica, Grey Anatomy, and River City. These games present relevant information and give students a chance to solve practical

problems.[41] Meanwhile, the Civilizations game helps students learn about geography. Using world and regional maps, students "come to understand how the constraints of the Mideast lead to conflict," according to Constance Steinkuehler, of the University of Wisconsin at Madison.[42]

These games also tap into interests that students bring to the classroom. Steinkuehler notes that "games are nothing more than the Trojan horse for interest-driven learning. They really are great at starting with individual interest and then enabling where you want to go with that interest."[43] They become a vehicle with which to explore subjects in greater detail.

Many of these software products deal with science. For example, Filament Games has developed products that are Internet based and feature different kinds of scientific inquiry. Its games prompt students to explore various scientific challenges and give them exercises that test key theories and hypotheses. This can involve data analysis, three-dimensional animations, video clips, or scientific simulations.[44]

Some also focus on mathematics. For example, the game Zombie Division teaches math skills using a three-dimensional adventure game based on fighting zombies. Game players must divide the number of skeletons by two to advance through various stages of the game. Higher levels require more complex calculations and more advanced computations. Comparisons of pregame and postgame math ability demonstrate significant improvement in comprehension for those exposed to the game.[45]

The National Research Council extols the virtues of these types of exercises. According to its scientists, the games "enable learners to see and interact with representations of natural phenomena that would otherwise be impossible to observe—a process that helps them to formulate scientifically correct explanations for these phenomena."[46]

There is some debate over whether game playing produces better attention and performance. One experimental study finds that expert gamers "could track objects moving at greater speeds, better detected changes to objects stored in visual short-term memory, switched more quickly from one task to another, and mentally rotated objects more efficiently."[47] However, in another study, extensive gaming did not improve performance on cognitive tasks. Gamers were not more adept than nongamers on executive function activities. Having experience in this area did not translate into improvements in cognitive thinking.

Doctors see great potential for video games in radiology education and practice. Among the advantages are improvements in rapid decision making, increases in multitasking capabilities, and enhancement in collaboration and problem-solving skills. Video gaming improves visual perception, a skill that is particularly beneficial in medical imaging applications.[48]

Performance assessment is built into many of the games. Teachers can see in real time at what point in the game students master concepts and how long it takes them to get there. Teachers can monitor how many game prompts it takes for each person to figure out the science question and then to find the answer.[49] Different levels of

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comprehension are built into the game in the same way that entertainment games feature various levels of mastery. Once students have demonstrated knowledge at one level, they can go on to higher categories of knowledge.

Those who have difficulty can be provided with remedial instruction. The games provide detailed feedback indicating when and where pupils have problems and then make suggestions on how to find helpful information. This helps teachers identify those students in need of greater attention or remedial help. There is no sense of a wrong answer but rather an emphasis on how to keep playing until the player solves the problems at hand.

With the popularity and effectiveness of this learning approach, schools such as Quest to Learn, which is based in New York City and Chicago, employ video games to engage students in the education process. Its curriculum uses games to teach critical thinking and problem-solving skills. Students develop their own video games and use other products already in existence to learn math, science, English, and logic.[50]

Scientists at the Massachusetts Institute of Technology have developed a new programming language known as Scratch. It has a user-friendly interface that enables children to drag and drop programming language that creates interactive effects, animation, videos, and game movement. This allows them to build their own video games based on programming building blocks.[51]

In general, video games can be effective educators. James Gee, of the University of Wisconsin at Madison, points out that learning accompanied by entertainment is most enjoyable for students and therefore most likely to be effective with young people. In addition, he notes that "good games allow players to operate within, but at the outer edge, of their competence." By challenging players to think more deeply, these packages push individuals to perform better and at a higher level. Finally, games help people apply current knowledge in new ways and in new situations. That helps them to generalize their experience and broaden their knowledge base.[52]

Researchers have found that collaboration enabled by video stories is very effective at solving mathematical problems. According to Brigid Barron, of Stanford University, "Students in the collaborative conditions outperformed students in the individual condition on their initial attempt at the problem. In addition, students in the collaborative condition performed better on the mastery and near-transfer problems on 2 out of 3 performance measures."[53]

Studies have also indicated that video game players outperform nonplayers on several learning dimensions. An experimental study of image identification found that video players "were able to detect the changes while requiring less exposure to the change" and that they "employed broader search patterns when scanning scenes for potential changes."[54] Those strategies allow players to perform better and enhanced the learning process.

Others have found that games improve quantitative reasoning. An analysis of young children aged nine to fifteen years old over a six-month period demonstrates that they learned quantitative skills. According to the researchers, games "lead to

more advanced quantitative reasoning that analyzes the tradeoffs of using particular sets of resources."[55] Students can learn how to use these skills for analytical and predictive purposes and to determine ways to answer questions by "asking basic questions about efficiency, tactics, strategies, and success."[56]

Such features work by combining collaboration with experiential learning. Kurt Squire, of the University of Wisconsin at Madison, argues that "the shift toward games also represents an intellectual recognition among many that they represent experimental learning spaces, spaces where learners have rich, collaborative, and cooperative interactions where they think with complex tools and resources in the service of complex problem-solving."[57]

iCivics offers online games for civics education such as Do I Have A Right?, Supreme Decisions, and Branches of Power. An independent evaluation by the Persephone Group found that students playing Do I Have A Right? improved knowledge of civics content by 13.7 percent between pre- and posttests; players of Supreme Decisions, 14.4 percent; and players of Branches of Power, 46 percent. Eighty-six percent of students reported that "they would rather learn from a game than a textbook."[58]

Conclusion

Digital tools represent new ways for participation, engagement, and collaboration to take place.[59] Through digital communications, students, teachers, parents, and administrators can share insights and reactions and develop a better understanding of instructional activities. Many teachers are incorporating elements of blogs, wikis, social media, and video games into the classroom.[60] They are experimenting with new delivery systems and report high student satisfaction with these pedagogical approaches.[61]

Alan November argues that in the contemporary world, "information will continue to come in multiple streams. You're going to see the Twitter feed, watch a video, and read a book. Show [students] that there are different channels and teach them to understand every stream."[62] These possibilities have broad implications for education delivery and student engagement in the classroom. Increasingly, social media are serving as trust filters for teachers and students, and digital content recommended by one's friends and acquaintances encourage web users to access particular content.[63]

Educators can take advantage of trusted networks to engage students and help them learn important skills and concepts. Based on psychological research, ensuring that particular books or articles are posted on student networks enhances pupil interest in the subject and the likelihood that they will view and trust that material. That type of collaboration is a vital new part of the educational process.

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[1] Jana Hrdinova and Natalie Helbig, "Designing Social Media Policy for Government," Issues in Technology Innovation 4 Brookings, (January 2011).

[2] Darrell West, Digital Schools: How Technology Can Transform Education, Brookings Institution Press, 2012.

[3] Howard Rheingold, phone interview by author, July 22, 2011.

[4] Alan Daly, phone interview by author, April 19, 2011.

[5] Alan November, phone interview by author, July 7, 2011.

[6] David Kline and Dan Burstein, *Blog!: How the Newest Media Revolution Is Changing Politics, Business, and Culture* (Weston, Conn.: Squibnocket Partners, 2005).

[7] Nielsen Company, "Blog Pulse," February 16, 2011. See http://unpan1.un.org/intradoc/groups/public/documents/un-dpadm/unpan046715.pdf.

[8] Darrell West, Grover Whitehurst, and E. J. Dionne, "Invisible: 1.4 Percent Coverage for Education Is Not Enough," Brookings Institution Policy Report, December 2, 2009.

[9] Hyung Nam Kim, "The Phenomenon of Blogs and Theoretical Model of Blog Use in Educational Context," *Computers and Education* 51, no. 3 (2008): 1342–52.

[10] Judy Robertson, "The Educational Affordances of Blogs for Self-Directed Learning," *Computers and Education* 57, no. 2 (2011): 1628–44; Eddy Chong, "Using Blogging to Enhance the Initiation of Students into Academic Research," *Computers and Education* 55, no. 2 (2010): 798–807.

[11] Quoted in Judy Friedberg, "Class Blogs: A Better Way to Teach?," *The Guardian*, November 4, 2010.

[12] Evrim Baran and Ann Thompson, "Extending Classroom Interaction to the Cyberspace with Facebook, Moodle, and Blogger," paper prepared for the annual convention of the Association for Educational Communications and Technology, Anaheim, Calif., 2010.

[13] Ingrid Graves and Yadi Ziaeehezarjeribi, "Microblogging with University Students 24/7: Twitter Comes of Age," paper prepared for the annual convention of the Association for Educational Communications and Technology, Anaheim, Calif., October, 2010.

[14] Yu-Hui and Yu-Chang Hsu, "Blogging in Higher Education: Issues, Challenges, and Design Considerations," paper prepared for the annual convention of the Association for Educational Communications and Technology, Anaheim, Calif., October, 2010, p. 57.

[15] Monika Andergassen and others, "Weblogs in Higher Education: Why Do Students (Not) Blog?," *Electronic Journal of e-Learning* 7, no. 3 (2009): 203–15.

[16]Don Tapscott, *Wikinomics: How Mass Collaboration Changes Everyting* (New York: Portfolio Hardcover, 2008).

[17]Bo Leuf and Ward Cunningham, *The Wiki Way: Quick Collaboration on the Web* (Boston: Addison-Wesley, 2001).

[18]Carl Challborn and Teresa Reimann, *International Review of Research in Open and Distance Learning* 6, no. 2 (2005): 1–5.

[19]Jeff Howe, "The Rise of Crowdsourcing," *Wired*, June, 2006.

[20]See Matt Evans, "The Power of Crowdsourcing" (http://www.exinfm.com/board/crowdsourcing.htm).

[21]Sue Dymoke and Janette Hughes, "Using a Poetry Wiki: How Can the Medium Support Pre-Service Teachers of English in Their Professional Learning about Writing Poetry and Teaching Poetry Writing in a Digital Age?" *English Teaching* 8, no. 3 (2009): 91–106.

[22]Peter Jones, "Collaboration at a Distance: Using a Wiki to Create a Collaborative Learning Environment for Distance Education and On-Campus Students in a Social Work Course," *Journal of Teaching in Social Work* 30, no. 2 (2010): 233.

[23]Edward Elliott and Ana Fraiman, "Using Chem-Wiki to Increase Student Collaboration through Online Lab Reporting," *Journal of Chemical Education* 87, no. 1 (2010): 54–56.

[24]Patrick O'Shea and others, "A Technological Reinvention of the Textbook: A Wikibooks Project," *Journal of Digital Learning in Teacher Education* 27, no. 3 (2011): 109–14.

[25]Yochai Benkler, *The Wealth of Networks: How Social Production Transforms Markets and Freedom* (Yale University Press, 2006).

[26]Chee-Kit Looi and others, "Anatomy of a Mobilized Lesson: Learning My Way," *Computers and Education* 53, no. 4 (2009): 1120–32.

[27]Scott McLeod, phone interview with author, April 18, 2011.

[28]Daly, interview.

[29]Mike Moran, Jeff Seaman, and Hester Tinti-Kane, "Teaching, Learning, and Sharing: How Today's Higher Education Faculty Use Social Media," Pearson Learning Solutions and Babson Survey Research Group, 2011, p. 3.

[30]Ibid.

[31]Ibid., p. 16.

[32]Keith Hampton and others, "Social Networking Sites and Our Lives," Pew Internet and American Life Project, June 16, 2011, p. 3.

[33]Darrell West, "Ten Ways Social Media Can Improve Campaigns and Reinvigorate Democracy," Brookings Institution Policy Report, June 28, 2011.

[34]O'Shea and others, "A Technological Reinvention of the Textbook."

[35]Jianwei Zhang and others, "Sustaining Knowledge Building as a Principle-Based Innovation at an Elementary School," *Journal of the Learning Sciences* 20 (2011): 278–79.

[36]Elizabeth Wilson and others, "Retooling the Social Studies Classroom for the Current Generation," *The Social Studies* 102 (February 24, 2011): 70.

[37]Cable News Network, "Twitter Finds a Place in the Classroom," June 8, 2011. (http://articles.cnn.com/2011-06-08/tech/twitter.school_1_twitter-students-classroom-discussions?_s=PM:TECH).

[38]November, interview.

[39] Amanda Lenhart and others, "Teens, Video Games, and Civics," Pew Internet and American Life Project, September 16, 2008, p. ii.

[40]Adam Penenberg, "How Video Games Are Infiltrating—and Improving—Every Part of Our Lives," Fast Company.com, December 13, 2010, (http://www.fastcompany.com/magazine/151/everyones-a-player.html).

[41]Chris Dede, "Learning Context: Gaming, Simulations, and Science Learning in the Classroom," National Research Council, September 2009.

[42]Constance Steinkuehler, phone interview with author, May 19, 2011.

[43]Ibid.

[44] Matthew Marino and Constance Beecher, "Conceptualizing RTI in 21st Century Secondary Science Classrooms: Video Games' Potential to Provide Tiered Support and Progress Monitoring for Students with Learning Disabilities," *Learning Disability Quarterly* 33, no. 4(Fall 2010): 299–311.

[45]Jacob Habgood and Sharon Ainsworth, "Motivating Children to Learn Effectively: Exploring the Value of Intrinsic Integration in Educational Games," *Journal of the Learning Sciences* 20, no. 2 (2011): 169–206.

[46]Katie Ash, "Games and Simulations Draw Children into New Vistas for Accessing Science," *Education Week,* April 6, 2011, p. 12.

[47]Walter Boot and others, "The Effects of Video Game Playing on Attention, Memory, and Executive Control," *Acta Psychologica* 129, no. 3 (2008): 387.

[48]. Bruce Reiner and Eliot Siegel, "The Potential for Gaming Techniques in Radiology Education and Practice," *Journal of the American College of Radiology* 5, no. 2 (2008): 111.

[49]Kimon Keramidas, "What Games Have to Teach Us about Teaching and Learning," *Currents in Electronic Literacy* (2010), (http://currents.dwrl.utexas.edu/2010/keramidas_what-games-have-to-teach-us-about-teaching-and-learning).

[50]Penenberg, "How Video Games Are Infiltrating Every Part of Our Lives."

[51]Nic Fleming, "Creating Your Own Computer Game Is Child's Play," *New Scientist,* August 2, 2008, p. 26.

[52]James Paul Gee, "Learning about Learning from a Video Game," University of Wisconsin at Madison Center for Education Research, n.d.

[53]Brigid Barron, "Problem Solving in Video-Based Microworlds: Collaborative and Individual Outcomes of High-Achieving Sixth-Grade Students," *Journal of Educational Psychology* 92, no. 2 (2000): p. 391.

[54]Kait Clark, Mathias Fleck, and Stephen Mitroff, "Enhanced Change Detection Performance Reveals Improved Strategy Use in Avid Action Video Game Players," *Acta Psychologica* 136, no. 1 (2011), p. 67.

[55]Tom Satwicz and Reed Stevens, "Playing with Representations: How Do Kids Make Use of Quantitative Representations in Video Games?," *International Journal of Computer and Math Learning* 13, no. 3 (2008): p. 179.

[56]Ibid., p. 202.

[57]Kurt Squire, "Video Game–Based Learning," *Performance Improvement Quarterly* 21, no. 2 (2011): 7–36, p. 2.

[58]Persephone Group, "Evaluation of iCivics Games: Executive Summary," October 2009.

[59]Richard Davis and Diana Owen, *New Media and American Politics* (Oxford University Press, 1998).

[60]Ben Wildavsky, Andrew Kelly, and Kevin Carey, eds., *Reinventing Higher Education: The Promise of Innovation* (Harvard Education Press, 2011).

[61]Tapscott, *Wikinomics*.

[62]November, interview.

[63]West, "Ten Ways Social Media Can Improve Campaigns and Reinvigorate Democracy."