The Future of Education: A *Threshold* Forum

Education leaders discuss how technology is raising new questions about knowledge, assessment, and the role of educators.

PARTICIPANTS

MONICA MARTINEZ, MODERATOR, is the vice president for education strategy for the KnowledgeWorks Foundation. Prior to this, while she was at the Institute for Educational Leadership in Washington, D.C., Martinez founded the National High School Alliance, a partnership of more than 40 organizations sharing a common commitment to promote excellence, equity, and development of high school-aged youth.

KEVIN CLARK is an associate professor and program coordinator of the instructional technology program in the College of Education and Human Development at George Mason University. Prior to his work in academia, Clark was a designer and senior program manager for Lightspan, Inc. (currently Plato Learning). His research interests focus on the design and development of online learning environments, the role of gaming and media in formal and informal learning, and the use of technology in learning with underserved populations.

CARL E. HARRIS is the superintendent of Durham Public Schools in North Carolina. He is the immediate past president of the North Carolina Association of School Administrators and chairs the North Carolina State Council on Accreditation and School Improvement (CASI), Southern Association of Colleges and Schools. In 2002, Clark was named a Broad Center Fellow as one of 23 professionals from across the nation who completed the inaugural class of the Urban Superintendents Academy, sponsored by the Broad Foundation in Los Angeles, Calif.

CHARLES (CHUCK) HOUSE is executive director of Media X, Stanford University's membership-research program on media and technology. He also is a senior research scholar, working in technology-enabled communications, collaboration, and community. Previously, he was the director of societal impact of technology for Intel Corporation. House was instrumental in establishing the Center for Information Technologies and Society at the University of California, Santa Barbara, and serves as advisory chair. He is a past president of the Association for Computing Machinery and an IEEE Fellow.

HENRY KELLY is president of the Federation of American Scientists (FAS). Previously, he was assistant director for technology in the White House's Office of Science and Technology, helping negotiate and implement major administration-research partnerships in energy and the environment, information technology, and learning technology. He convened the President's Information Technology Advisory Committee and helped translate its advice into a large expansion and refocusing of federal information-technology research.

MONICA MARTINEZ: KnowledgeWorks Foundation is about eight years old and was created from the assets of the student-lending corporation. We have primarily served Ohio over the last eight years, but are starting to think about some national and other statewide initiatives.

One of the reasons we are trying to go national is because of the viral effect our *Map of Future Forces* has had on us. About a year and a half ago, our chief executive officer contracted the Institute for the Future, a nonprofit think tank in Palo Alto, Calif., to create a *Map of Future Forces Affecting Education* so we could begin to have a new conversation with a new paradigm about how education has to change. Instead of fully focusing on things that are current and specific to the student-achievement gap among people of color and low- and high-income issues, we try to take that conversation to the next level. These are all real problems that could be exacerbated or solved if we start thinking about some of the forces that exist in the external environment that are going to press on education. *(For an overview of the* Map*, see "Change Agents" on page 4.)*

What we see in this map, the big message to us, is: "Hey, students are learning differently." This is about participatory pedagogy. This is about meeting a visible community for learning, but possibly not at a school-

(Continued on page 21)

(Continued from page 12)

house. This is about how you use personal digital media. This is about a media-rich environment where information is ubiquitous. This is about gaining a personalized learning plan. This is about an extended learning economy where anybody, anyplace, anytime can actually offer education to multiple people. Learning is happening beyond the schoolhouse—after school, in study-abroad programs, and in other enrichment opportunities. With this, there are many different providers of learning, potentially increasing the role of businesses and communities. Will our public education system be able to sustain itself within this?

To get started, tell us about where you work and how you see these forces taking shape.

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CARL HARRIS: I do not classify myself as a futuristic person, but I do have a sense of what education might look like in the future. In our public schools in Durham, N.C., we have approximately 32,000 students. We are an urban environment struggling with the challenges of redesigning our school system so we can meet the needs of today's learner. I think education will look different in the future because the access to information—and that information itself—will be far different from the way it is within the system that we currently use.

CHUCK HOUSE: I'm at Media X at Stanford University and am reasonably familiar with the Institute for the Future. With respect to the *Map* and its interactive nature, it seems to me to be a most effective categorization of a lot of the trends and thoughts that we're seeing.

KEVIN CLARK: I am a professor at George Mason University in instructional technology and have a background in designing and developing educational games. I have two ways of coming at this. One is the business of education. I've visited most of this country's urban centers and talked to them about technology and how it could help improve their student scores and teacher practice. On the other side, I do research that looks at how technology can be used to improve student achievement and practice in the classroom and informal-learning environments. Most of what I do focuses on activities that take place outside of the classroom, because I believe that, in some instances, changing a school is like turning a ship. There are some kids that can't wait for that ship to turn so they can get access to new tools at after-school and informal-learning environments.

HENRY KELLY: I'm president of the Federation of American Scientists. We're a 52-year-old not-for-profit organization doing science-policy work. One of our themes is finding technology opportunities that aren't being used effectively by the country. It's clear to us that we're not making effective use of technology that could provide a much richer set of tools for education. It's been one of our central themes.

We spent a lot of time defining the research that is needed to take advantage of this, because we all know it is extremely hard to fill a lot of the promises we've been talking about here. And we've outlined a very detailed road map for research and have been working hard to get legislation through to start a major national-research enterprise.

We also are building a series of three different educational games so that we can begin to learn what we don't know, which turns out to be a lot. We have a game for high schoolers that teaches immunology, called Immune Attack. And one for younger children about the fundamentals of phonetics through a game set in ancient Egypt. And we have one for adults designed to teach incident commanders of firefighting teams how to manage the complex set of problems faced in high-rise fires.

'We're going to have to come to some consensus about what knowledge is.'
—Carl E. Harris

MARTINEZ: If information is ubiquitous, who will contribute and who will be the purveyors of information?

CLARK: My gut reaction is that it's everybody. When we look at how people can become creative in terms of technology or through technology, like YouTube and wikis, then we get a sense that knowledge isn't just going to be reserved to that set of *Britannica* encyclopedias in the library. Everyone contributes to the knowledge space, and everyone has to be critical and be able to analyze the information that is put forth as a part of that knowledge space.

It's one thing to contribute to a wiki, but we also need to be critical thinkers to be able to spot false or inaccurate information. I don't think that the negative part—people adding false information—should prohibit us from allowing others to be knowledge creators. I think we just have to be smarter about how we get people to decide which information is appropriate, accurate, and relevant given particular situations.

HARRIS: When we talk about contributors of knowledge, it is about defining what we think is knowledge versus just an array of information that's quickly available, and what we think all of our kids should know coming through an educational setting versus what they should know how to access, because our view of knowledge changes. I think there are going to be multitudes of people who will be the information providers, but I also think we're going to have to come to some consensus about what knowledge is. Is it something that we all agree on, or is it something in Durham, N.C., that is quite different from something in Cincinnati, Ohio?

HOUSE: Carl, my reaction to your comment is solid agreement. Information access is ubiquitous. But knowledge is much harder to define and find agreement on. I'm struck a little bit by the Wikipedia findings where, if you look at how many people access it to gain information as a reader versus those that contribute knowledge or information, there's a disparate ratio of more than 1,000 to one.

I think each or many of us are in the position to contribute something to the corpus of knowledge, but all of us are going to be users of that information database. The difficulty with a Wikipedia experience is that they try to aim for the quick understanding and they leave out a lot of the nuance because it tends either to be conflicting or disruptive or argumentative. And to me, one of the beauties is we'll be able to handle knowledge as different for North Carolina versus somewhere else. You'll be able to have conflicting knowledge out there to be examined for the overlap.

KELLY: There are two questions here: How do we create this knowledge base? And, do we like it or not—this distributed online knowledge system that is the Web, which is going to be the dominant source of information for the next generation?

One of the intriguing things is how to define peer review and expertise in this world. This is one of the skills that people need to master. Also, [what is] the definition of an amateur, a professional, a journal, a blog? These boundaries are beginning to break down. The interesting tension in many of the communities I deal with is with peer review—if you rely on three experts to verify the information, are you going to get a better answer than if you have 10,000 people looking at it? This is an ongoing debate. In many cases, you get a better answer if you have more people looking for error.

But having said that, you haven't defined how you're going to create an education. Just turning somebody loose on the Internet is not an education. And it seems to me incumbent on educators to define or probably redefine what it is you're trying to accomplish in education. But how do you create a path through this that makes sense? That's the challenge. And we haven't been able to articulate what the goal is.

Now, one of the intriguing things about games and simulations in this new environment is that you can create a method for testing some incredibly sophisticated skills. If you're trying to overcome a challenge, and you can only overcome that challenge by acquiring a whole set of information and skills, then you don't mind being tested and failing, because you know that if you keep trying hard enough you can acquire the information and expertise and overcome that challenge. That's a very different approach to learning than memorizing a bunch of facts and not knowing why you need to know them and being tested at the end of the year.

MARTINEZ: Do we need to control the flow of information to students? Some cities or districts have created firewalls so that students can't access Wikipedia so they won't use it as a form of research. Others have said, "Well, you can use Wikipedia as a form of research, but it has to be your second or third reference on a finding."

HOUSE: I don't think you can stop it fundamentally. And I think it's a mistake to stop it. The excitement is when kids do that kind of exploration on their own. The challenge is for the teacher to have an effective way to deal with that.

KELLY: To me, the challenge is to create an experience that is so inherently interesting that you don't have to worry about the fact that [students] may be spending some of their time drifting off [in class] but they know that they need to accomplish some task that really means something to them. You can get an amazing amount of time on task.

MARTINEZ: If we know this is what students do and it's moving into anytime/anyplace learning, how can we appropriate that for the good of learning, like we are doing with gaming?

HARRIS: This control of information is almost impossible within our current system. However, I do believe—at least within the public-school setting where I am now, and based on the age of the children that we deal with—we have some responsibility to control somewhat the flow of information, to make sure that the information we have and that we are allowing kids to be exposed to is appropriate and relevant for what we're trying to do.

CLARK: I also agree that there need to be some parameters, meaning we need to determine the outcomes. In early education, they looked at what skills were needed for people to become good citizens. We need to define similar skills needed by students to function in this technology-filled society. It's one thing to see students who have all these tools at their disposal; the next step is to help them figure out how to use them wisely.

I've worked with underserved populations, where we go to a community and everybody wants to assume that once you put in a computer lab at a housing project they'll be okay. The big issue is, what are the outcomes? What are the goals? That may not be technology-specific, but we may look at how technology can help them achieve those goals.

So, if we say we want students to be good collaborators, what does that mean? And not just with technology, but what does that mean in general? And how can we get technology to support and encourage those types of skills so that we spend less time looking at whether children have specific technology experiences and more time looking at how those experiences can contribute to their intellectual and social growth?

MARTINEZ: The elephant in the room is, what do we want students to be able to learn and do when they finish K–12?

HOUSE: Let me take a shot at that. I think all of us are aware of the efforts to identify the 21st-century learning skills that kids are going to need, such as collaboration, verifying the data you pull off the Web, and a variety of things that we haven't taught historically but that are becoming increasingly important in this cyberspace world. We've been helping participate with a number of those efforts.

KELLY: The standard law of this sort of thing is that you get what you measure. Now, if you really are going to try to teach 21st-century knowledge, you need to be able to test it. You may need to be able to verify it. If you watch, for example, how people collaborate within a multi-player game, you can actually watch teens get together and solve problems as a group.

Can you measure the performance of the individual and of the group separately? It is very hard, but it's possible. And the intriguing thing is you don't have to stop and take the test. The gamer expects the test to be going on continuously. And so, you have this continuous dynamic system that could make a lot of sense to the student. And I think it also provides the information you need to confirm that someone has these 21st-century skills and can work with people that they never meet and learn things they didn't already know and efficiently put them to use.

I think there is a large opportunity here. But again, trying to take the existing set of rules we have in education and morph them to these new sets of rules is going to be an extremely difficult task.

HOUSE: Let me build on that. One of the blocks on the *Map* is about kinetic learning. At Stanford Medical School, they wanted to teach about emergency-room teamwork. The goal was to build a synthetic world in which every student has an avatar. The experiment begins with a triage set of cases and then a patient is to be worked on and may live or die as a function of what the team does. But the significant piece is that every avatar is constructed to be archived, so that, post-experiment, you can go back and talk through each student's activity under pressure. The learning is extraordinary. I think this type of thing can be extrapolated to lower grades.

KELLY: And I think there's a whole class of people who are turned off by the formal-education setting. One data point here is provided by the experience of the Naval Education and Training Command. They have begun to move away from standard classroom-lecture formats of fixed duration, where students sit for eight weeks to learn the material and then take a test. The new systems are based on performance tests. You pass the course when you demonstrate an acceptable level of expertise, no matter how long it takes. The average student meets this standard in about half the time allocated for the old-style course, with some taking much less time.

HOUSE: There's a report called "Leadership in Games and at Work: Implications for the Enterprise of Massively Multiplayer Online Role-playing Games," commissioned by IBM and done by Byron Reeves of Stanford University and Thomas Malone of Massachusetts Institute of Technology. They analyzed the leadership traits exhibited in *World of Warcraft* and other games and compared them with what's being taught at the classic business schools. So I think this engagement piece Henry is getting at—to start measuring accomplishment—is on the right track.

MARTINEZ: It seems like we need to expand people's ideas about what learning looks like in the 21st century, and then work to change those assessments. What are your thoughts on how to morph to a system that has new learning outcomes around collaboration, leadership, and content? Also, what are we going to do about this measurement trend in our society?

HARRIS: I think we're going to have to truly embrace project-based learning and collaboration, and it's going to force us to change the assessments we use. We're going to have to rely more on our content experts—our teachers—and others that do some of the assessments.

CLARK: I think, on one hand, that individual assessment is good, and having portfolios or projects is a more accurate and authentic way of assessing knowledge acquisition. But the other side of it is: How do you assess large numbers of people with reliability and validity so that you know the assessment is accurate? I don't have the answer to that. I just know that whatever the solution is, it's going to need to be scalable.

KELLY: I think that the one optimistic thing you can say is that, to the extent that technology becomes ubiquitous in schools—including extremely powerful, low-cost simulation and other devices—you now have the ability not only to deliver this complex, sophisticated information cheaply and efficiently, but you also have the ability to undertake sophisticated testing at an affordable price.

MARTINEZ: I think, similar to what Kevin was just saying about scalability, we need to look deeply at the local level and within schools and bring that vision of learning forward so they can create their own assessment, because we may not ever be able to scale this. And if we don't have the political will to do something besides standardized tests, then we need to dig deeper with education leaders so this is happening in schools—even if it's not going to happen at the state or national level.

These are some really good ideas about how we start turning the shift in education to respond to the technology and opportunities that are available to us. Thank you.

RESOURCES

Durham Public Schools. www.dpsnc.net

Federation of American Scientists. www.fas.org

George Mason University. www.gmu.edu

Hillsboro School District. www.hsd.k12.or.us

Institute for the Future. www.iftf.org

Media X at Stanford University. mediax.stanford.edu

Reeves, Byron and Thomas Malone. "Leadership in Games and at Work: Implications for the Enterprise of Massively Multiplayer Online Role-playing Games." www.seriosity.com/downloads/leadership_in_games_seriosity_and_ibm.pdf