Connie Yowell and Diana Rhoten
John D. and Catherine T. MacArthur Foundation

Digital Media and Learning

Technology is here to stay. As educators, we can attempt to ignore it or we can work to harness it. We can face the fact that many—perhaps most—children say that what they like to do best has something to do with digital media, be it playing games on their Nintendo DS or Wii system, making music, creating videos, or social networking. It is clear that the lives of the young people enrolled in our colleges and universities are ever-increasingly online and interconnected. Connie Yowell, Director of Education Grantmaking at the John D. and Catherine T. MacArthur Foundation, where she oversees the foundation's program on Digital Media and Learning, and Diana Rhoten, director of the Knowledge Institutions program area at the Social Science Research Council, and former director of the Virtual Organizations and the Cyberlearning program areas at the National Science Foundation ask, *Where is school?* They call for a new paradigm of participatory learning, one that is based on a research and development program and focused on taking advantage of new technologies and enabling new processes for learning. One of the key principles of this new theory of learning with technology is that it be designed to close the knowledge gap rather than expand it. Yowell and Rhoten emphasize that while this paradigm shift will require innovation on the part of institutions, the individuals we teach, on the other hand, are already well down this path.

Key Notes

Given the highly networked nature of students' lives, it is clear that they can learn almost anywhere and anytime—which begs the question, *Where is school?* We have begun to think of schools as just one node on a young person's learning network, and to wonder what the rest of the learning network consists of.

While institutions feel significant pressure to be early adopters, the reality is that teaching and learning are still highly contained within the classroom, with little attention devoted to tapping the opportunities for informal learning outside it.

The NSF Task Force on Cyberlearning recently wrote that cyberlearning—the use of networked computing and communications technologies to support learning—enables "customized interaction with diverse learning materials on any topic…. Learning does not stop with K-12 or higher education; cyberlearning supports continuous education at any age."

It is time for a paradigm shift in how we think about information seeking, learning, and the role of peers and assessment. Yet it is no small challenge for institutions to consider what it means to become truly networked and to tap the potential of such interconnectedness. It calls for a commitment to improve learning, coupled with an acceptance of innovation and change on the part of institutions.

Digital Media and Learning

The MacArthur Foundation launched its Digital Media and Learning initiative in 2006 with a number of grants, the largest of which funded a three-year ethnographic study about how young peoples' learning is changing through the use of digital media. The study, involving more than 700 middle and high school students, found that their online time is highly interactive and that learning is happening in a rich social context that is participatory and peer-based. Further, the learning is interest driven. That is, the young people organize their networked interactions based on common interests. The students move seamlessly from one medium to another, unaware of the technology that enables it (as older users tend to be). They move easily between the local and the global, the virtual and the physical.

Given the highly networked nature of the students' lives, it is clear that they can learn almost anywhere and anytime—which begs the question, "Where is school?" We have begun to think of schools as just one node on a young person's learning network, and to wonder what the rest of the learning network consists of. Are classrooms with blackboards and textbooks and teachers up front really the best learning environment we have to offer? We at the foundation think not, and have asked how we can

support the design of learning environments of the future.

To that end, MacArthur supports an after school program in Chicago called Digital Youth Network (DYN). Similar to many after school programs, DYN is based on pods where the students can engage in various activities such as making videos, music, publishing, and so on. The backbone of the program is its social networking tool—iRemix World—which is very much like Facebook and MySpace but customized somewhat to focus more on learning and less on socializing. This use of commercial tools that clearly appeal to students to support learning is promising. Three factors about iRemix, as it is called, are key: First, the network has mentors—adults who actively participate in the network by, for example, sharing videos or music they have created and otherwise participating as equal members. (Contrast this mentor role with that of typical teachers.) Second, the learning is participatory and peer-based. Peers are determined not by friendship or age, but rather are defined by similar interests and expertise. Mentors play another role in the network, too, which is to provide comments and critiques of the students' productions. The students do so as well, all via blogs. Feedback and reflection are extraordinarily important in the network; likewise, its third key characteristic is that it facilitates multiple iterations of the students' productions. Unlike a paper, which they hand in at school and may never look at again, in the iRemix world the students revisit their work over and over again. They are incented by a built-in economy of iRemix dollars that they earn based on the quality of the comments about their work and on those they contribute about the work of others. iRemix dollars can be used to gain privileges such as access to top end video or recording equipment.

The DYN program can point to noteworthy results, both in terms of students' creations and transformations in their relationships to their teachers and school. A question we face now is, what might all this mean for K-12 and higher education? We know that our students live in public, networked worlds. Both the MacArthur ethnographic study and the DYN experience have shown that the aspirational pathways amongst young people in the digital world appear to be quite similar across racial and class lines. This is encouraging because we know that a strong understanding of how they can move toward their future serves as an important motivator for young people. Virtual worlds could be used to create and simulate a variety of experiences about the future and be connected with institutional opportunities in the real world.

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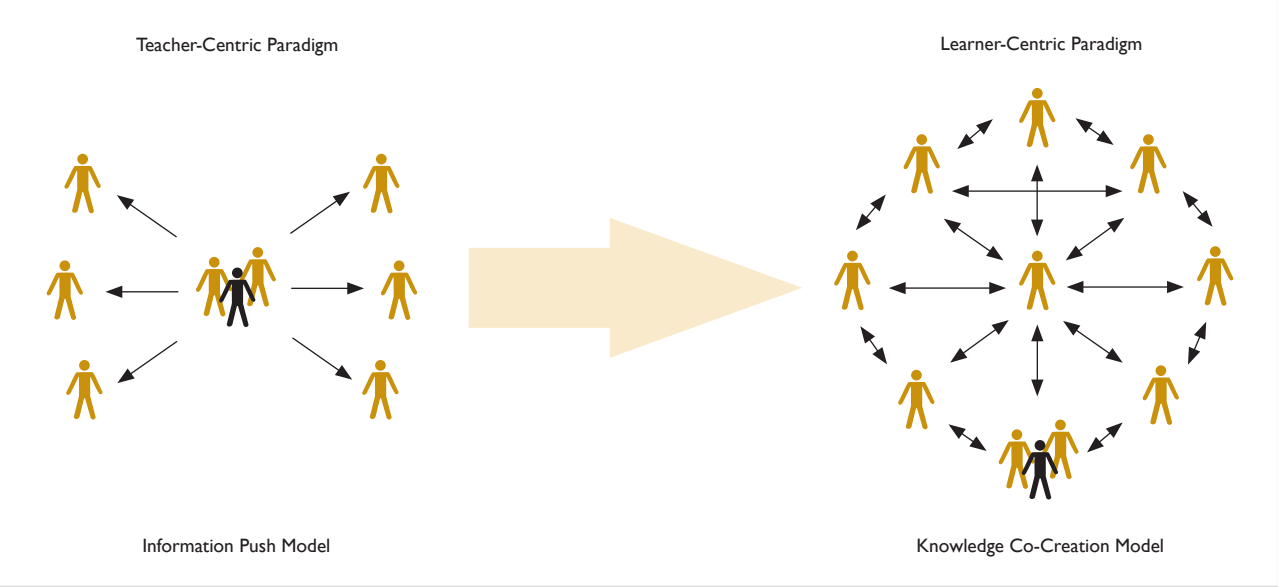
From Information-Push to Knowledge Co-Creation

Despite new technologies, classrooms, lectures, and students' learning experiences at colleges and universities often resemble those of generations gone by. That said, some classrooms have evolved to incorporate technology, and vast numbers of institutions are pursuing distance learning—which is usually quite different, however, from participatory learning. And

Figure 1.



while institutions feel significant pressure to be early adopters, the reality is that teaching and learning are still highly contained within the classroom, with little attention devoted to tapping the opportunities for informal learning outside it. Further, the application of learning technologies largely still caters to the *information push* model.

Figure 1 illustrates the differences between the teacher-centric information push model and a participatory *knowledge co-creation* model that takes advantage of learners' networked interactions and interconnectedness. The new model is no longer about the teacher imparting knowledge to the students; rather, students and teachers work together both inside the classroom and beyond—at libraries, museums, camps, and via environments on their mobile phone and laptop.

Historically, the emphasis has been on teachers and schools as the source of information and the nexus of how young people learn. New digital media are chipping away at the old teacher-centric information push model by making what happens at the edges more visible to the center. The shift to the new knowledge co-creation model entails expanding our notion of where "school" is on the map of students' lives—and designing an infrastructure to support the interest-driven, participatory networks that are so much a part of their daily lives.

Such networks already are leading to the democratization of ideas. That is, anyone can contribute from anyplace they wish, in any format they wish to contribute in. The idea is that everyone has something to contribute—given the right environment—and that one learns by contributing. The sciences already have taken advantage of this, as evidenced by the emergence of virtual organizations that offer the opportunity to contribute. Recently, for example, NASA opened up a project involving measuring the size of craters on Mars. Eighty thousand people contributed to it, and the average precision with which people measured the craters was at the expert level—with absolutely no formal training. The benefits of designing sustainable environments that enable ongoing research and knowledge co-creation are indeed worth pursuing.

A more common example of knowledge co-creation is Second Life, a 3-D virtual world created by its users, or residents, that can be downloaded for free. Second Life has more than 12 million residents, one million of whom use it at least once a week. More than 1,000 research and education institutions as diverse as NASA and the American Cancer Society have sites, or islands, on Second Life. And corporations, such as IBM, use private sites on Second Life for communication, collaboration and virtual 3-D training. The National Oceanic and Atmospheric Administration (NOAA) has an island called Meteora, where residents can ride on the wing of an airplane through a hurricane or simulate a tsunami. NOAA has scaffolded these activities with interactive instructional materials.

A final example is the enormously popular Wii, a Nintendo home video game console, which offers more than sports and fitness activities: Endless Ocean, for example, allows players to explore a fictitious region of the South Pacific Ocean and have a remarkably authentic and engaging learning experience about marine biology. People can play together remotely and learn by collaborating on the games' activities.

Networked Science

Computer networking was first developed as a tool for scientists and engineers. It is no surprise, then, that many scientists today are deeply engaged in virtual collaboration and learning. nanoHUB, for example, is a virtual environment funded by the National Science Foundation (NSF) and developed by a consortium of universities that allows scientists to collaborate on nanotechnology. nanoHUB has nearly 500 contributing scientists from more than 180 countries. It has sophisticated simulation tools and offers hundreds of resources and links to presentations, learning modules, and teaching materials. NSF devoted extensive resources to the development of nanoHUB; the software that supports it, HUBzero, will be used for future HUB sites devoted to global climate change, pharmaceuticals, and so forth.

As early as 1989, William Wulf, then head of the Directorate for Computer and Information Science and Engineering at NSF (and later NSF director), imagined a "collaboratory…a center without walls, in which the nation's researchers can perform their research without regard to geographical location." Today, Wulf's vision has become a reality, and networked science is possible. Vastly more sophisticated and powerful capabilities—such as high-performing computing, remote access to scientific instruments, shared databases, and astonishingly advanced simulation and visualization technology—allow dispersed networks of researchers to exchange data and pool computational resources across both time and space.

The NSF Task Force on Cyberlearning recently released its report, *Fostering Learning in the Networked World.* While the task force's focus was on the sciences, its findings are widely applicable to education. The task force wrote that cyberlearning—the use of networked computing and communications technologies to support learning—enables "…customized interaction with diverse learning materials on any topic—from anthropology to biochemistry to civil engineering to zoology. Learning does not stop with K-12 or higher education; cyberlearning supports continuous education at any age."

The task force concluded that "…widespread access to technology, increasingly sophisticated tools, and

advances in understanding about how individuals learn combine to provide a stunning opportunity to transform education worldwide."

A New Paradigm of Participatory Learning

Is all this hype? Or can we use technology to create real learning opportunities? We believe it is possible, but that doing so calls for focused research aimed at development of a new paradigm of participatory learning, one that encompasses the abundant opportunities that lie outside today's formal learning systems and enables new processes of learning. As John Seely Brown has said, we have the technology before us and are limited only by our imaginations.

Several principles should guide this new theory of learning to ensure that it closes the knowledge gap rather than expands it. First, the infrastructure supporting it should be widely available and accessible by individuals. The infrastructure can be based on internet applications that already exist, making it more likely to come to fruition. Identity authentication also is critical so that the system is safe for participants and that data being shared are secure. Interaction should be re-conceptualized and move beyond e-mailing and PDF sharing, and collaboration should be seen as instruction, on par with lecturing.

The key features of a participatory learning model are virtual environments that include a high degree of realism, social interaction and immersion, and resources that are dynamically adaptable and continually available. Further, the virtual learning experiences should be highly customizable and ubiquitous. (See Table 1.)

Table 1. Requirements for a Participatory Learning Paradigm

Principles	Features
Provision of Infrastructure	High Degree of Realism
Promotion of Individual Access	Dynamically Adaptable Resources
Adaptation of Internet Applications	Continuously Accessible Resources
Authentication of Identity	Social Interaction and Immersion
Reconceptualization of Interaction	Highly Customizable
Collaboration as Instruction	Ubiquitous

Conclusion

Today it seems that many of the people doing the most innovative work in digital media and learning are either very much on the fringe of academia or have left higher education altogether. Development of a participatory learning paradigm calls for a commitment to improve learning, coupled with an acceptance of innovation and change on the part of institutions. Higher education leaders can choose to be a part of the network our students have already formed and capitalize on the learning opportunities it presents. To do otherwise would be to fail our students and fail ourselves.

Connie Yowell is the Director of Education Grantmaking at the John D. and Catherine T. MacArthur Foundation. She oversees the foundation's program on Digital Media and Learning, which explores the impact of digital media on young people and implications for the future of learning. Prior to joining MacArthur, Yowell was an associate professor in the School of Education at the University of Illinois at Chicago. Yowell can be reached at cyowell@macfound.org.

Diana Rhoten is the founder and director of the Knowledge Institutions program and the Digital Media and Learning project at the Social Science Research Council. Currently, with funding from the MacArthur Foundation, Diana is leading the Learning Networks project in New York City, designed to help non-formal learning institutions develop collaborative digital media and learning strategies. In addition to her role at the Council, Rhoten also spent the last two years as the founding program director of the Virtual Organizations & the CyberLearning programs at the National Science Foundation. Rhoten can be reached at rhoten@ssrc.org.