

THE BROOKINGS INSTITUTION

COLLABORATION BETWEEN SOCIAL NETWORKING AND EDUCATION

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P R O C E E D I N G S

MR. WEST: Good afternoon. I'm Darryl West, vice president of governance studies and director of the Center for Technology Innovation here at the Brookings Institution. And I'd like to welcome you to our forum on Education, Collaboration, and Social Networking. And we are webcasting this event live, so we would also like to welcome our viewers from around the country as well as outside of the United States.

We've set up a Twitter feed at hashtag #TechCTI. That's #TechCTI. So if you wish to post comments during the forum you're welcome to do so. And then also in our question and answer period we will take questions both from the webcast audience as well as those of you here in the room. So those of you watching who would like to get your questions asked, just ask them of the Twitter feed.

Educators all around the world are experimenting with social networking to find out how it can enhance school curricula, improve student engagement and performance, and help teachers work together. Collaboration is the key to the future of education and we need to identify the ways to make the most effective use of technology. So we need to find out what students, teachers, and administrators can do to harness the power of social networking to improve educational outcomes.

Today I'm putting out a new paper entitled "How Blogs, Social Media, and Video Games Improve Education." This is drawn from my forthcoming book entitled "Digital Schools," which will be published by Brookings Press this summer. Copies of the paper are out in the hallway or it is available online at www.brookings.edu.

In the paper I look at a variety of collaborative tools that are being used in the United States, as well as around the globe. There have been net platforms that have arisen that are altering patterns of content delivery and learning approaches and is

changing the way in which both students and teachers operate. There is some preliminary evidence already appearing suggesting that the use of blogs, video games, and social media encourage reflection and critical thinking and also enhance writing skills on the part of students. I give some examples of how these various tools are being incorporated into the classroom and the manner in which they are affecting student attention and performance. And I'd like to thank the Bill and Belinda Gates Foundation for helping to support this paper as well as a series of forums that we've been organizing on the subject of education technology.

To help us understand these new tools and the issues that they raise for education we have brought together an outstanding set of speakers. Constance Steinkuehler Squire is senior policy analyst at the Office of Science and Technology Policy in the Executive Office of the President. She is currently on leave from the University of Wisconsin-Madison where she is an assistant professor in the Games, Learning, and Society Group in the Curriculum and Instruction Department. Her research investigates cognition, learning, and literacy in massively multiplayer online games and the use and impact of other types of video games. Her work has been funded by the MacArthur Foundation and the National Academy of Education and the Spencer Foundation. She recently helped author as one of nine committee members the National Academies of Sciences report entitled "Learning Science: Computer Games, Simulation, and Education." She's also the editor of a forthcoming book entitled Games, Learning, and Society: Learning and Meaning in the Digital Age, which will be published by Cambridge University Press.

Janet Kolodner is the cyber learning program officer for information and intelligent systems at the National Science Foundation. She is a cognitive scientist and she's the Regents professor in the School of Interactive Computing and the College of

Computing at the Georgia Institute of Technology. She is the editor-in-chief of the Journal of the Learning Sciences and was founding executive officer of the International Society of the Learning Sciences. Her research addresses issues in learning, memory, and problem-solving, both in computers and in people. She pioneered the pioneer reasoning model called case-based reasoning, which is a way of solving problems based on analogies to past experiences. And her lab has emphasized case-based reasoning for situations of real world learning.

Holly Sagues is the chief policy officer for Florida Virtual School. Holly taught in the traditional classroom for eight years prior to joining the virtual school in 1998. After she joined it she developed four online courses. She is the former chief information officer at the virtual school and she led the scalability of the school's information technology systems. She helped lead the school from 10,000 enrollments in 2001 to over 100,000 enrollments. In her current position as chief policy officer she has developed the school's strategic plan and helped to implement a balanced scorecard approach to performance management in order to foster greater innovation and future growth. She also has worked very closely with state legislative leaders to formulate digital learning policies.

Marla Ucelli-Kashyap is assistant to the president for education issues at the American Federation of Teachers. In that position she leads a team of professionals working on key areas of policy, practice, and professional development aimed at helping teachers and their unions improve education, quality, and professional development. Previously, she served as director of district redesign and leadership at the Annenberg Institute for School Reform at Brown University. There she oversaw the institute's technical assistance program, knowledge building, and tool development efforts in support of Smart Systems in helping school districts redesign themselves in order to get

better results. During the 1990s, she was a senior program officer at the Rockefeller Foundation where she was responsible for the foundation's efforts to improve the education and development of school children in poor, urban communities.

So I'd like to start with Constance. I mean, you've done pioneering work on the use of video games for educational purposes. How are educators using games and how are games affecting the manner in which students learn? And what are the types of challenges that we're encountering in this area?

MS. STEINKUEHLER SQUIRE: Great question. So right now there's a lot of interest around video games as a medium for teaching and learning. So there's interesting investments, both out in the private market and within the federal government. And in philanthropy in terms of developing games that may be a catalyst or a vehicle for various pedagogies or content areas.

So why games first off? Games are, as we know, have very broad market penetration. They certainly, you know, after they're developed have the cost for distribution of the ideas that are contained therein, starts to dwindle immediately. So there's this sort of arithmetical reduction of cost in terms of distribution, but the reason that people find them so compelling for learning is deeper than that. You know, games offer students of all ages simulated worlds, a kind of designed experience that they can move into and sort of experience, whether it's a small concept, a small sort of conceptual domain like, for example, understanding proportional reasoning and playing within that space, or whether it's a much broader 3D virtual world where you're doing scientific experimentation on tasks like water quality. So games give you this sort of ability to design and experience for a kid to have with media, or an adult.

Beyond that they also happen to kick off some really interesting, what you might call "data exhaust." So the data that you can get from a student interacting

with a game is compelling. And it opens up an entire new area of formative assessment and mapping formative assessments and learning analytics to game-type environments which has been of a lot of interest both private and public.

So those are two kind of deep reasons that people are interested in games. A third would be engagement. The reason they have broad market penetration is because, as we know, games, if there's anything the game industry has done, it has figured out how to get -- how to make something fun, how to architect play, if you will. So games, as a medium, is interesting. It's a compelling medium for many people.

As far as their using classrooms, that's a bigger challenge. Classrooms are not necessarily set up, not just for the kind of experiences you get in games but also for more sort of enduring persistent experiences with complicated context or complicated content like, let's say, science. Or hands-on kind of lab experiments. Teachers face challenges in those areas all the time.

All of that said, there is quite a bit of both research and development in games in domains as diverse as science education over to literacy, early literacy in particular now that we have gesture interfaces where a child does not have to read text before he or she can interact with the technology which is very provocative. Over to areas like history and civic engagement. So games have sort of touched a variety of domains, not just those identified in formal education settings but also sort of the values that are in play in informal settings as well. So civic engagement, teen leadership, being able to be a team player and other sorts of topics.

Now, my own work is focused on sort of collaborative games. Not all games are created so that you work with other people within the game space, but even the ones that are created to be single-player technologies with a person interacting in some form of hardware, let's say anything from an iPad to a phone to a console and a

television. Even in games that are intended to be single-player games there is always a very rich fandom around those spaces. So, you know, the first thing that people do when a game comes out is go and develop a fandom space around it online, meaning that people gather around the topics they care about, passion topics, and interact about that media. About its narrative, about its game play, et cetera. So you can pick any popular title and you'll find online a variety of different fan sites dedicated to discussing the merits of various aspects of the game or cursing, you know, particular mechanics or debugging other parts, offering different design suggestions. Also, doing things like expanding the narrative through fan fiction and other creative work, art, et cetera. So these games actually create collaborative spaces around them, whether they're intentionally by design collaborative in its first order or not.

So what are the affordances of those game fandom spaces? Interesting and diverse. So I'll give just three for the sake of time. You know, one would be that when you start to look at peer-to-peer interactions in these spaces, you see really interesting forms of peer apprenticeship so that learners learn from one another and you might consider it sort of a distributed apprenticeship rather than there being one teacher. Your peer is your teacher and next week on a different topic that relationship could reverse so that the learner becomes a teacher of some other aspect of the content.

Another compelling aspect in terms of collaboration again would be the fandom communities. So there are studies of, I'm not kidding, around say the civilization series -- I think it was Civ 3 -- but the fans actually made an online university with a designated dean and had a curriculum of various modifications to the game or mats to play on that would teach you in incredible depth the mechanics around, for example, how to win the game but never go to war. And those are the kind of challenges that they issued to one another. So it's very intriguing that you see this kind of development in

play spaces. Right?

The third one is kind of this hope around collective wisdom. So I don't know how many people are familiar with Fold It or some of the other sort of crowd sourcing games. But whether it's within the game as a mechanic or in the community itself, games is a space in which sort of collective work goes on, has been documented, and is under analysis in multiple papers I could point to. But there's a real hope there in that, you know, if you look at sort of collective intelligence, collective wisdom, when you leverage 10,000 people on a particular problem it turns out you can make some traction fairly quickly. In areas like World of Warcraft, we call it theory crafting. On something like Fold It it's leveraged toward understanding protein structures or predicting what might be valuable protein structures.

Now, one of the drawbacks that I'll leave on, you know, games are not always easy to fit into your standard curriculum. There's a lot of challenges there. One that I'll leave on touches on the topic of collective intelligence, collective wisdom. And that's that in many of those worlds in a game space your value and part of your contribution is differentiated knowledge. So if everyone knew the same thing what would they actually have to discuss or add to or debate or build as a form of social knowledge construction? Instead, the more particular your area of expertise, the higher sort of social capital it gets. Well, that's very orthogonal how we think about assessment, for example, in the schools where, you know, we do believe that students now not only have the right to access equal access to school but also having some equal outcomes in terms of understanding. So there are some fundamental rubs such as that that are difficult.

MR. WEST: Great. Thank you. So Janet, Constance was talking about some of the possibilities and then she concluded with some of the challenges. How do you think we should manage collaboration and social networking in order to get the

desired benefits?

MS. KOLODNER: So thank you for asking that question. I wanted to follow up on some of those things that Constance was saying. So the big point that I want to make is that any tool or resource that we make available to people is going to be as valuable and as effective as its use. And so the really important thing for us is going to be to design ways of using the social media, using the games, using simulations, using all of the different computing tools that are around. We're going to have to do a really good job of designing experiences for learners so that they can learn using those different tools.

So some of you might remember in junior high or middle school when you learned to use a microscope. Some of your teachers had you use them well to learn; some of your teachers had you use them not so well to learn. It depends on how it was integrated in. Let me give you -- let me give you an example. So suppose you have -- or a computing example. Suppose you have this really nifty visualization modeling simulation program that can show you all kinds of things about the human body. Anatomy and physiology. The way things work, the way things are put together. And suppose you're in middle school. And your teacher makes this piece of software available to you. The teacher might just assign the class to play with it and to come back and, you know, what did you learn? Well, some of the kids are going to get really excited and go out there and learn all kinds of things, and most of the class is going to be lost. Another teacher might guide the kids step-by-step through how to use the program so that they can use it and half the class is going to get bored by being guided through. Right? Because they don't really know why they're doing it. Now, another teacher might have the kids working on a project. They're going to design an artificial lung. And these kids have started to figure out what questions they have to answer to be able to do that.

And the teacher walks them through using this piece of software to answer some simple question there. And then sends them out to use it. And some of the kids do a really good job learning about all kinds of things in the body having to do with lungs and circulation and the things that go into an artificial lung, okay, or into real lungs I should say. Some of them get a little lost but now the teacher brings them back together to share what it is they've learned. And the kids who really found a lot in there, helped the class understand how they did it, and they generate some more questions and everybody goes out there. And more of the kids now have an opportunity to use this in a valuable way.

So the effectiveness of using this resource and what the kids learned from it; very complicated. It depends on a lot of different things. The curiosity of the learners, their self motivation, the goals that they have in going in to use it, their imagination about how they might use it, what they might use it for, the help they get in using it effectively, the way they get that help, the follow-up that allows them to reflect on it, and correct any misconceptions or misunderstandings.

Okay, now, social media can be used for a lot of these things and that's a lot of the way that social media is used in these game kinds of situations that Constance is talking about. So people playing Worlds of Warcraft or some other multiplayer game -- and Constance knows more about this than I do -- not only play the game but they engage online with others who play the game to better their imaginations, to learn better how to use the tools to discuss possibilities, collaborate on strategies, and so forth. Why do they do it? Okay, they do it because they're self motivated, the game is engaging, and the game keeps them engaged, and because the social network lets them do more, okay, than they could do by themselves. So social media could provide that kind of infrastructure and could do it in school also. Even allowing more than that,

collaboration and conversation across long distances, with peers, with experts, with mentors, a whole variety of new opportunities for learning. But it depends on how all of it is used.

I want to give you a couple of other examples, though I'm probably running out of time, but I want to do it anyway. Wikis. Everybody is used to wikis nowadays. But it turns out that Georgia Tech, where I'm on the faculty, was one of the first, if not the very first place, to use wikis in education. Mark Guzdial was leading the effort. And he had this homegrown wiki that he built for Georgia Tech. It was called a swicki, a wiki using Squeak. And in his initial work with it he tracked about 35 uses of it on campus. I mean, faculty and students were all really excited about it. It was used across disciplines, all kinds of classes, science, engineering, architecture, history, writing. It allowed interactions between professors and students that they couldn't have before. Peer review of projects. They could post things online. Mentoring and critique by experts, communication between teachers and students, posting of homework, sharing of ideas. I mean, you know, this is all run of the mill stuff now. At least at universities it is. It's not in school. But when you just think about what's possible, this is all run of the mill stuff. But this is back the first time.

And there were some things he learned when he analyzed these 35 or whatever it was possibilities. Students engaged to the extent they were self motivated or to the extent it was required -- one or the other. They were self motivated more if teachers were directly engaged in the conversations on the wiki. They were -- participated at a higher level to the extent that the teachers set expectations and also modeled the way that the teacher wanted them to communicate on the Wiki. It was at a higher level the participation if what they were doing was attached to a grade.

In another set of projects they're kind of, again, hybrid Wiki blog

something or other projects. Andrea Forte did her Ph.D. work looking at using a wiki very similar to Wikipedia wiki to have kids learn history and then learn science. So they were high school kids and they would write and share the writing of articles so others could read it. They were teaching others by writing articles themselves. And again, these same things were happening. The kids participated and did a good job to the extent that the teacher gave the class time to do it. To the extent to which computers are available. That's less something now that everybody's carrying around their own devices, but still it's hard to write on your little phone that you're holding in your hand. Better you should have computers available that, you know, let you see more of what you're looking at. Dependent to the extent to which the assignment was integrated with other activities in the classroom. And the extent again to which the topics they wrote about were covered on -- this was a history AP course -- were covered on the AP test. It wasn't a history AP course but whatever the AP course was.

One of my students, Chiquita Thomas had kids use some cross between a blog and a wiki, to look at how to solve science problems. They were designing -- I don't remember what they were doing. The extent to which they engaged at a rigorous level depended on the time allotted by the teacher, the extent to which the teacher discussed what was expected beforehand and went over what was expected and how to do it, and the time the teacher made available. So all of those things were really important.

So social media can promote learning. You know, using them to write something that other people will read requires reflecting on what one knows and one's own experiences in a way that promotes learning from those experiences. So it's great. The interactions you can then have can cause you to go back and think about the things you were thinking. Refine what you were thinking. Do so much better. And they provide

interactions at the moments when people want to interact. But the students have to have the disposition and imagination to use them in those ways. Somebody somehow has to model it for them so they know how to do it, can use them at a level of rigor that leads to learning. They need the right kinds of interfaces so they don't get lost in the morass of stuff that's out there.

So the really big issue is learning how to promote those things well. And for school, helping educators imagine how to use the technologies and even more important preparing packages, like curriculum modules that incorporate the technology because teachers aren't really paid to go out there and find all this stuff and put it all together and create all those new experiences from scratch.

MR. WEST: Okay. Thank you.

Holly, you are on the front lines of innovation at the Florida Virtual School. How are you using technology to further collaboration? And where would you like to see things go in the future?

MS. SAGUES: Great. Thanks, Darrell.

At Florida Virtual School we use social media in a variety of different ways. So I'm going to kind of talk about what we do currently and then where we want to go. So right now our students have the opportunity to communicate with their teachers in a variety of ways, including traditional type web conferencing. We use a tool that allows for both video conferencing, light boards, chats, very similar to some of the tools that you see out in the market that businesses use all over the country. We also use a couple of traditional technologies. When I joined Florida Virtual School back in 1998, our primary methods of communicating with students was through the phone and also through e-mail. Well, today we still use the phone, except the phone has evolved quite a bit in the last 15 years. And the last way students want to be communicated with now is through e-mail.

So our students like to get text messages from their teachers. They like to communicate with their teachers through Facebook, through various types of apps and different technologies, including the phone. You know, old fashioned speaking on the phone. They want a very close relationship with their teachers. So the more communication the better. Our students will tell you that they know their online teacher better than they know their traditional classroom teacher. So building that relationship is one of the key components to successful online virtual program with K-12 students.

So you also see our students posting questions out on the Internet, you know, if they need help with something or, you know, before they're even in a course, how do I sign up for a course? We'll find questions like that. We have students that inside of their courses -- and this kind of goes back to what Janet was saying around students will participate if it's an assignment -- we do have blog and wiki-type assignments. Students like to do YouTube videos; however, they do like them to be graded. They like to see a reward at the end for doing that. They may do them off on their own on things that they just enjoy doing. But as far as their courses go they do like to see a grade for those types of things.

We're also seeing students really starting to engage in our Me Studying apps. It's a series of mobile apps that we've developed that cover algebra, reading, art. We've got a frog dissection app, psychology, economics. We've got a Word Joust that's an SAT prep app, which is a game that we just developed. And we also have an app that is a GOFOVS or Go Forward to Virtual School app that really connects all the different things that are happening within our school so students can very quickly on their smartphone or on their iPad see, you know, what different clubs are meeting, what's on the calendar, and things like that. So those are becoming very popular.

We have launched two games in the past under a conspiracy code title,

and we've learned a lot from those games. Now, they were full course games. One was in American history and one was in intensive reading. And we launched them about four years ago and had some great results. The technology is getting a bit old now and through some of the lessons that we've learned we're focusing more on shorter games rather than the full length course game. And one of the new ones we're developing right now goes along with our middle school math course and it's called Ko's Journey and it introduces students to the middle school math course and then students sort of follow the journey as they get into the course after they play the game at the beginning.

So where are we going? What else do we need to focus on? So as we continue to develop, you know more apps for kids around mobile learning and gaming and then also test prep that seems to be the areas that they have the most interest right now. We've learned that 4 out of 10 students like to go in and do some last-minute test prep quizzing on their smart phones or on their iPads before they go in and take a test. So we're starting to see more and more of that.

Areas that we're moving into, we are finalizing our social media policy for our staff and teachers and the rest of our staff. Not to restrict social media but now to use it intelligently with our students and with other folks on our staff. We've also been approved to develop a social media course so we can teach students the proper ways to use social media and what's out there. And then we're also launching a program that we're calling right now Ask an Expert program where we're trying to bring in more course-specific, topic-specific experts for our students to engage with through various types of social media so that their coursework becomes more engaging to them.

MR. WEST: Thank you. So Marla, we've heard Holly talk about the various ways in which students are using technology and the texting and Facebook and games and other online activities. I assume teachers are starting to be drawn into this

domain as well. So what kind of opportunities are there for collaboration among teachers? What are the barriers? And what are the concerns teachers have about this area?

MS. UCELLI-KASHYAP: Thanks, Darrell. Great question. And this is actually a terrific lineup to bat cleanup with. So I'm really happy to be here.

AFT has long been an advocate for providing teachers and students with the highest quality instructional materials and pedagogy and for adapting new knowledge and tools to improve instruction. So for that reason alone we know that incorporating technology in K-12 instruction is critical and teachers are thinking about and worrying about and doing this every day and the opportunities are tremendous.

What I wanted to do, I don't want to be the skunk at the digital learning picnic at all but I wanted to just step back for a minute and talk about a couple of those kind of conditions or principles that we need to be thinking about if we're going to maximize the potential of technology and especially of collaborative and social technologies in the real life world of public school teachers and students. So I'm going to try and just run through five principles that I think will help us think about the terrific opportunities we've been hearing about.

The first principle is that quality teaching and learning has to drive the decision-making. One of the biggest ongoing challenges that teachers face is differentiating and personalizing instruction so they can meet the needs of all the students in their classroom. Digital resources, digital learning environments have tremendous potential for extending teachers' reach and for enabling them to meet individual student needs, but that potential can only be realized if the technology decisions are made based on sound educational policies and they support standards-based instruction. They can't be based on ill-informed choices or fed by marketing as

opposed to educational choices.

The second principle is that effective integration of technology into instruction requires more, not less of teachers. And I think Janet was getting at that in her comments. One recent report that I like from the Joan Ganz Cooney Center, which of course is named after an educational technology pioneer, is that for the promise of technology to deliver on student learning, more robust professional development and more ongoing support for teachers are required. So too often what we do now is we introduce digital resources without adequate professional development for teachers and for other school personnel and without enough support to really be able to use those resources well on an ongoing basis.

Which leads to kind of a third principle of all this that decisions about implementing digital learning technologies ought to be done with teachers and not to them. Research shows, and I think some of what Holly was getting at approaches this as well, research shows that teachers are integral to the success or failure of technology used to reach students but often those resources are purchased, decisions are made without adequate teacher involvement in the selection and the use. So that input is key. If part of a teacher's job is to bring coherence to the classroom to make sense of standards, of curriculum, of tools, of context, and to know their students, then they have to be really involved in making sense of the options. At the same time, they don't need to reinvent everything. So that's a big challenge that we face.

The fourth principle is that digital learning opportunities must enhance equity rather than exacerbate inequity. I think we would all agree that the digital divide is narrowing which is terrific but still, schools that serve disadvantaged and minority students often have less access to high speed equipment, to communications technology, and to the kind of administrative support for having all those things. So that

really limits the potential of all kinds of technologies to enhance complex thinking and advanced achievement. The last thing we want to do -- what we do want to do is provide for all kids the kind of exciting opportunities we've been hearing about this afternoon, not just use high-tech versions of drill and kill.

Mobile technology has all kinds of new possibilities, and in fact, it is almost ubiquitous and even students from lower income families tend to have access to mobile devices. There's no replacement for wired access though. You can't file a college application from, you know, from your mobile phone yet. So equity remains a big issue.

And the last principle to think about is that there's really a fine balance to strike between safety and access. Some of the exciting things that you were talking about are really challenging because the very nature of the collaborative technology is something that school districts are afraid of because they have a responsibility to prevent access to inappropriate content. So sometimes it's just easier to prevent access at all. And that's not good for teachers or students. So we need to do more about having acceptable use policies and educating students and teachers about ways to use particularly social networking technologies more effectively.

So I think that I would say simply that technology is not a panaceas but it sure can be a terrific tool. Teachers, our members across the country are embracing it. Veteran teachers are thrilled that chalk and talk overheads are being replaced by whiteboards and laptops. They're excited that students today can get instant feedback about whether they're on the right track and teachers can get that feedback, too. Young teachers who grew up with technology re incorporating it into every aspect of their teaching and learning. There are a lot of issues to be resolved and it's going to be tough to get it right, but we can and we have to if we're going to use technology to help teaches

transform our schools and the ways that they work with each other in support of student learning. And I'm sure we'll get more into that aspect in the conversation.

MR. WEST: Okay. In a moment I'm going to open the floor to questions from the audience but I want to throw out a question to the whole panel and anybody who wants to jump in can. As I listen to each of you, each of you mention various types of barriers. Some policy barriers, barriers in terms of operations in schools, or even cultural practices and norms in schools. So I'm just curious if each of you could address the issue of how can we overcome some of those barriers? Are there policy changes we need? Are there changes in operations? Are there changes in culture that we need to think about? Any of you who want to jump in. And don't be shy. Go ahead.

MS. KOLODNER: I'll just jump in first. I think that an awful lot of what's - - I'm not quite sure how to say this -- but an awful lot of discussion around schools has to do with teaching. Even when people are using the word "learning," they're almost always talking about teaching. And I think that one of the ways that you start to overcome barriers is by talking about learning, by helping teachers, administrators, maybe even more important for administrators to start learning more. I shouldn't say to start learning but to learn more about learning, about the processes involved in learning, and to start planning based on that. So if there are things that we know about learning and the technology can afford, can provide opportunities for making some of those things happen, maybe we can start there and start pulling in technology to do those things first. I'm an idealist so maybe I don't know enough, but my picture of that is that you'd have teachers involved in learning and administrators involved in learning, and you'd really be doing it from a point of depth and scholarliness.

MR. WEST: Okay. Other comments?

MS. UCELLI-KASHYAP: I'll take a crack at that one as well. And I

agree with what Janet said. I think -- I'll come back to a cultural issue in a minute but certainly, the professional development and not just thinking about technology as a tool but how you actually incorporate technology pedagogy into instruction. That's an effective way to overcome barriers and concerns or fears that teachers might have in using technology effectively. The other is the involvement in decision-making. I think when you have an involvement you have a lot more stake in getting it right for your kids and your colleagues.

There's a cultural barrier that I think is more challenging to overcome, and that is that so much of the way we think about teachers' work focuses on the individual instead of the collective. So there's not a lot of incentive or even space in the day to have the kinds of conversations and learning that you're talking about. So partly that's structural. We can structure things differently. I've just come back from a couple of Asian countries where, in fact, they create white space in Singapore during the day where you don't -- where you're not in front of kids; you're with your peers and you're figuring these things out. But I think that notion that it's all about the individual, not the collective responsibility for a class or a school full of kids, is a really challenging cultural barrier.

MR. WEST: Okay. Holly, you were going to jump in.

MS. SAGUES: Thanks, Darrell. I'm going to tackle it from a policy perspective. And you know, in order to really free the power of the technology, one of the things I think we could do to really speed that along would be to start to move away from a seat-based model in our schools to more of a performance or competency-based model in our school. Florida Virtual School has always been performance-based. We are only funded if our students successfully complete the course that they're enrolled in. So students can enroll any day. They can move as fast as they want. If they need to

take more time, if it takes them 24 weeks to complete a semester course rather than about 18 weeks. That's okay if they need to take more time. So if we can leverage the technology and pair that with students in more of a competency-based system I think that it will really free up some of the other issues that we're seeing and we'll really start to see the power of what can happen.

MS. WEST: Constance, do you have thoughts on how to overcome some of these barriers?

MS. STEINKUEHLER SQUIRE: Well, the issue that connects all of this together for me is actually more of a problem than a solution so I'm trying to think of like how would you solve that. So one of the great promises of technology, of learning technologies generally right now is that the name of the game currently is data. Right? This notion that we could, if we get the right kinds of data, quantify it in certain ways that make sense, that we could have much better analytics for learning and be able to, based on those analytics, trace and personalize what a child does or what a returning adult does. You know, and it's interesting because part of that conversation, the part that sometimes is worrisome for me is that the teacher is left out of that conversation. Meaning that, you know, just what Janet said, technology is only as good as how it's leveraged. I've seen games that are nothing but button mashing and I've seen games that are amazing, provocative catalysts for all sorts of intellectual work that we would get ourselves in trouble for trying to require for that same age group in classrooms. Right? But I've also, for what it's worth, seen math classes that were button mashing as well.

So back to, you know, if a technology is only as effective as the conversation that happens around it, well, part of that conversation and that, you know, I think that a lot of research has shown is that there's this peer conversation but the role of expertise and teachers or, you know, the more knowledgeable others is massive

significant and rarely part of the conversations around data and analytics which I think is a problem.

And so that's not a very good solution I'm handing you but maybe it goes back to the comments about teacher professional development and teacher education programs. Where are the coursework on things like data management, data visualizations, understanding data organizations? That you could actually trace your kids and leverage those data in a way that makes sense for you and that kid in that context. I think part of it in some ways I think is an interesting -- I'm going to go on a limb here and say that in some ways, you know, if data is the name of the next century, it deprofessionalizes teachers, not to treat them as people who are the primary analysts for something like learning analytics. So maybe that's a solution or at least half of one.

MR. WEST: Okay. Why don't we open the floor to questions from the audience? We have one from our webcast audience. So Christine, if you can --

CHRISTINE: Sure. Thank you, Darrell. Actually, I have a couple. There's quite a few.

The first comes from Shari Garmise in Washington here with the Coalition of Urban Serving Universities. She asks, "We've moved from a focus on equal access to equal outcomes. What is the role of social media in achieving this?"

And a second question I have is from Evan Burfield, who is the founder of Synteractive, a firm based here in Washington. And he says, "Does the traditional idea of a teacher remain relevant in a social media learning world? What's the world's school even mean in a post social media world?"

MR. WEST: Okay. Good questions. The idea of the teacher and equal access. So does the panel have thoughts on those items?

MS. STEINKUEHLER SQUIRE: Moving to, you know, the equal

outcomes and how social media is part of that, yes, that basically is the goal. You know, our teachers are very engaged with our students and as they learn about each student they learn about how each student likes to communicate with the teacher, with their peers, and you know, we encourage our teachers to, you know, capitalize on that with the student and bring that student to a successful outcome within that course.

And then I think the other question had to do a little bit about, you know, the role of school. And one of the things that we talk about is that, you know, school has kind of moved from being a noun, a place where you go every day, to more of a verb, which is, you know, all focused around learning. And it doesn't matter if you're in a specific place to learn anymore. And so social media is the way that we can still stay connected and, you know, the place is starting to become a little bit less important.

MS. UCELLI-KASHYAP: I'd like to take a crack at that as well. Really provocative questions actually. And first on the idea of school.

MR. WEST: We just started, by the way.

MS. UCELLI-KASHYAP: On the idea of school, I absolutely agree that it's going to continue to look more and more different. Actually, you go into a lot of classrooms today and they do look like they did 100 years ago but that is starting to change. I think what won't change and I think much of the knowledge base that we have right now says this, while we acknowledge different learning styles, all learning can't be independent or distant. So I think that there will always be some sort of a relationship between an educator and a learner or a set of learners or relationships across peers but that we can't have the act of learning in a formal way without that adult educator mediation and support. It may look different and feel different but that will not go away.

On the issue of equal access to equal outcomes, I mean, that's a really tricky one. We all want to focus on what kids know and can do and how they can support

themselves in our global world. So it would be hard to argue with that. I think that it's -- you can't really say that without getting inside of the black box. And you also have to be really careful, especially in virtual learning environments that kids don't get -- that kids have equal access to various kinds of environments and that we don't set up schools, whether we're talking about a charter school or, you know, a school, an exam school, not all kids have equal opportunities to get to the point where they can attain those outcomes. And so I think we just have to always be very mindful that while outcomes are the goal, you better be looking on the front end and on what's getting them to those outcomes to make sure that you're not, again, increasing inequities.

MR. WEST: Janet.

MS. KOLODNER: So part of what I'm going to say I'm not sure I'm supposed to say as an NSF officer, so I want to just tell you that it's coming from me.

MR. WEST: I can hardly wait to hear this one.

MS. KOLODNER: You know, there's this focus on equal outcomes but the truth is we're never going to get equal outcomes. I mean, you're always going to have some people who are better able to perform than others. So I think that the really important thing is the best outcomes we can get as opposed to equal outcomes. And that's related -- so that was the thing that I'm not sure I'm supposed to say as an NSF person. But there's something else that I can say as an NSF person that's kind of related to everything everybody's talking about and the answers to these questions that's really bewildering to me as I'm sitting here and listening and thinking about this, and that is this tension between taking individuals as far as they can go and at the pace they can do it. And also taking into account all the things we know about the roles of collaboration, the roles of working together in learning. And the need to have that collective and have learners sharing with each other, reflecting together. It's not just working together on

projects. I mean, it's reflecting together, presenting to each other, having an audience, being an audience for others. All of those things are immensely important in getting to depth with respect to learning, with respect to understanding. And if everybody is moving at their own pace, I don't know how you get that. And if we have all this data that says this person needs this and this person needs that and this person needs the other and the teacher's job is simply to figure out, you know, what comes next for each one of them, I agree with you. It makes the teacher not quite the professional in terms of helping people learn that we want them to be. I mean, it makes the teacher just somebody who's handing out tasks to people as opposed to really orchestrating an experience and designing or making run the experiences that are designed so that the kids can really get to depth.

And I think that, you know, that this thing I'm worrying about here is important to the answers to both of those questions that just came across. You know, the issues about what school is going to look like and what the outcomes are going to be. It's really tough to think about that. I also don't think school is going to go away. I mean, parents need to work. I mean, if parents are working --

MR. WEST: So we need some place to put the kids.

MS. KOLODNER: Yeah. You need a place to put the kids. Schools are not going to go away, and you can't have kids going from one place to another to another to another every day. I mean, all throughout the day. I mean, you know, maybe the soccer moms can do that, okay, but most people can't. So school is not going to go away in terms of having buildings. It would be great if it goes away in terms of it looking like the classroom where, you know, everybody's sitting there and just writing things and listening to the teacher all day. I mean, we need the teacher to be -- the kids to be constructing, to be solving problems, to be doing it together with each other. To be doing

it together with people who are in another place, okay, who are doing similar things.

They don't all have to be in the same place to do it.

MR. WEST: Okay. There are people in the audience who wanted to jump in. So right over here. And we have a microphone that's coming up. So if you could give us your name and your organization.

MR. DILLON: Ken Dillon. I'm an adjunct history teacher at Marymount University.

I'm wondering, to follow up on this most recent comment, where is it that we're going to find balance between the digital media and other ways of learning in the school context? There are some people who think that more -- spending more time with -- - staring into a computer screen or working with Facebook or whatever is what students need least of all. They need less of that. How do you address that?

MR. WEST: Constance, do you want to --

MS. STEINKUEHLER SQUIRE: Well, I mean, first on the topic of sort of technologies like video games generally, video games are not going to replace television. Television didn't replace radio. Radio didn't replace newspapers or reading or, you know, social conversation. So I think there's sort of an ecosystem. And so the word "balance" that you use is the right one. So who figures out that balance? Well, in a teacher it's the teacher, and I would argue that, you know, the need for a teacher is more dire than ever because a teacher doesn't just curate content albeit that's a really important function in a world in which we can all now produce and there's an incredible amount of stuff, information online. Right? Not all of which is necessarily grounded in facts, for example.

So the role of a teacher, you know, is certainly to me more and more central there. But not just as a curator of content but again, you know, in my experience most transformative teaching comes from -- it's what people -- teaching and learning

happens between people and technology is sort of part of the thing that structures it or provides a new context for it in the case of networks or whatever. And so, you know, whether or not that social interaction is technically mediated I don't think is the interesting question. I think the interesting question in my mind is what new sort of context or what new environments can we create to do things we couldn't do before? So I have a lot of hope in things like being able to let a young person in middle school navigate the human body as a white blood cell defending off an attack from a particular disease or virus. I think that's a completely new content.

But to go back, I mean, I think the role of teachers within building that ecosystem across digital media is going to be a matter of curation, but also a matter of sort of orchestrating which technology fits which task and which sort of content understanding we're going after. I don't think it's going to be easy. I also think that the notion that we will be able to come up with a model that fits every context is naïve.

MR. WEST: Okay. We have a question right there. There's a microphone coming up right behind you.

MR. PEHA: Jon Peha, Carnegie Mellon University.

I applaud the comment on the importance of data. Certainly, all kinds of software, gaming, social media, whatever, have an unprecedented ability to capture data and from what I see I suspect a good part of it goes into a black hole. So I wonder are there good models out there about, first, what kind of data should be collected, and then how you actually make use of it and feed it back to make real improvements?

MS. STEINKUEHLER SQUIRE: Well, I'll make a quick comment and then I'd like to hand it over to let other people talk. But I will say that in the sort of -- from my perspective, my observation would be that many of the most important data sets sit inside industry and yet many of the questions industry wants to ask about them are not

about learning but about marketing. So how do you -- and I'm saying this generally -- but how do you restructure moment by moment, you know, sequencing of tasks or content in order to get a person to buy a personal widget X milliseconds faster, better, for more money, whatever. And those are perfectly valid questions but there's a whole other suite of questions around learning and cognition and human interaction that we ought to be asking. In order to do that we're going to have to build some partnerships between unlikely bedfellows, for example, between companies who create sort of some of the compelling worlds that I look at, you know, around games, including entertainment games, but also partnering them with research scientists, with data scientists, and growing a whole new generation of data scientists because right now they're hard to find. And when one enters the market they get snatched up very, very quickly.

MS. UCELLI-KASHYAP: I'd like to add to that -- that's a really interesting question as well -- from a slightly different angle. And that is around creating demand, if you will, from different quarters for the kind of information that could and should be available, especially to the extent that it could be used formatively to support student learning. We're talking about a huge, multi-billion dollar industry and teachers and parents and community can make common cause around creating demand for greater transparency in data and greater availability of data that enhances teachers' work. So I think part of it is the demand side as well. We're still figuring out what are the right questions to ask.

MS. KOLODNER: I just want to say that we shouldn't just think about the data that enhances the teachers' work but also think about the data that can be used by computer systems automatically to help people learn better. And in fact, you must know that CMU has one of the biggest installations of people working on that work now. But I think this is one of the really big issues in research right now and there's a

conference I'm going to next week that's about data analytics. And NSF just put out a, you know, an announcement about a new program in big data and part of that big data initiative is around big data being used for learning. And not simply being used so the teachers have the right data, although that's a piece of it, but also being used so that if we have kids learning in the context of games, kids learning in the context of tutoring systems, that a system will be able to analyze that student's work and their understanding, be able to give the right kind of feedback at the right time to help them deepen that understanding. So I think all of that is part of what we need to be doing.

MR. WEST: The quick answer I want to give to you is the importance of embedding assessment in content delivery because that's the key to providing the real-time analytics. Unless we can get to that point it's going to be hard to really do it.

MS. UCELLI-KASHYAP: I would say it in a different way. It's not just embedded in content delivery; it's embedded in the activities that the kids are doing. It's not always content delivery activities. They may be expressing themselves in some way and the computer can be looking in on that and helping them do a better job of that.

MR. WEST: Good point. Other questions? Right here on the aisle.

MR. ALTMAN: Hi. I'm Fred Altman.

The educational technology is moving ahead at a very rapid pace as these sessions that Darrell holds demonstrate. My question is the cognitive science and cognitive neuroscience of learning that would underpin much of this, is it keeping pace with the technology?

MR. WEST: Janet, I think that question is directed at you since you're the cognitive scientist on this panel.

MS. KOLODNER: I actually head up a program with somebody else at NSF called Cyber Learning: Transforming Education. And what we're trying to do in that

program is to do both of those things. To have researchers who we're funding, envision the next generation of learning technologies and how to use them, and also advance our understanding of learning with technology. There's a lot we know about learning, about cognitive issues, about social issues, cultural issues. When the opportunities people have, I mean, you know, cognitively we build mental models. Whether they're in our heads or they're shared between our heads and the world around us, I'm not going to get into that. Or shared with our bodies, I'm not going to get into that. But we build mental models. And that's not going to change. But when we have opportunities to be a white blood cell moving through the body, for example, the kinds of mental models we can build are quite different. And the kinds of connections we can make between -- I'll go over the different things we know are quite different. And the pieces of -- the little pieces of stuff we pick up along the way, right, and the kinds of reasoning we do are a little bit different. And all of that could qualitatively change -- the speed, the depth, the connections, you know, that we make. How does that change? Well, we've got to study that. We've got to know that because you're right. We're not going to be able to use these technologies in the best ways unless we also know how learning is happening. And we've got a lot of different programs at NSF where we're looking into that. Mine is just one of them but absolutely.

MR. WEST: Okay. In the very back on the aisle.

MR. COLLINS: Hi. Donald Collins, University of Maryland University College.

First of all, I think there was a movie about 8 or 10 years ago with Bill Murray and Eddie Murphy about something osmosis about -- anyway, I just figured I'd throw that out there for those of you who have actually watched animated movies in the last 10 years. Anyway, my question to you is about a different issue around balance. At

the higher education level over the last 10 or 15 years we've had this whole issue of for profit institutions and the use of new technologies around education at that level. And some of the not so good, disastrous, mixed results in terms of learning and teaching and all those sorts of things at that level. And in terms of just visioning what education at the K-12 level is going to look like in a decade or even two decades with social media, isn't there a danger sort of -- I would say danger around the whole issue of possibility with working with corporations and so on that you end up with a system that might actually have K-12 proprietary institutions as well providing a lot of the services that used to be enhancing public education since most of the technology is already in their hands to begin with. I'm not being a luddite. I'm just asking a question based on what I see every day at the higher education level.

MS. UCELLI-KASHYAP: I'm happy to start that. I'm sure Holly would want to address it as well.

I think the scenario that you're talking about is actually already happening because there certainly are for profit institutions that are providing education usually in a completely virtual space as opposed to a more blended space which tends to happen in more traditional schools. So yes, I mean, that is a concern and the ways that you address that concern are around issues of transparency, are around making sure that people who teach in those institutions are actually certified to teach in the area that they're teaching, understand the standards of the state in which the students are located. So you have to really put some safeguards in place to assure that, again, the basis is sound educational decision-making and what's best for the set of students served as opposed to profiteering on the part of a provider.

MR. WEST: Holly, do you want to jump in?

MS. SAGUES: Sure. Marla, I think, really hit it. I'll tell you a little bit

about how things are happening in Florida because Florida tends to be a little bit further out on the limb when it comes to some of what's happening in the virtual space.

So Florida Virtual School is considered a public school, public school district in Florida. So we're just like any other school district; it's just that we're kind of at the state level and we can serve students throughout the state. Most of our students only take one or two courses from us and they spend the rest of their time either in their public school, their charter school, their private school, or they may be a homeschooled student.

So Florida also has -- every school district in Florida must provide up to three different virtual options for their students. So all of those other school districts, they can provide their own program, they can use Florida Virtual School or they can also contract with a list of approved providers that the Department of Education approves every year, every couple of years. I'm not really sure what the cycle is. But those providers have to go through a rigorous application process and they do have to have, you know, all of their teachers certified -- Florida certified in the subject areas. They have to make sure that their content addresses all of the Florida Next Generation Sunshine State standards or the common core standards when they come onboard. There's an entire list of things that they have to be able to prove that they can do. And so that is vetted. And then the district can choose which one, any, none of those private providers that they might want to contract with. They just have to have options for students. So what we're trying to do in Florida is level that playing field so that a student in a very rural district has options to take the same AP courses that a student in a more affluent suburban district may be able to take.

MR. WEST: Okay. Christina has another question from our webcast audience.

CHRISTINA: Sure. The first one comes from Wendy -- I'm sorry,

Whitney Gutman here in Washington. "Is there any way to know how many institutions, schools are using video games and social media for learning??

And second of all, Mallory Smith, who is a graduate student at American University says, "Realistically, how can we continue to integrate technology into schools when getting a new textbook can take a year or even longer in some school districts?"

MR. WEST: Good questions. How many schools are using video games? Constance, I don't know if you ran into this during your search.

MS. STEINKUEHLER SQUIRE: I can give two good resources that can give you partial numbers but I don't know that we really actually know that number yet. And one is SEDNA, so they're doing a survey of their member schools, so the people who actually do procurement around technology. And another one would be -- there actually now is a new game publisher who has done sort of a full-on market analysis -- the name of the company is E-Line Media -- looking at contact points with schools. But I don't think we have a really good understanding of what that landscape looks like yet. There's a third group called Games Publishing Council or maybe it's Educational Games Publishing Council that is partnered with the Joan Ganz Cooney Center that is doing additional market analyses that include both in school and out of school. So I think it will be interesting to see that data come out in the next year.

And the second question was about --

MR. WEST: The second question was tougher. It's basically how can we have confidence in schools doing all this new online stuff when it takes years to order paper textbooks?

MS. STEINKUEHLER SQUIRE: Right.

SPEAKER: It's a different budget.

MS. UCELLI-KASHYAP: I would love to answer the textbook question

because it lets me tell one of my favorite stories in this area. And it involves collaboration, resources, and all kinds of things. So we have an affiliate local called Anoka-Hennepin. It's a school district in Minnesota. And they were about to do a new textbook adoption related to high school sophomore math in essence. And they had a \$200,000 budget for that and each book would cost \$65 and they kept their books for 10 years because that's what the budget allowed. And so the teacher said, you know what? We can't find anything that really matches the standards we're using, you know, our state standards and our scope and sequence here in the district. What if you let us, some teachers, over the summer, come up with a better alternative? And what they did was for the princely sum of \$10,000 in fees and \$5,000 in materials, create an online lesson resource that has replaced the sophomore math book in that district, save the district \$185,000 and got -- the teachers got the agreement of the district to pile those resources into improving the math program. So that's a really, I think, interesting example of how collaboration and technology can come together to make something that's a challenge for school systems actually work more effectively and provide a better tool for student learning.

MR. WEST: Okay. Question back there.

MR. SLADE: Mike Slade, U.S. Department of Education.

I applaud Janet's comment regarding best versus equal outcomes and I sort of couch that within the context of all outcomes contribute to the greater good. And speaking on behalf of the more than 6 million kids who have disabilities across the nation in one particular form or another, what have been the experiences for those kids within the context of this changing learning environment that we do have?

MS. STEINKUEHLER SQUIRE: I can start on that one. You know, for many students who have special needs, just being able to take more time to learn your

lessons, have that individualized instruction with your teacher and being able to work a little more at your own pace, take extra time on exams, that is just a huge benefit of either an online or a blended or a competency-based system. So in that respect then, you know, it's a beautiful thing. There are other students that have disabilities, you know, and depending on what the disability is or the special need is an online learning environment can be a really great resource for them. For others it may not be the best or the least restrictive environment for that student. So it needs to continue to be a choice and it needs to be part of a very large toolbox of things that we can use for our students to take them as far as we can.

MR. WEST: And I have a chapter in my book on special needs students. And just a couple things I'll point out is, you know, there have been tremendous advances in voice-activated computing. So for students who have various types of physical limitations, that's a huge plus. They can have access through voice commands. And then secondly, with visually impaired students, you know, there's been software for a number of years now that will essentially take the contents of a website and read it and convert it to an audio signal so they can't see what's on the website but they can basically get a verbal description of that. So I think there are lots of things out there that make, through technology make educational content more accessible to students.

MS. KOLODNER: I could just mention two projects that we're funding. I mean, one of them is a really simple use of -- a person came to talk to me about it this morning -- very simple use of augmented reality for kids who are hard of hearing and deaf where instead of having to keep looking from the signer to whatever they have to watch, to the signer or to whatever they have to watch, they wear a monocle. You know, they could wear a monocle and have the sign, you know, see the signing and -- I don't know how to sign -- and whatever it is they need to be looking at at the same time. Okay,

now there are issues of backgrounds and various things like that, I mean, but they're not big, you know, they're not rocket science issues. So technology can do things like that.

Another one is, again, at CMU, somebody there -- Jack Mostow was working on a -- I guess a reading tutor. Helping kids who are having trouble learning to read, learning to sound out words, and every year it's gotten more sophistication. Now it's up to, you know, some degree of helping them understand. Just giving them that personal attention that they need with the program. So it helps them practice. It collects data. It figures out when they're confused. You know, it does things to help them to move forward.

MR. WEST: Okay. Other questions? Yes. This young lady right here who has her hand up.

NATASHA: Hi. My name is Natasha and I'm a graduate student in communications.

I just had a question. You brought a lot of valid points about social networks and online games, but I want to talk about drawbacks and whether -- if I find that I see quite a scary trend where 12-, 13-year old girls -- I see them at Starbucks. They'll come together for a coffee and they'll just be sitting there with their iPhones just messaging each other online even though they're sitting across from each other talking. And I've had -- in my graduate years I've TA'd classes, or like even school and undergraduate students and they admit quite a lot of times they'd have a connection online and they'll be having like a deep conversation online but when they meet that person in real life it's kind of awkward because even though you've had this conversation all of a sudden like you have to face them and you have to talk to them.

So with the school definitely gives a lot of good points, definitely enables the concerns of science, definitely enables a lot of learning experiences, but do you find

that it also takes away and puts certain social skills in danger? And whether or not like, as you mentioned, teachers are very important now I find as well. They can moderate and make sure that those social skills do not go away and that people, students can still present, have presentation skills, like face-to-face skills because you still need them to go through job interviews and such.

MR. WEST: Interesting question. Are we losing face-to-face communications here?

MS. SAGUES: I'll tackle that. I do think that that is a danger. You know, I see it all the time as well. That's one of the reasons why we want to develop this social media course. And if you'd like to help us with that I'll take your advice. And you know, we also still require after 15 years -- we still require our teachers and our students and our parents to talk on the phone on a very regular basis. And we require our students to discussion-based assessments, which would be sort of like an oral assessment in very single module of, you know, pretty much every course that we teach because that voice-to-voice communication, that face-to-face piece is still very important. And we build projects into all of our courses as well so that we can make sure that the students are actually, you know, working together or working with people in their community. We try to get our students working on things away from the computer as much as possible and then bring those results back and submit them online. But we do try to -- we used to call them "get out of your seat" assignments to get kids out in the community and interacting.

MR. WEST: And right behind her there's another question.

MR. CRAWFORD: Hi, Steve Crawford, George Washington University. Thanks. This has really been fascinating.

My question I guess is directed mostly at Holly. I was struck by your comment about the students have a closer relationship to their online teacher or tutor. I

mean, that's both thrilling in the sense that we now have Stanford professors teaching courses that reach 158,000 people around the world. I don't know if that can be translated. I doubt it can be. But, you know, Western Governors University tries to do these sort of add-on coaches and things. So you wonder about one of the great reservations about massive online education. We that lack of contact with the teacher or with other students and maybe social media making that much more possible than we appreciated.

My bigger question is about the costs of all this. I haven't heard, I mean, we have this national debate going on about the affordability of higher education and student loans and indebtedness, et cetera and the president is speaking in North Carolina today about all that. So what -- is all this an additional cost to we hope enhance learning? And Janet may be able to speak to this but or are there productivity gains? Another word I haven't heard today but, you know, iTunes, Amazon, Netflix, all of these resulted in lower prices for the delivered product or service. But of course, they're very different than educating our kids. So are the kids at Florida Virtual School, do you know the sort of per course expense for a math course that you teach versus a classroom-based one?

MR. WEST: I bet she does.

MS. SAGUES: Yeah. Yeah, I do. Okay, so going back to the first part of your question around the personalization, you know, the relationship between the parent or the teacher and the student, we intentionally, you know, try to keep our teacher-student ratios at a very reasonable level comparative to what you might find in a traditional school because we feel like that relationship is a very key part to our success. Probably the main difference there is that the students can move more at the same -- at their own pace so that the teacher does have to learn some new skills around how to

keep track of where every student is at and provide that personalized instruction to each and every student.

And then as far as the cost goes, Florida Virtual School is about \$1,200 to \$1,400 less than -- we're funded at about \$5,200 per student and the average class, average school in Florida is funded at about \$6,500 per student. So we're a lot less than some of the northeast partners that are up here. But so we are cheaper.

And then on top of that, we are only funded for the students that actually pass the course. So each year our completion rate averages between 80 and 85 percent. I think last year it was at 83 percent. So we had about 17 percent of our students that did not -- that either didn't pass, they moved out of the state, they got ill, they dropped out for one reason or another. We did not get funded for any of those students. So you have to discount that 5,200 by the percents of students that don't complete. So we are much more cost effective than a traditional school. But we don't have to provide all the services either. We have different services. We don't have to provide transportation. We don't have to account for, you know, the other custodial aspects of school. We don't have to, you know, provide a building. But we do have some extensive technology costs. So you know, we have done studies where if you boil it down to, you know, try to boil it down the best you can from apples to apples, you can never quite get it right. We are, you know, cheaper but if you -- it's not that much cheaper if you kind of discount out the building and like some of the transportation and some of that sort of thing. But it is more cost effective.

MS. KOLODNER: So I want to say two things. First of all, you mentioned massive online education. So I want you to notice that not one of us talked about massive online education. And I don't know what everybody else's reason was but, you know, that course from Stanford is really wonderful and MIT has a lot of courses

out there also and other places do, too. And sometimes they provide, you know, social media around them. MIT has something called open study that they use around the courses that they have out there. You know, we don't really know a lot about these thousands of people who take those courses, what they learn, what they do with what they learn. But there are some interesting things happening with those courses that are broadcast that social media can play a role in but also that academic faculty play a role in. So I know that the artificial intelligence course from Stanford, one of my colleagues in Massachusetts was taught a course around that. The kids got credit for attending his seminar, for watching that course and attending his seminar. And in the seminar they talked about what was presented in the course and they worked out the problems together. And he says it was a wonderful experience, you know, that he got to learn a whole lot, too, in doing that. And I know with the MIT courses you have people from around the world who are interacting with each other, you know, solving problems together that come up in the course. And we don't know right now what anybody's learning from it but, you know, it does make the -- it does make those courses certainly more engaging for the people who choose to do it and probably more valuable for the people who choose to do it than simply watching the online, you know, massive online education.

But don't think that the massive online education is going to solve all the world's education problems at any low cost. I mean, people are watching this stuff. We don't know how much they're learning from it or if they're keeping with it or anything like that.

MR. WEST: Marla, you wanted to address the cost and productivity issue?

MS. UCELLI-KASHYAP: Yeah, and I really do actually appreciate the

way that Holly described the differences and what the costs are. In all of this there's a tradeoff, but I think that when we start to approach what we are getting in our K-12 system from solely a productivity perspective as opposed to an investment perspective and what we hope to get out of it, then again we're asking the wrong question. I absolutely think that we have to look for economies of scale and we have to look for ways of spending money that's more effectively reaching kids. But I think that our competitors and the systems that rate highest on the international tests of student assessment think about it in terms of investment more than they do in terms of productivity. And I think that's the way -- that's the mindset that we all have to have to be successful.

MR. WEST: Okay. We're out of time so I'm going to make that the benediction of this event. But I want to thank Holly, Janet, Constance, and Marla, each for sharing your views. And thank you very much for coming out.

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CERTIFICATE OF NOTARY PUBLIC

I, Carleton J. Anderson, III do hereby certify that the forgoing electronic file when originally transmitted was reduced to text at my direction; that said transcript is a true record of the proceedings therein referenced; that I am neither counsel for, related to, nor employed by any of the parties to the action in which these proceedings were taken; and, furthermore, that I am neither a relative or employee of any attorney or counsel employed by the parties hereto, nor financially or otherwise interested in the outcome of this action.

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