THE BROOKINGS INSTITUTION
EDUCATION TECHNOLOGY:
REVOLUTIONIZING PERSONALIZED LEARNING
AND STUDENT ASSESSMENT
Washington, D.C.
Thursday, October 6, 2011

PARTICIPANTS:

Moderator:

DARRELL WEST
Vice President and Director, Governance Studies
Director, Center for Technology Innovation
The Brookings Institution

Panelists:

JOANNE WEISS
Chief of Staff to U.S. Secretary of Education, Arne Duncan
U.S. Department of Education

CHIP HUGHES
Executive Vice President of School Services K12

NINA ZOLT
Co-Founder and Chief Learning Officer of
ePals.com

ZORAN POPOVIC
Professor and Director
Center for Game Science
University of Washington

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P R O C E E D I N G S

MR. WEST: Okay. We would like to get going. First of all, good afternoon. I'm Darrel West, the Vice President of Government Studies and Director of the Center for Technology Innovation here at the Brookings Institution. I would like to welcome you to our forum on Personalized Learning and Student Assessment.

We are webcasting this event live, so we also would like to welcome our viewers from around the country, as well as outside the United States. We will be

archiving this, so anybody who wishes to view this after today will have an opportunity to do so by going to the Brookings website at Brookings.edu.

We welcome any comments or questions that you have. We have setup a Twitter feed at hashtagedrev. That's hashtagedrev, E-D-R-E-V. So, if you wish to post comments during the forum, you certainly are encouraged to do so. And for the question and answer period, we will take questions from our virtual audience as well as the live audience here at Brookings.

I think everyone recognizes how important education is to personal development, social opportunity and economic prosperity. Learning is an essential ingredient in how well people do. But many of us worry about whether today's generations of students will experience the same opportunities and prosperity that we have had. We need to get more low-income youth into post-secondary education and we need to provide greater access to quality education for additional Americans.

There are many ways to think about improving our education system, but technology innovation represents an important part of that overall puzzle.

Technology has the potential to improve education by personalizing learning, enabling different forms of student assessment and making class time more flexible. Wired classrooms and instructional sets allow for education that is adaptive to student's needs, letting students learn at their own pace, having them receive individualize instruction and then be assessed in real time. So it really represents, we think, a very interesting way to think about ways of making educational attainment more systematic than is possible today.

We are putting out a paper that reviews the evidence on education technology. Hopefully, each of you had a chance to pick up a copy on your way in. If not, there are copies out in the hallway.

We find that there are a number of impressive initiatives taking place across the United States, as well as around the world demonstrating that it is possible to personalize learning and assess students in real time.

We find that there are blended projects that are combining online education with traditional classrooms that are boosting student interest in education and providing more immediate feedback to students. Some projects have found that online learning and collaboration improves reading comprehension, as well as writing skills.

But in many respects, the technology is ahead of our public policy in the education area. I argue in the paper that we need to think about several policy changes to enable technology innovation. Many states still emphasize time-based approaches to learning that equates seat time with subject area knowledge. I suggest that a skill mastery approach allow students to progress at their own rate and offers a certain advantage. So, I'll refer you to the paper for additional details on that topic.

To help us understand how we can leverage technology to improve learning, we have brought together an outstanding set of speakers. Chip Hughes is Executive Vice President of School Services at K12. He joined K12 in July of 2007 after 10 years with Blue Capital Management, where he served as Co-Founder and Managing Director. Prior to that, he worked as a partner at McKinsey & Company as a member of the firm's strategy and healthcare practice.

He currently serves on the National Board of Recording for the Blind and Dyslexic and on the Board of Councilors of the College of Letters, Arts and Sciences at the University of Southern California.

Joanne Weiss is Chief of Staff to U.S. Secretary of Education, Arne Duncan. She joined the Department in 2009 as Senior Advisor to the Secretary and Director of the Race to the Top Fund, the Department's $4.35 billion program designed to encourage and reward states making system-wide comprehensive and coherent education reform.

Prior to that, Joanne was a partner and Chief Operating Officer at New Schools Venture Fund where her work focused on investments and management assistance for chartered management organizations, human capital solution providers and academic tools and system designers.

Zoran Popovic is a Professor of Computer Science and Director of the Center for Game Science at the University of Washington, so he gets the prize for having come the furthest distance to participate on this panel.

His research interest lies primarily with computer graphics, more specifically in character animation, motion editing, physically-based modeling and modeling and simulation of natural phenomena.

He received his Bachelor of Science degrees with honors in computer science from my favor institution, Brown University, and his masters and PhD in computer science from Carnegie Mellon.

Our last speaker will be Nina Zolt, who is a Co-Founder and Chief Learning Officer at ePals.com. Nina co-founded ePals, formerly known as Into Books in 1997, and serves as its Chief Learning Officer. Her work is focused on improving learning opportunities for all students in the digital age.

She has extensive experience as a lawyer, a digital media executive and designer of digital learning products. She serves as a board of member of the Washington D.C. Advisory Board for America, the Board of Trustees of the National Gallery of Arts, the Corcoran Museum and the Carnegie Institute for the Advancement of Teaching.

So why don't I start with Chip, and I'll just pose a question. What are private companies doing to encourage innovation in the education area, and what are you finding works best, in terms of personalizing learning and assessing students?

MR. HUGHES: Sure. Thank you, Darrell. By the way, thank you for inviting me. It's a pleasure to be here today. Starting with the second first, it's really a multilayered approach when you talk about individualizing learning for students.

The first thing that is maybe the most obvious is putting them at the appropriate level form what they've mastered to date, so that they're working on what they need to learn next. And so, they're challenged but not overwhelmed with what they're facing. And an individualized learning environment is much more appropriate to

that than simply an age group sitting in a classroom with 30 other students.

Second, in our case, we have a curriculum that is designed for all the grades to be delivered asynchronous, which means the students are working at their own pace. This curriculum is being served up to them. So, if there is a concept they need to spend a little bit more time on, they can do that.

If they need to go over things a second time, there's no embarrassment factor. They can review the material as many times as they want. Other material that they are grasping more readily they can move through at a faster pace. So they aren't bound by the circumstances of all the other students that are on the class list of their teacher. Those two things are kind of inherent in the whole concept of individualized education through an asynchronous curriculum.

Beyond that, what's really vital is frequent invalid assessments, so that the teacher -- and in our case, also the learning coach, which is a caring adult working with the student -- can understand what the student is mastering and what the student isn't mastering, and in the latter case, deliver targeted interventions. So, any given student's pattern of what they're interventions are going to be different than the other students that are on that teacher's class list. So, if somebody's getting it, then they're not going to participate in the intervention. If they're not getting it, they are.

The interventions can be anything from one on one to a small group, depending on whether, you know, 10 kids aren't getting the concept or whether it's just one that’s just struggling. Similarly with enrichment; if a student has an opportunity to move ahead, then the teacher can provide that by understanding that the student's mastering the material very quickly and might want to move ahead to additional material.

The latest thing we've put in place, though, goes beyond, or at least makes an attempt to go beyond what can be done in those kinds of targeted interventions. Because what we run into, especially in mathematics, is cases where students are multiple years behind. So you might get a student that appears to be struggling in Algebra-1 when the real problem is they didn't master fractions in 5th grade.

Well, targeted interventions aren't likely to solve that problem.

So what we've done is we've created a national program for the students in our schools all around the country where they're going to continue with their grade level work in their home school, but they're also going to participate five days a week for an hour a day in a math instruction that is at ability level. So, if you've got that 9th grader that didn't master what they needed to master in 5th grade, they'll be with a whole bunch of other students, virtually, synchronously with an expert math teacher working on those concepts from many years earlier.

Now, they might be in that program with students that are in 6th grade or 7th grade or 8th grade. They wouldn't be all 9th graders, but in a virtual context, it doesn't matter because you haven't got the -- from the standpoint of the older student -- the embarrassment factor of knowing you're sitting there with younger students, and from the younger student's point of view, the fear factor of sitting there with people that are much older and scarier than you are. So, what we try to do is individualize on multiple dimensions.

The other thing I would point to in that that people leave out a lot is sort of the psychosocial side of it. What we find is, the students who have fallen behind have fallen behind for a reason in many cases that relates to the family circumstances or their personal circumstances. And so, when we think about individualizing their educational experience, we're not only thinking about the academic piece of it, but also the non-academic barriers that might be in the way of their succeeding academically.

So, it ends up, we hope, being a very rich experience where no two students are experiencing the same thing in their school, because what they need is never exactly alike.

Now, on the first question you asked, Darrell; I think what I'd point to first -- I mean, the obvious thing is, as a private company, we have access to the capital markets and it's lets us invest in the kinds of things that I've just been talking about, which is terrific. But the other thing, a lot of it depends on the talent you bring together and on

the culture that you create.

So what we have is people with a whole varied rich set of different backgrounds. We've got people who've been teachers for 20 years. We've got teachers who've been superintendents. We've got people who've been principles. That's all on the educational side. We have people who've been very successful guidance counselors. We have instructional designers. We have people working on gaming with people, like Zoran. We've got business people like me. We've got marketing people that can help us understand how a teacher, a student or a family member is likely to react to a new curricular intervention that we're trying to come up with or a new way of conveying material.

So, you put all the people at all those different backgrounds together and a lot creativity emerges. And then, what I think the private sector is really good at is scaling things once we know that they work.

So, for example, in my part of our business, which is where we provide turn-key management services, as well as the online curriculum, we have no fewer than eight operating models that are different around the country, of which five there's only one or two instances. Because what we're trying to do is seat enough opportunities to figure out what works the best for which kinds of students in which kinds of environments, and then we'll go out and scale the ones that prove out, the ones where there is an academic case to be made, while simultaneously being attractive for students to come and enroll.

And so, the ability to, number one, do that many prototypes at once; but number two, really put all kinds of economic muscle and organizational muscle behind scaling them once they do work is really important.

I mean, it's terrific if we have a 300-student school that's working wonderfully well for the 300 students that are in it, but we all know something like that just scratches the surface of the educational needs in the country. And if we're going to have a real impact, we've got to have dozens, if not hundreds of things like that going on

around the country. So, the ability to scale in innovation is equally as important as the ability to innovate in the first place.

MR. WEST: Okay. You mentioned a problem of learning fractions in the 5th grade. There for a minute, I worried you'd gotten a hold of my elementary school records. Joanne, what is the Department of Education doing to expand the adoption of technology and education, and how can the Federal Government encourage new models of personalized learning and student assessment?

MS. WEISS: Well, I think this is a critical, critical issue to our whole country, going forward. And what we're doing now is just so clearly not working, and it's not working for most students. I think sometimes we think about this as a low-income problem. But if you look at the most recent PISA results, our middle class white kids are under performing relative to the all students group in a lot of the developed countries in this world. So this is just a system that is not serving us well and we just can't afford to keep doing things the way we've been doing. And that's both sort of an intellectual "we can't afford it" as well as a very real economic and financial issue. So this issue of what technology needs to do to really change teaching, learning and assessment in the 21st century is one that we think about a lot.

Now, the vast majority of the policies around this really are state level policies. In fact, when I read your paper, Darrell, I was looking at it and thinking to myself, how is it that the Carnegie unit is adopted in, you know, virtually every state in this country? It's a state-level policy, not a Federal policy. But it just like whipped around this country at lightening speed back when we figured out it was a good idea. And now that we've figured out that maybe it's not the best idea, if we need teaching and learning, to operate differently, we need to think about what it takes to kind of have a new system zip around the country. It's not so easy anymore.

But having said that, I think we're thinking of a lot of different things at the Federal level, different levers in things that have not been used before, as well as some of the tried and truths. So on the tried and truth side, there's the bully pulpit. There's the

Federal role for convening. These things sound a little bit like mom and apple pie, but I do think that there is a tremendous, tremendous amount of power that we have when the secretary takes to the microphone and talks about the national education technology plan that we've put together, a vision for what teaching, learning assessment need to look like in the 21st century where we shine a light on successful examples.

Like, recently, we talked a lot about what's going on in Morrisville school district in North Carolina, a small rural school district that just completely overhauled their curriculum, gave laptops to every single kid and teacher. Their curriculum is entirely digital. They went from the bottom of the state in performance to last year, in a very short period of time. They're tied for number three in the state, in terms of performance on their student achievement test, and their funding in the state is 99th in the state, so they're doing this on a relatively low-funding base. This is not something that's cost them a fortune.

They invested their time, professional development. They got all the teachers on board and they've seen incredible student achievement gains as a result of it. So when we can shine a light on something at the national level, it makes a difference.

We also have a really powerful convening role so we can share knowledge in ways that can start national dialogues. I think we saw this a little bit when we did our Race to the Top Assessment competition and brought a lot of assessment experts together and had convening around the country talking about what does assessment for the 21st century look like, and just opened a dialogue about assessment that looked very different from the multiple choice bubble tests that we see today.

Something else that you guys probably know we have been experimenting with a lot, is what does it take to turn the Federal Government from this big compliance machine into an engine of innovation? So, how can we use the funding sources that we have to really spur and support novel solutions to problems? Our investing in innovation or (i3) grants were all about this. The Race to the Top Assessment grants were all about this.

We also have been using them to require grantees to make their solutions publically available. So, all the grantees that won Race to the Top grants and are using their money to create novel solutions, new curriculum around the common core standards, all of that material has to be made publicly available.

We just did a bunch of grants to community colleges, TAA grants. They require everybody to make their materials available as open education resources. So those kinds of ways of building these requirements into our grants help spur a new kind of learning economy.

We also used to, at the department, segregate our technology grants into this one funding pool that was sort of a separate set-aside. Now, we're trying to integrate technology across all of our funding streams. So, some of the most interesting technology work is actually being done within our school improvement grants that are just part of our Title 1 programs. But schools are doing really interesting things to transform the way teaching and learning is happening in some of the schools that used to be drop-out factories in this country, and have gotten big grants to try to do things very differently and turn around what's been happening in those schools.

We're also using this both grant-making and convening power to help encourage common infrastructures and standards. Some of the baseline, boring, unsexy plumbing that needs to happen in order to make sure that we really can advance the education applications on top of it in much faster ways, create incentives to build more effective solutions, make it easier for people to find the learning objects that they're looking for. And finally, to support research to help us understand what's really working.

Another big role that is a traditional role that we've had is equity of access and opportunity to learn for kids. We're looking at this too in some new ways. So, we just came out with a broadband plan that was actually an interagency activity with the FCC and commerce and agricultural, and that was not just focused on access, but now on adoption. So, how do we make sure that even though that broadband wire is passing by a school that actually, at the school and in the community, people have the

ability to tap into it and actually use it and adopt it, and not just see it fly by their school.

Comcast, as some of you might know, just recently announced something called internet essentials. They've agreed to provide broadband access to low-income families for under $10 a month. So, this is part of a public private partnership that we've been working to put together to make sure that we really can get access into households and communities that traditionally haven't had it. We look at access and equity.

Traditionally, I think, as -- you know, if I'm going to buy a computer for one kid, I need to buy a computer for every kid. And the price tag is so dramatically high that we then don't do it. Instead of saying, a whole bunch of kids are coming to school already with a computer in their backpack, how about if we let them take it out of their backpack and use it? Then we don't need to buy as many computers, and suddenly everybody's got it and we can all be online doing the work we need to do. So just allowing new ways of thinking about what it means to enable equity of opportunity to learn for kids. And these public private partnerships, like the Digital Promise Initiative that we just announced last week, I think are also just a really important thing for the Federal Government to do together with private organizations, foundations, the business community to really tap into and spur this kind of innovation in the country. So let me leave it there.

MR. WEST: Thank you.

MS. WEISS: Sure.

MR. WEST: Those are terrific comments. Zoran, both Joanne and Chip mentioned this notion of scalability, and I know that's an issue that you have looked at. What do you see as the opportunities for scalability, and then also, what are the risks and barriers to scaling up innovative local projects?

MR. POPOVIC: Yes. So, I have recently started thinking a lot about that and it came out of, sort of, the thought, how can you actually think of education as a data-driven science? As a computer scientist, you have astronomy, biology, all these fields

come to you. We have huge amounts of data, please help us analyze. You know? And nobody from education ever comes. And the reason is that there certainly, there is no -- there is no data. And, in fact, when I started looking at -- okay. Everybody identified fractions as one of the key early stumbling blocks that -- it's a precursor to algebra and algebra is gateway to everything else. It's a big problem. So I was like, "All right. I'll start to focus on fractions."

And then I collected a lot of experts in the area, and what I heard was a lot of arguments. And it was not arguments because -- it's arguments because, like, that's what academics do when they don't have enough data to actually back up the things. So, I realized that I cannot actually make games in fractions because I don't know how to do just the right thing for every kid. What I needed to do is have games that actually able to do this.

And so, why games? Obviously, it's really hard to make engaging games. If it wasn't the case, we'd all be millionaires by selling the next angry bird model out there, but it's really hard to do it. But here are several reasons why it's actually a very nice platform.

First of all, any kind of learning has to happen when you actually spend a certain amount of time on something. Okay? And there is -- and what that means is there has to be an engagement mechanism that enables kids of varied backgrounds, varied preferences for learning or what they really care about to really sort of try to get engaged into something. And so, that's what games really are. They're basically an incentive structured made for, sort of, pulling you into a particular world where you start sort of engaging yourself and maybe switching from exterior motivations to personally caring about a specific thing that you're doing.

The other aspect of it is that it's naturally a thing that kids gravitate towards, you know? This is the world, whether you like it or not, that kids live it or they just naturally gravitate towards. So why not actually have that huge amount of time spent there, being the one about learning? It's sort of the most un-intrusive way to introduce

education to kids. And in fact, it's nimble because it can be done in an informal way outside of the school. It can be done within the school. It can be done no matter what kind of educational system you have running in parallel with it. It can be done on a smart phone that's now -- I just heard, in Africa, you can buy a smart phone for under $40. You know, this is only going to drop further. But still, there's a way in which you can have state-of-the-art adaptive technology on that kind of phone that's basically accessible to everyone. So that's basically the great promise behind that.

Now, the other really exciting thing -- and perhaps, the thing that excites me the most, is that it's a platform for mask scale of randomized studies on what actually works for every individual kid. Because, unlike many other places, here, you have kids just doing huge number of trials, voluntarily. You don't have to put them in a classroom. You don't need -- they don't need to be in a lab trying different things; it just happens, you know?

If you have the same thing, they will give you information about how they think about different problems. And so, as a result of that, you can actually start collecting data that's not just on two questions in a typical A/B study that maybe takes three to four years and maybe four or five classrooms with so many confounding variables that you can't really conclude anything definitively. Here, you can start talking about 500,000 kids of all walks of life, of all different preferences being able to give you hundreds of sample points on different problems that they're actually solving. And so you think about -- you know, I can't tell you how many researchers are just practically drooling over that kind of data because of the amazing stuff that they can actually uncover from this.

The other aspect of this is, not only can you use games to sample the space of all possible confusions on fractions -- for example, that's something that just simply doesn't exist now -- but you can also try to figure out what are the optimal pathways to conceptual understanding for every kid, based on their preference of learning? Maybe they're experimenters. Maybe they like to think first. Maybe they like to

think socially. All of those modules can be detected and customized within the game concept.

And then, basically, how each one of those confusions can be sort of guided through an adaptive game such that every kid gets their own unique light bulb shinning above their head, and they're actually -- and as one more misconception is removed through that whole process. So we're actually thinking -- so that's actually the mapping and the structure that we're building on, and it all came down from the -- the initial thing that we've done on Folded -- how many of you have heard of the game Folded? Okay, we have about one-third, one-quarter of people out there.

MR. WEST: You have a lot of fans here, obviously.

MR. HUGHES: So, it's basically a game that's setout to start from novisists who know nothing about biochemistry and be able to sort of start to solve real scientific problems that currently remained unsolved.

And so, obviously, what is the platform? Would you wish you can do that? Obviously, I concluded earlier on that the only way I can engage people for long enough period of time, such that I can't even discover what are the ways in which I can lead them to those kind of levels of expertise was game.

So, basically, over the two years, we were able to -- through continuously adaptive process -- basically, it's a game that change itself every two to three days, based on the data produced from the new people that are continuing to play the game.

And so, as a result, we have built sort of a community of experts that have now just published the second nature paper on a long-standing problem that hasn't been solved by scientists for 15 years. So some of you may have seen that in the press recently, but even more excitingly, there's a set of things -- the sort of a critical mass of this collaborative expertise is now capable of producing results at a much faster pace.

So, now we have synthetic proteins constructing and confirmed in the lab that basically came directly from game play that are 20 times more reactive than anything else that scientists have produced in the past. So now we're doing modification of Folded

towards drug design and other problems that basically these newly minted scientists are now specifically caring about, and therefore, are spending their time solving.

And so, all of that was done through data-driven self-adaptive way of game discovering what are the best pathways to have every person be lead to some level of contribution on this fairly large and complex problem, and sort of -- and obviously took some time. But just because that infrastructure was nimble enough to allow for that, we were actually able to lead to that kind of expertise. And obviously, when you talk about novis expertise, you're really talking about education in a nutshell.

So, if you were able to do that, then obviously, the next step was, "All right, let's pick the big bottlenecks and try to really address them." So that's what we're working on now.

MR. WEST: Sounds very exciting. Thank you. Nina, what are the key elements of a digital learning environment that fosters personalized learning?

MS. ZOLT: Well, I think the common core tells us a lot about what it takes to be an effective learner. You need to be able to read closely, you need to be able to think critically and you need to be able to communicate orally and in writing, and we know how to make that engaging. It hasn't traditionally been the role of technology. Technology and education has been more drill and practice. But think, in an increasingly digital and networked environment, we have a lot of flexibility to create the kind of learning experiences that we're finding are most effective. And what are they? They're project-based and they're authentic, and they involve a number of header-genius collaborative partners.

And two of the things that are characteristic of them are that they are collaborative and they're purposeful. And there is an end result in mind, and hopefully it's in writing or has some sort of data combination. So then the question is, how do you enable that at scale? And that's what we at ePals have been thinking about deeply for the last several years. And the first and most important part of that is safety.

So what we call it at ePals is role-based policy management, which is,

how can a district classroom, a school, a community decide who talks to who for what purposes and under what circumstances. And that's a critical part of how we think about protecting, but enabling collaboration across the neighborhood and across the world.

Secondly, how do you create a learning environment that's an integrated learning environment? We know that it has to be integrated in terms of reading, writing and thinking, but it also has to be integrated in terms of professional development. It has to be integrated in terms of providing an opportunity for informal assessments. And one of the things that are really clear in our schools today is that students aren't doing enough writing. So it's important to be able to capture the writing, tag it, make it available both for long-term portfolio assessment and for a third-party assessment.

Next, we need to be able to match people in environment. It's a world of people studying and thinking about the same things. So how do we enable kids in China to study with kids around the block about a subject? So thinking about that match algorithm is a really important part of it.

And last is opening the APIs, and that's consistent with what Joanne was talking about, this concept of being able to create on the environment so that people are creating curriculum, whether it's teacherpreneurs, whether it's publishers. Anybody can actually come in and share a curriculum.

So, one example of how we've done this is a program called Into Books. And Into Books matches adults with students and teachers to read and talk about books online. And it's -- someone talked about the engagement mechanism. It's extraordinary how simply having an adult learning partner is incredibly motivating and engaging.

For kids, especially kids in low-income areas, and extraordinarily so in rural areas, they don't really have adults that they can talk to about books. They don't have unconditional friends. So this environment where a students gets to pick the book that they read, where they get to talk to an adult about that book, practicing their writing, seeing adult writing that's personalized to them -- they get to decide what they write. They get to decide how to decorate the letter. And then they live in an environment,

because we have a dedicated website called Student Place where students can actually see a check list, see sample letters, have tremendous resources that they can draw on.

So, all of a sudden, we're enabling this loop, which is, I think, the next generation of education, which is individualized, self-propelled, self-directed learning in combination with collaborative learning, so that you have this opportunity to have resources that you can draw upon, but then you can also turn around and collaborate.

And what does that mean for the teacher? Well, actually, pretty much the same thing. In the first instance, she's excited because she gets excited students. And then, what she also has is work product. Across the course of the year our students write six to 12 letters. And we're big fans of the common core so our letters are opinion pieces. So now, students would be producing 12 opinion pieces across the curriculum because kids read books and fiction, social studies, science, biography, traditional tales and science. And -- I missed something; sorry. So they're going to cross the curriculum and they're writing about it. And all of a sudden, as Lee Schulman puts it, it's a low-pressure high-yield assessment.

They're producing assessments that are produced as part of the normal course of their work, so it's a true expression of whether they stand. And the letters themselves, because it's writing, actually show reading comprehension, critical thinking, writing fluency and mechanics. And we've normalized a rubric and, you know, prepared a teaching guide, so all of a sudden, teachers are in control of their own destiny.

So, when we think about what it means to do personalized learning and assessment, we think about it in context of how do you really enable kids to exist in the 21st century, whether it's to advance in school or to go to school, but that concept of being able to produce writing, to be able to collaborate and to understand how to use technology to further your own learning. So we're terrifically excited about the common core and the opportunities. Thanks.

MR. WEST: Okay. Thank you very much. For our webcast audience, I just want to remind you, our Twitter feed is hashtagedrev, E-D-R-E-V. So, if you have

questions, feel free to post them and we will move to our Q&A in just a minute. But before we do that, I just want to pose one question to everyone on the panel. I want to turn you into a policy-tsar in this area, and I want you to tell us what are the policy barriers that you currently see, either at the state or the Federal level, and I know Joanne already has talked a little bit about this. And then, what are the policy recommendations that you think would help enable some of the innovations that's we're talking about? Chip, why don't we start with you?

MR. HUGHES: Where do I start? And what you said before about seat time is obviously very relevant. You know, particularly in our context, one of the reasons families come and enroll their students in virtual schools is to work anytime/anywhere, and some states allow that and some states don't. Some states have limited hours in which you can record attendance, so that's an issue.

I think, probably though, the bigger issue is -- our program, particularly our K to 8 program is designed as a mastery-based program, so the idea is you work through, and as you master something, you move on to something else.

The accountability systems, both at the state level and the Federal level, are basically proficiency-based, not mastery-based. And they're basically driven, in most cases, by the age of the student. So, if you have a student who comes into one of our schools in 6th grade and they're working at the 3rd grade level in math, well, the test they're going to take at the end of the year is on 6th grade math, so your faced with a terrible conundrum of, "Do I teach them 6th grade math or do I teach them 3rd grade math."

And, you know, what we end up trying to do, as I was mentioning before, is teach them both. But then you've got an awful lot of math load for a student that's been struggling with math anyway.

So, it kind of put you across purposes of just what makes sense. You know, the idea that you're going to have a kid who is so far behind in math struggle with math at several grade levels ahead of what they're ready for all year long is kind of

counterintuitive. On the other hand, not exposing them at all to any of the curriculum they're going to be tested on at the end of the year, seems kind of counterintuitive too.

So, it's kind of case-after-case where, the way the system is setup kind of embodies a concept that was probably true a long time ago of how schools worked and just isn't true anymore, and that will be just one example.

MR. WEST: Okay. Joanne, I know you've talked a little bit about this already, but what are the barriers you see and how should we think about those barriers?

MS. WEISS: So, I'll echo Chip's, except to say that we just released a flexibility package to let people out from under that and to encourage them to use student growth as opposed to just proficiency, because the way we've been testing is -- forget about the 21st century. It's not right for the 20th century either, so we just need to get out from under that and do that properly.

MR. HUGHES: From your mouth to the state's ear.

MS. WEISS: Well -- yeah. But I actually want to go back to some of the stuff that Zoran was talking about, because I think that the biggest challenge for us is that education has been a place that is wildly resistant to innovation. I mean, it was designed very much to resist the status quo so that crazy fads wouldn't use kids as guinea pigs. And the problem with that is that, now that we are desperately in need of innovation, we have built a system that is really, really good at repelling it.

And so, the things that Zoran's talking about are critical, like this country is great at innovation. I can't tell you how many people from around the country have come to visit at the Department of Ed in the past couple of years, just since I've been there, to study how we instill innovation in our kids, in our culture; where does it come from and how can they teach it too. If we had the answer to that, that would be another whole great thing, but we don't.

The thing is that it is a huge strength of this country, and we've got to figure out policies that allow us to let it loose on education, 'cause a lot of the stuff that Zoran's talking about is happening not in schools but in and around and outside, which is

fine, 'cause learning needs to happen 24/7. But what a crime and a shame that we can't figure out how to bring it into schools. So there's just a lot of barriers and misconceptions that we need to break down in order for this to happen.

One thing that makes me hopeful is, first of all, I do think that, as a country, we're great at innovation, and I do think that this is clearly our path forward, that technology enabled learning and teaching is the way that we're going to sort of figure out, again, how to teach kids what they need to know to be successful in the future.

I hope it happens through schools, but I do believe that, whatever, it will happen in this country and we'll figure out what that pathway looks like. But I also see -- like, yesterday -- I think it was just yesterday, the state of Iowa released a blueprint for education reform in the state that gets ride of seat time and moves to a competency-based model that completely overhauls the teaching profession, in terms of how it's organized, how rolls are differentiated, how people are compensated. I mean, it's a really big bold initiative at the state level to try to get at some of these issues that are preventing them from being able to do what is most effective in classrooms.

And so, I hope that if we keep sort of beating this drum, shining a light of what's effective, showing the way and figuring out how to make an infrastructure in this country that's amenable to change and innovation in education that we will sort of pound our way there over a shorter period of time than we may think.

MR. WEST: Zoran; barriers, and how do we overcome them?

MR. POPOVIC: Yes. I would definitely echo that the IRB on human subject issues are actually quite problematic, especially when you talk about collecting data from half a million kids all over the place. And actually, maybe wanting to know some of the demographic information so that you know how to adjust the actual teachings for a different type of kid.

But more pragmatically speaking, I mean, the policy by nature has to lack innovation. I mean, I think it's just impossible to design a policy that's going to predict all possible ways in which one would innovate. So I think -- and this is why I'm

looking at ways in which -- no matter what policy you might have, it would be a very light weight way to introduce it.

So what I would say is, if there is a way in which a cascading effectiveness can be propagated to a larger and larger scale, that would actually help. So obviously there are structures on policy across the board, but then there are basically mechanism with which new things can be actually probed. And then, if shown effective, can be scaled to the next level and, perhaps, adapted wider. So basically, no matter what you setup as a structure, it's setup -- some pile of mechanisms that can actually, if effective, propagate on a broader scale.

MR. WEST: Okay. Well, we're going to hear from Nina and then we'll open the floor to questions and comments from our audience. Nina?

MS. ZOLT: Well, I agree with everything that's been said, and I think we're facing three areas that it would be helpful to have some broader statements on. One is; a lot of the districts that are still living in the 19th/20th century and view technology as an enemy and don't realize that there are safe and secure environments within which kids can collaborate and learn. And so, I'd encourage more information about that and an understanding of that.

Secondly, we do a lot of work in low-income areas, and I can tell you that there is very little technology access. And to the extent it exists, it's now being used for testing. So, a number of our schools actually have trouble finding the time to use the program for deliberate learning in the way that they can because of lack of access. So, anything we can do to increase the amount of technology available in low-income environments and to reduce the amount of time that's actually spent dedicated on testing.

And last, and I think most important -- and this comes from my background both in education and in business -- we need to encourage more writing, and we need to encourage it and value it and focus on it; focus on the Ed schools, focus on it in professional development and focus on it in the classroom. It's not been a focus of education in the last decade and we know why. It's hard to test, it's hard to score, it's

hard to measure. But anybody who has spent any time in college, graduate school or in the real world knows that that ability to communicate for various purposes is the difference between failure and success. So, anything we can do to support writing, to me, is the most critical thing we can do.

MR. WEST: Okay. Let's move to the audience in terms of questions you have. We have a question right here. We have a microphone that's coming over to you from here. We would ask if you'd give your name and if you are with an organization. And we'd also ask you to keep your questions brief just so we can get to as many of you as possible.

MR. ALTMAN: I'm Fred Altman and my question is, would it help this whole process, competency-based, if we encourage universities to accept on this base and not wait for high school diplomas?

MR. WEST: Panel, what do you think?

MR. HUGHES: You know, everything I hear from universities is complaints about how kids aren't ready for college work, as it is, even the ones with the diplomas. So I'm having a hard time visualizing what you're saying but I understand what's behind it.

MR. POPOVIC: Well, if you take it one step further and you look at sort of the big ideas and the big new companies that came out recently, pretty much, most of them came out with people who haven't finished college, or they had an idea and they ran with it before they actually finished. And so -- I mean, if you project that -- I mean, it's a little bit harder to argue that on a high school level, but -- I mean, it's -- I mean, what is a high school diploma? It's some kind of artificial across-the-board measure, right? I mean, really, what everybody learns is at different paces on different aspect of things.

So, if you had a way of actually just knowing exactly where you stand on maybe common core concepts, or whatever, that's what really matters, rather than some kind of artificial threshold.

MS. WEISS: And I think, as we move more and more to mastery-based

system, the distinction between college and high school will be reduced. I think, right now, one of the things our educational system is hopefully moving towards -- and that's another reason why I'm so exciting about the common core -- is this continuum. So, the more we understand what it takes to master a subject, the easier it'll be for universities to decide whether or not a student is ready for student work.

And there are some colleges already that do that. And interestingly enough -- and not to belabor the point, but the one that I know of most prominently is barred. And what does it do it on? It's a school that focuses on writing, and so, therefore, students can apply and demonstrate their competencies as writers in order to be accepted. So, they accept kids as earlier as their junior year in high school.

MR. WEST: Okay. Right here on the isle.

MR. MCGEE: Thank you. My name is Raymond McGee and I'm a researcher as SRI International. With respect to innovation, I wonder if the panel could comment on some of the efforts being undertaken by philanthropic foundations around next generation learning, so-called next generation learning. I know that the Gates Foundation is involved in funding projects with higher Ed institutions, as well as K12 institutions.

The Stupski Foundation and the Council of Chief State School Officers has a partnership, as well, too, which is working with individual states, state agencies as well as local education agencies to test new innovative models of learning, which involve this customization and the use of technology that you all have been speaking to.

I wonder if you, from the Federal Government's perspective, from the university's perspective and from the private sector perspective, if you all could comment on the promise of this to promote more innovation and, perhaps, even be a catalyst for transformation in our schools.

MS. WEISS: So, from -- I mean, I think all of these initiatives are critical ingredients in making sure that we have the funding and the impetus in this country to dedicate really serious resources to figuring out what the right next steps are for the

country, so I think it's all good.

MR. HUGHES: I don't think it'll happen without it. I mean, I was just reading a paper that Parthenon put out in cooperation with some of those same groups that you're discussing on this whole concept, and it's very consistent with that we're trying to do and what we are doing.

And the thing that we find is that the -- what the teachers are confronted with is such enormous diversity in the incoming skill levels, the backgrounds, the values, you name it, of the students that come in that, if they aren't enabled by technology to help them sort through all that and do all the right things for the right students, I just don't see how they can ever do it. Nor, by the way, do I ever see, at least in my lifetime -- I'm 53, so that gives me however many more years you want to count -- us getting to the point where the technology itself and the curriculum itself is so good that the teacher ceases to be a vital aspect of it.

For us, the teachers are pivotal, and we spend an enormous amount of money on the curriculum and the systems. And yet, without the teacher doing what the teacher needs to do, it all falls apart. So you have this situation where the teacher is the lynchpin, but the teacher is going to be overwhelmed without the technology to help in exactly the ways that the next generation learning concept promotes, so I personally think it's essential.

MS. WEISS: And I would agree with that. I think so many of the problems are so thorny and don't really have a clear revenue generating mechanism that it's incredibly powerful and exciting to have the dedication of the kinds of monies and efforts that we have right now through the Gates, Stupski and other foundations.

MR. WEST: Christine on the isle has a question from our web audience.

CHRISTINE: Sure; I've got a couple. Thanks, Darrell. First off, the project director of E-Learning in Ohio at the University of Akron wanted to know, for the whole panel, how can technology make educational attainment more systematic? And then, Jeff Dunn, who's a specialist in Academic Technology Innovation in Chicago

wanted to know -- Finland's number one in PISA. Do they use technology to personalize and enable learning? Who's doing it well?

MR. WEST: Good questions. Joanne?

MS. WEISS: So on the international side, Finland actually uses very little technology. And, in fact, most of the European countries use technology very little. I'd say the Asian countries are probably the ones that are using technology most heavily. But even they, probably with the exception -- you know, Korea has declared that by 2015, there's going to be no more text books. Everything will be digital. But arguably -- and that gets rid of backpacks, but arguably, that's not everywhere we want to go with what it means to personalize instruction.

So I think this is a place where there's just plenty of room for us to figure out new and innovative and better answers than the rest of the world so far has figured out. But, obviously, this is a place where a lot of the poor countries, a lot of the developing -- a lot of the under-developed countries and the third-world countries have a much bigger stake in this because this is a place where they can really use technology to leapfrog other people and to bring education to people who've really been left out of the educational system heretofore.

So I think we have an eye on the developed world, but it may also be really important for us to watch the under-developed world in this regard. And can you ask that first question again? It was about measuring.

MR. WEST: It was how to make things more systematic.

MS. WEISS: So I think that technology can do more than make things more systematic. I think they can make things more individualized and personalized and still measure an outcome in a systematic way, but you can get there in any number of ways, and that's what our system today is not very good at doing. We're not great at measuring outcomes, but we're even worse at providing multiple pathways to get there for different kinds of kids 'cause it's just too hard a problem with the levels of expertise in each of those classrooms.

So, I think technology is actually the only way to get to sort of consistent level of outcome in all kinds of diverse and creative ways that will meet the needs and the starting points of all the different kinds of kids that are in our classrooms today.

MR. WEST: Okay. Over here on the far side, we have a question? Microphone coming over that way.

MS. HERK: My name's Monica Herk. I'm Director of the National Board for Education Sciences. And let me touch on these issues of diverse learners and mastery learning and just the implications of that and how important that is, also, this gentleman's question about college accepting mastery learning.

Before I came to the National Board for Education Sciences, for about five years I educated my daughters using the K12 curriculum of Mr. Hughes' company. The reason I did that is -- especially my older daughter was quite advanced. After five years with the K12 curriculum when she -- after she chronologically finished 8th grade, then she basically skipped high school, went to college. She's now an honor student, junior at American University in Biology.

So that was really possible because the online learning was able to individualize to where she was, and she could advance in the topics she was advanced in and be more on grade level in other topics. But it was really based on mastery learning.

There was then a college similar to Bard, which would except her application based on her SAT scores and demonstration that she could do college level work. And so, for her, that was -- you know, anything else would've really wasted her time and de-motivated her. So I think the mastery learning -- I think we need to go there. It makes so much more sense, both for kids who may be three years behind and for kids who may be three years ahead. So maybe the panel could comment on that.

MR. HUGHES: Well, I'm glad your daughter had a good experience, first of all.

FEMALE SPEAKER: He wasn't sure what you were going to say at first.

MR. HUGHES: That's right, exactly. But I think that's exactly right. I

mean, it's both ends of the spectrum and everyone in between. I mean, the great thing -- you know, the more -- you know, there's a question about being systematic. The more data we can collect, Zoran's point, we can figure out what works for different students in different circumstances in a real data-driven way. But it takes -- there is a whole nother [sic] order of magnitude, better data capture that we can do and, you know, you'd --

I have a son that sounds like he's, in some respects, similar to your daughter in that, you know, the one thing he didn't want to ever do is waste his time, and that was the thing that was most de-motivating for him. And so, that's the great promise of personalized education, is, you know, you're challenging people at all times in a way that they are ready for, so I think it's terrific.

MR. WEST: And it's funny, when I go back to college campuses, I swear the students are looking younger and younger, and maybe this is the reason why or maybe I'm just getting older. Here in the front we have a question. There's a microphone right behind you.

MR. NADELL: Hi. My name is Mark Nadell. I have a question about what responsibility we want teachers to have for staying up on what is the new stuff that's coming through. Zoran developed some great presentation on photosynthesis. So, is the individual 9th grade science teacher supposed to be monitoring the web for photosynthesis and this and that, and that while they're doing their regular duties, some teacher does a great introductory presentation for Hamlet. How does this get out there so that any teacher who wants to make that available to their students knows about it? Do we need another layer, sort of what the librarian used to do? I know, in universities, the librarians often help the professors find the materials. Is there a different role now that we have the technology out there to share better? And we don't have extra time. Do we need to create a new role of this intermediary, like librarian, to help teachers find great stuff?

MR. WEST: Nina, do you want to address that, because you actually do that?

MS. ZOLT: Well, I think it's a great set of questions. And I don't say that we have all the answers, but we're thinking about it and we're innovating towards it. And what we think is that, all of the things that you're seeing on the internet, all the social networking tools, all of the tools that you are seeing to keep people apprised of what's going on and what they're interested in we're bringing into a safe and secure environment, so to do exactly that; to encourage easy dissemination of innovative and educational practices, to encourage teacher-sharing.

One of the things that we've done at Into Books this year is, we're sponsoring some awards at IRA, the International Reading Association, to honor good teaching, to encourage the sharing of good teaching, curriculum units, action research.

But I don't know that it's an individual role, but I think in the years to come, it's incumbent upon us as technology experts to create an environment that enables teachers easily to upload, share, experts to download and share so that there's a complete information sharing and -- you know, one of the things that we're very interested in is how do you personalize to specific disciplines, how do you personalize to interest so that a teacher could sign on to ePals in a year and actually get the latest news about any subject that they've indicated an interest, latest curriculum units, and anything they can find. So we think that's a very important role that technology can play in supporting education.

MR. WEST: Zoran?

MR. POPOVIC: I can say a little bit more. I mean, I've been thinking about it, obviously. Because, just as I think games can actually easily access students, I think they can also provide a backdoor channel for the latest and greatest methods to actually be presented to teachers.

So the kind of teacher portals that we have in our games actually enable them to not just see on a curriculum item-per-item how much -- there's a certainty that the kid understands something -- but also a way in which the teacher can actually assign, you know, home place, we call them, basically, just transfer exactly mathematical

problems from the books into four different games the kids can chose to play from, and then no need to take test or anything else afterwards.

The game, basically not only tells you where the kid is in every one of those aspects, but what are the next set of potential challenges and how best to present them to the kids. So that, actually, is a different practical application of how you can actually just distill something that massive data analysis has produced into a concrete example for that potential type of kid.

And of course, the teacher with more of those kinds of practices will get a better, better sense of what other the things that work and what do not work.

MS. WEISS: I mean, in a way, one of the beauties, I think, of a common core set of curriculum materials that are aligned vertically from kindergarten through 12th grade is that you can have things like a recommendation engine like we get in Amazon or Netflix that allows you to say, for you, given your particular learning profile and what we've noticed about you, here is the next thing that would work for you out of this whole universe of things that are out there. And furthermore, as we're gathering data about those, the things that are proven to be ineffective fall down on the list and don't appear. So I just think this combination of personalized information correlated with the effectiveness data is going to make it so that teachers don't have to be experts in everything, and that technology can help serve up the right thing at the right time to each kid.

MR. WEST: And we can do the policy evaluation nearly in real time.

MS. WEISS: Yep.

MR. WEST: Okay. On the isle back there, the woman who's standing up, yep.

MS. KOLODNER: Hi. My name's Janet Kolodner. I'm on the faculty at Georgia Tech in Computing and Learning Sciences.

MR. WEST: Wow, you came a long way for this forum.

MS. KOLODNER: No. And I'm also doing my time at the National

Science Foundation as a program officer. And, so I represent the research community, and specifically, research community in the learning sciences and learning technologies, people who are doing research on how people learn, and particularly learning with technology and learning in technology-rich environments.

And my question that I have is, you know, at NSF we fund a lot of research in understanding how people learn, understanding learning with technology, and I do such research as a faculty member. And then, we don't know how to get all of that into actual practice in the world.

You know, I listened to you, and it's not something new, it's something I hear all the time. I mean, you guys, you're doing all this great stuff, okay, and it could be even greater if the results of research were being brought into it and if we had these partnerships with people who really understand the issues in learning deeply, and, you know, what it takes to learn and in all the different kind of things that technology can do. How do we make it happen?

MR. WEST: Good question. How can we make this happen?

MR. HUGHES: Well, it's a little bit out of my direct realm at K12, but we do have a commitment to using the best research we can find in developing the curriculum. And what I can't speak to is the degree to which our people who do that are plugged in with your people who're working on that, but I would love to make sure that that happens.

And, you know, it's one of the great things about the amount of effort that everyone's putting into this. Now, I think we all recognize really a national crisis in education is, it does become very difficult to stay abreast of everything that's going on and make sure that you're using all the best that's out there. But I can tell you, at least in our case, we're very committed to doing it and would welcome any relationships that'll help us do it better.

MS. ZOLT: And we feel the same way. I mean, everything that we do we try to find people who are interested in research. And the environment that we're

creating is intended to be an open environment to enable anybody to share their work.

MS. KOLODNER: My question's broader than each of you. I can meet with each of you and I can help you plug into some of the right people. But how do we do it, in general? I mean, that's the really big question. I don't know. And it's something that, you know, as a researcher I worried about, and it's something that now, as somebody's who's doing more policy stuff, I worry about.

MS. ZOLT: Well, we've actually given a good deal of thought to that as well, and have thought about the idea that, because it's an online environment, and data is so easily collected, and actually so -- there's so many disciplines that are involved in looking at learning, you know, whether it's from a literacy point of view, from a research science point of view, or any of the specific disciplines, that how interesting it would be to be able to create a multidisciplinary research institute that's working from the same data.

And so, one of the things that we are working on is how do you create that. And when we talk about IRBs and all of those issues, that's a big obstacle because -- you know, for example, ePals is in 700,000 classrooms. It'd be great to be able to have a number of research scientists working together looking at what's happening in those classrooms, but how you figure out the logistics of that is pretty daunting. And -- I'm sorry.

MR. WEST: If we could just hold on, because we have some other questions. Christine, you have some additional questions from our web audience?

CHRISTINE: Yeah, I have one more. Kelly Marie Johnston who's a participant from New York wants to know how will students connect when each are following a personalized learning plan? How will personalization affect community and student school life?

MR. HUGHES: Well, it's something you'd have to work on, I think. For one thing, it isn't as if students are going to have -- what I said earlier, students are not going to have the exact same experience but they're going to have a lot of intersection points where the things they're struggling with are the same things that several other

students are struggling with, or the things they want to be enriched on are the same as several other students want to be enriched on.

And the great thing is, you can bring them together in a group of five or 10, rather than sit there in stand and deliver mode in front of 30 or 35 or 25 and have it be immediately relevant to them. And so, you can develop a better connection in sort of different intersections with different people. But we try to augment that with social networking. We try to augment it with school events. So, we do believe that the students will learn better if they have a connection to their school community. School community is a vibrant thing.

And, in our particular case where most of the students are working virtually, it takes real effort to do that and we extend it for those reasons. But I don't think -- I do think it's a mistake to think that the individualization is really in the way of that.

You know, if you're doing individualized curriculum or an individualized learning approach in a physical facility, then the same exact kinds of community-building things that go on in any other kind of school can go on, and there are ways to substitute for it if you are working in a virtual context.

So, I wouldn't take it as a given that the fact that you haven't got 30 students at a time listening to one teacher talk about one thing is a big obstacle to creating a school community. In fact, quite to the contrary, I think that that does not lead to students being properly engaged, and less engaged students are going to disengage from everything.

MS. WEISS: I think technology offers us a really exciting opportunity to further collaboration, given individualized learning. The more a learner understands who they are as a learner in their interest, technology affords us the opportunity to help them find other like-minded souls.

So, in a safe and secure learning environment, learning takes place 24/7, it's across the world, and it enables the learner to connect with experts, adult mentors, peers any place, any how in a very safe way, but to discuss areas of interest at their level

of interest. So, I think it's a very -- I see the two working very nicely hand-in-hand.

MR. WEST: Over here on this side we have a question.

MICHAEL: Yes, hi. My name is Michael. I represent EDSG, Educational Development Solutions Group. My question goes to all of you. The question is -- we all have birth certificates which have a stamp, the date and the time and the month. What about the policy to put like an international unified report card system for every single student on earth so the Chinese could get to compare what they're studying in the America; and then you can predict trends like stocks in New York?

MR. POPOVIC: Well, obviously technology makes it very easy. I mean, you know, if you have a game, oftentimes you don't even have to translate it in many different places. It just would work, more or less, everywhere. And then you have exactly one-to-one mapping between actions all over the world. And sometimes you can even get it from the IP address of the person so you know actually where the person is, so you could be doing sort of cross-cultural analytics on the effectiveness in certain things. And, in fact, how would something change maybe for different cultural backgrounds?

MR. WEST: In the very back?

FEMALE SPEAKER: In the very, very back or --

MR. WEST: Actually, we'll do both you, and then there's a second person behind you.

FEMALE SPEAKER: Okay.

MR. WEST: Go ahead.

MS. WESTERHOF: I'm Jolanda Westerhof and I'm the Director of Teacher Education and AASCU. And last time we counted, we still prepare about 50 percent of the teachers who get initial certification in the country.

Given the issues and the problems, what does your ideal teacher do in your online environment, and do they require -- are they at all enhanced through any kind of teacher preparation program? And if so, what do you wish teacher preparation

programs were doing that they're not, so that they are better prepared to function and be successful, especially with kids that don't have maybe extensive social support networks and haven't done really well in academics, historically?

MR. WEST: Great questions.

MR. HUGHES: Yeah, they are great questions. You know, the great thing about most teachers is that they went into it because they want to help kids. There's certainly not a lot of money in it and that sort of thing. And, I'm a firm believer -- particularly, when you were specifically asking about the students that are struggling and are behind. You know, a lot of those students are not getting at-home answers to their -- or, they aren't getting reinforced in two things that they need to believe, 'cause at some point it's going to get tough for every single students. You know, even the advanced students are going to hit a point where it's hard, and they need to believe two things. They need to believe that they can do it and they need to believe that they should do it.

And if it isn't the family helping the student understand those two things, then let's hope it's somebody at the school, and it's probably going to be a teacher. And it's not going to be listened to from a teacher and also the school if they haven't built a relationship with that student where the student is convinced that that adult cares about them.

And so, one of the things that we emphasize is that, you know, we've got all this wonderful curriculum. We have these systems. We have to spend a lot of time because most of the teachers that we work with have been used to teaching in a bricks and mortar setting and we're going to have most of them teaching in a purely virtual setting about the tools that they have to use and the differences between those jobs.

The thing we try to emphasis is, you're still a teacher and you still need to build a relationship with those students. And in our case, it's often also with the families, but I think that's one key thing that we need to do.

What we do is, we do not find that -- and probably for pretty good reason. I mean, we still get somebody who's going to -- we think that when the dust settles, we

won't be seeing anymore than five percent of the public school students in the United States wanting to do a fully virtual setting. So, you know, you're talking about 95 percent of the kids who won't, so they'll be in a bricks and mortar setting. So why would education schools be training teachers for a virtual world? They're not going to. So we put an enormous amount of effort into helping teachers make that transition.

Having said that, the real discussion eventually is going to be about personalization, and I believe that that is going to be the dominant mode of education in our country within bricks and mortar settings. And now you really are talking about a different kind of a job.

Chances are that the curriculum is going to do more of the basic blocking and tackling work for you. The curriculum basically is going to be thought through down to the lesson plan level for you, so you're not going to be doing all that kind of work.

What you're going to need to be doing is using data much more effectively, and we find that teachers are not as well prepared in that arena as we would like them to be; understanding how to look at data, understanding what data means about what a student is doing, understanding what they're supposed to do when they see data they don't like, and then figuring out how to creatively intervene when the situation isn't going as well, or conversely, when the student is hungry and wants more and is ready to move ahead.

So figuring out how you're going to address not your full class list, but a subset of your class list with what they need at a particular moment really is a completely different mode of how the educator is going to operate. And I think that that is a transition that we don't see people being intuitively prepared for, based on the normal teaching training that they have. And that, I think will be generalized over time, and not just limited to a virtual context.

MS. ZOLT: So, I see the future differently. I have to start by confessing that I think teaching today is a superhuman job, and I do think there is a serious place for teacher education programs.

My biggest quarrel with teacher education programs is that they end and don't continue when the teacher actually makes that transition into the classroom, because I think that teaching is very different than teacher education. And the more practical experience that we can have, and the more a school stays with new teachers, the more likely they are to succeed in the profession.

You know, traditionally, it's been a very isolated profession. What technology enables is collaboration and community. So if I were to support one particular thing -- and I think there were a lot of things that Chip said that were right on, but if I were to support one particular thing it would be to build an online community from the get-go within the teacher education program, so that when teachers actually went out in the field, they had a support network that was broader than the environment in their schools. Because we know that, especially in low-income schools, it may be that the very thing that is the hardest for teachers to exist within is the cultural of the school.

The point that Chip made about analyzing data and analyzing student work I think is very, very important. And that's why I'm a very big fan of rubrics and checklists and anything we can do both to align students having clear expectations of what's expected of them and teachers having very clear measures of what good is.

The last thing though -- and this is the point of disagreement -- I don't think that the curriculum is going to be dictated. I think it's going to be much more the way Joanne described it, that there is -- and when we look at the common core, it expressly says that teachers should be deciding what it is that students are -- how to teach the standards.

And so, I think there's going to be a vast selection of choices that districts are going to approve or schools are going to approve. And we have to help teachers in Ed schools be educated selectors, and that's going to require an understanding of the common core standards. It's going to require an understanding of what a good curriculum is and it's going to require an understanding of how to evaluate student work in order to determine if it's meeting the needs.

MR. WEST: Okay. In the very back, the woman who's standing up.

MS. MCADAMS: Hi. My name is Camsie McAdams and I'm the Director of STEM for D.C. Public Schools. And prior to being here, I was both at the National Science Foundation -- hi -- and a teacher in both New York City Public Schools and Oakland, California for 10 years.

There's like eight questions that are in my head but I'll try to ask one and a half. I think that the concept of blended learning is much more of what I see for the future, than the straight bricks and mortar or the straight virtual world; you know, dabbling a little bit as a teacher, pulling in some online resources, having stations, having sort of a model that incorporates a lot of what you're talking about, but also some paper and pencil. However, state testing agencies are not going digital. They are not going virtual.

It is a paper and pencil standardized test with multiple choice and bubbles. So how do we spend an entire school year prepping our kids to operate in a more blended hybrid, you know, digital, virtual, engaging world, and then at the end of the year, we slap them down with a week long testing period where they're pulling out their number two pencil and they're filling in the bubbles and, at most, they get a brief constructed response where they use their pencil and paper and no calculators, and they're sitting there doing that?

It's not only hard for the kids to reconcile, but then, in districts like mine, that's what determines teacher's paycheck. So you're not going to get a teacher to fully buy into a virtual or hybrid blended learning model if, at the end of the day you're going to determine their pay based on paper and pencil. That's the first thing I'd love to hear your thoughts on.

The second thing is --

MR. WEST: Actually, can you hold on just for a minute so we can get an answer to that?

MS. MCADAMS: Yeah, sure. Sure.

MR. WEST: Because that's a very interesting set of questions there.

MS. MCADAMS: Great.

MR. POPOVIC: I guess I can say -- so I agree with you. And in fact, when I realized -- I mean, the first thing you realize is that you can get a lot better assessments and a lot more nuance assessment without the paper and pencil, but then you also realize that nobody's going to care about it unless it actually measures in a true transfer way.

So basically, there's actually a way in which you can actually maximize transfer by actually having the same problem presented in, let's say, four different games. If you're actually able to contextualize it in completely different ways, you will have much higher likelihood that it will be contextualized in an imperfect written test, as well.

So, the question is, no matter how imperfect the test is, it should still show the effects of blended learning or virtual learning if it's done right. And so, in my mind, if it actually does work, it should show there as well.

MS. WEISS: Can I just add one thing though that's directly germane to what you said, because the new assessments that are being developed right now by these two assessment consortia that will be used in D.C. -- because D.C. is part of it -- are required to be administered online to the extent that that's applicable. There's listening and speaking portions which, presumably, will be done in different ways, but they're required to be administered online by the 2014/15 school year, and they are also required to test things using item types that are much more authentic and much closer to the actual kind of production that we want kids to be doing, so they include a lot more than just constructive responses scenarios; writing, problem-solving. Some of them are even multiple sessions of work so that there can be extended products that kids produce.

So, I think that we are trying to move the country to a different model because it's really important that those tests not only reflect what we actually think needs to be done, and that we're not only measuring what matters, but that we also can use those to sort of reflect and inspire teachers to teach to something that is a bar worth teaching to. So, hopefully, that's actually changing.

MS. MCADAMS: I'm so glad you said that because that's like part .5 of my question. So, to go back to the idea of aligning the games and the problems -- then, not only do you need to talk to the research community, but you need to talk to the test developers, because they are the ones that are going to ultimately decide what our kids see on whatever form of the test. So, having us all here is great, but I hope that somebody from AUSSI is here to represent the data people in our state agency and I hope other state agency test-makers are also here.

The .5 is; how do you deal with the incredible stratification of resources, and even just bandwidth? So, I just left a high school this morning. They have six; six computers for 600 students; six. And the librarian brought those out of her own personal money. They don't have the -- our elementary schools have a bandwidth of 25 megabits per second, which means you can't stream anything. And this is a huge public school districts with one of the top expenditures per capita of students in the nation, and we still have places where there are no computers and low bandwidth. So how do we promote all of this cool digital virtual stuff without always sending it to the exact same schools that already have it?

MR. WEST: Great question.

MR. POPOVIC: Well, my design target is always the smart phones and, sort of, something really lightweight that will cost one tenth of a computer cost. And so, there are many -- technology is such that you can make actually very lightweight, and not requiring a serious amount of hardware to do a lot of things. So, basically, a lot of stuff is being computed elsewhere, and just the slight details are being sent on a fairly impoverished device that hopefully will cost under $10 fairly soon. So that's what I'm designing towards, anyway.

MS. ZOLT: But, you know, these choices -- I mean -- so one of the reasons that we also required this to be given online is because it will push technology into schools, and for the other 179 days of the year when the kids aren't testing, those technology devices will be available for use in all kinds of other, hopefully creative

curricular-focused ways.

It is, however, something that every state is right now engaged in the process of, and I think you should talk to AUSSIE ‘cause I'm guessing that they're in the middle of doing this, as well, an analysis of what they have to do in order to provide the right kind of devices across the state in order to make this work.

And, I mean, I'll just remind us; like, budget is not some fixed thing. Budgets reflect our values. Budgets are decisions we make about how to use resources that we have most efficiently. And technology has always been put to the side in a technology budget, and we need to think of technology is a curriculum resource that’s a trade-off against other resources that we have. And we're going to have to make some hard decisions about which resources are going to be the most effective for our kids.

MR. WEST: Okay. We are out of time, but terrific questions. We appreciate your coming out. And I want to thank Chip, Joanna, Zoran and Nina for sharing each of your views with us. Thank you very much.

(Applause)

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