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P R O C E E D I N G S

MR. WEST: Good afternoon. I'm Darrell West, Vice President of Governance Studies and Director of the Center for Technology Innovation at the Brookings Institution. And I'd like to welcome you to today's forum on Education and Immigration Reform. We are webcasting today's events so I'd like to welcome those of you who are watching live from around the country, if not around the world. Oftentimes we get about 10 percent of our viewing audience from outside the United States. We're also going to be live tweeting this event using the hashtag techcti, that's techcti. For those of you wishing to post comments or ask questions during the broadcast event.

And then during the Q and A we will take questions both from the live audience here at Brookings as well as our virtual audience. And we will be archiving the video from today's event so people can go back and evaluate your own performance if you're a speaker or take in additional comments.

I think today when we think about our situation in terms of training, our leadership is threatened by a skills and talent deficit, largely due to the lack of professionals trained in various science technology, engineering, and mathematics fields. Employers report that they are unable to fill all the positions that they have in these areas and there is a gap between those who go into those areas versus those who do not.

So, today's employers and policy makers are facing a similar type of challenge. How can we restructure our educational system to prepare for the next generation of students so that they're better able to compete at the global level? What are the policy changes that are necessary in education as well as in immigration to make a real impact on the workforce and our economy? And how can corporations, educators and policy makers produce meaningful change?

To help us answer these questions we brought together an outstanding

set of speakers. Today's featured speaker is Brad Smith, the Executive Vice President and General Counsel of Microsoft. He's been General Counsel since 2002. He oversees numerous negotiations leading to computation law, intellectual property agreements with governments around the world. He has spearheaded Microsoft's intellectual property portfolio and he's launched numerous global antipiracy and digital crimes initiatives.

In 2010 he chaired the Washington State Higher Education Funding Task Force and successfully advocated for a number of major policy recommendations. Following Brad's speech we will have a panel. Michael McShane will be on the panel. He is a Research Fellow in Education Policy Studies at the American Enterprise Institute. His first book is entitled "President Obama and Education Reform," which was just released earlier this month. And it provides a comprehensive description and analysis of President Obama's education agenda. At AEI he focuses on Federal Education Policy and the politics of education reform including school choice and the common core standards.

Nicole Smith is a Research Professor and Senior Economist at the Georgetown University Center on Education and the Workforce. In this capacity she leads the Center's work and has developed a frame work for restructuring long term occupational and education projections. She puts out a help wanted report which projects educational demand for various occupations in the US economy through the year 2020. And she's the co-author of an article on "The Inheritance of Education and Equality."

Our last panelist will be Stan Jones. He is the President of Complete College America, which is a national non-profit which seeks to work with states to increase the number of Americans who obtain quality career certificates or college degrees. He was elected to the Indiana House of Representatives at age 24 and served

as a member of the House Education and State Budget Committees. He also served for more than five years as an advisor to then Governor Evan Bayh. He worked as Indiana's Commissioner for Higher Education for 12 years.

So, we're going to start with opening comments from Brad Smith and then we will hear from our panel of experts. So, please join me in welcoming Brad Smith to Brookings.

MR. SMITH: Well, thank you Darrell. Thanks to all of you who've spent a little bit of your time this afternoon. I know your time is valuable and I really appreciate it.

I've been to Brookings before to talk about Cloud computing. I've often had the opportunity to meet with people here and talk about competition law or intellectual property. But today I want to talk about something that I think is more important still. I want to talk about people.

Because we've had the opportunity as a company from our firsthand experience to get a perspective on what's happening with people in the country, with education, with immigration. But as I've talked with others including a week spent at the Republican convention in Tampa and a week spent at the Democratic convention in Charlotte, one thing has become increasingly clear. Our experience is far from unique.

But let me start with what we're experiencing ourselves. When I went to the two political conventions I participated in a number of conversations where I did something that frankly is a little difficult to do when you work for a company. We started to share some of our more confidential information about what we were experiencing with respect to our hiring.

Today, in the United States, Microsoft has over 6,000 open jobs. That's 15 percent more open jobs than we had a year ago. Of those 6,000 open jobs over 3400

of them are for engineers and software developers and researchers. And that's an increase of 34 percent year over year. The reality is that in the United States we are creating unfilled jobs faster than we are creating new filled positions. And yet, I know we are not alone. I know we are not alone because when I describe these numbers people from other companies come up to me and say, "You know I'm glad you said that because our story is exactly the same."

And I know we are not alone because one hears it not only in the stories that other business leaders have to tell, but one sees it in the numbers statistically across the country. The government estimates that there are over 3.7 million open jobs in the United States today. If you look at the occupation that we know best, computer related occupation, the unemployment rate is only 3.4 percent. Since the traditional definition of full employment is about 4 percent, that tells us that we have a shortage.

And it is therefore not surprising that when one talks to people who work in companies, they experience the shortage firsthand. Part of what one needs to think about is not only about the shortage but why the shortage exists. And I think the answer has become increasingly clear. One set of numbers brings it into bold relief. It is this. This year the United States economy will create 120,000 new jobs that require a Bachelor's Degree in computer science.

But as a country all of our colleges and universities put together will produce only 40,000 new Bachelor's Degrees in computer science. What tells us is not only why we have a shortage today, it tells us this shortage is going to get worse because these same numbers are projected to persist each and every year through the remainder of this decade. As I talk to other business leaders, one conclusion is inescapably clear. For many companies seeking to recover from the recession, one of their biggest problems is finding people with the skills to fill the jobs they are creating.

And increasingly we fear that if we cannot provide or produce the people in the United States who have the skills to fill these jobs, the jobs will start to migrate to other countries who do have people with the skills that are needed. And if the situation is challenging overall, and it is, the truth is it's even more dire for the minority population.

Consider this. In the United States last year, there were 1603 new PhDs in computer science. Only 349 of those degrees went to women. Only 47 went to African-Americans and only 17 of those degrees went to Hispanics. When we look at the education and the degrees that are going to move the country forward it is becoming clear that some minorities are being left behind. And when we see the continued persistence of unfilled jobs and unemployed people at the same time, it's clear that we're not only talking about a problem, we're talking about a tragedy. And it is a problem and a tragedy that requires new steps for us to address effectively.

Certainly as I talk to people across business, one other thing is inescapably clear; we're not just talking about IT companies here. And we're not just talking about companies in one particular part of the country. If you want to think about the future of manufacturing or the future of retail or the future of healthcare or the future of any industry in this country, you're thinking and talking in part about the future of software. Because virtually every industry and every business in it today increasingly relies on automation and computing technology for core business processes. So this isn't just an issue that comes to the forefront in the IT sector even though in some ways we may be a little on the earlier side to experience some aspects of it firsthand.

The real question is not whether we have a problem because we so clearly do. The real question is: what can we do to solve it? We've been giving a lot of thought to this as a company. We've been given a wonderful opportunity to listen and learn from many other people, experts in the field, people in other companies, people in

industry associations, people in government, people in Congress, people in both Houses, and in both parties.

And so, we put together a few ideas that we wanted to share today. I would never, for a moment, think that a problem as big as this is going to be solved in an afternoon. But maybe there's some new thoughts that we can bring to the conversation and maybe there are some new paths forward that we can identify that we can take here in Washington, DC and across the country in the year ahead. We've concluded that there is a path forward. There is path forward that in part builds on some successful efforts in recent years. There's a path forward that in fact combines some ideas that to date people have been talking about separately.

What we proposed, what we've written about in the White Paper that we've put out today is, in effect, a two part solution. One part looks at investments the country needs to make in education and STEM education in particular, to create new and better opportunities especially for the next generation of our people.

And the second part involves overdue reforms in our high skilled immigration arena. But in part what we're suggesting is that we use the second piece, immigration reform, to raise the money to help pay for the first piece, the education investments that the country so clearly needs.

Let me take a few minutes to highlight each and then we'll have, I think, a very interesting conversation about all of these issues with the panel. First, when it comes to STEM education it has become so clear that we need to take a number of new steps. As a company, we've concluded that we should borrow from and learn from some of what worked in the race to the top initiative in recent years. We need a new national initiative. We need a race to the future. A race that will bring together the resources and invest them in the areas that will make a difference.

There are many people with good ideas about where investment is needed but we've highlighted four in the White Paper that we've published. The first is to focus on stronger STEM education in the K12 system. To train and recruit new teachers in math and science and technology and engineering and to raise standards in schools across the country building on what is already starting to work with the common core standards and the next generation science standards.

And to provide funding for the states that want to make the investments and take the steps that will lead to stronger STEM education across the board. That's the first of the four things that we think merit some new investment.

The second is this: it's computer science in education and in high school in particular. If you think for a moment about some of the people who have remade our world, people like Bill Gates or Steve Jobs or Mark Zuckerberg, and you ask: what did they all have in common? There is one thing they each had the opportunity to do. They each learned computer science before they graduated from high school. They were the fortunate few. They happened to have families or friends or mentors that made it possible for them to work with computers and not just play computer games but create them and build programs at a very young age.

We live in a country today where any young person should have the opportunity to become the next Bill Gates or Steve Jobs or Mark Zuckerberg. But consider this, in our country today there are over 30,000 public high schools. There are over 12,000 private high schools. We have over 42,000 high schools in the United States and yet only 2,100 of them last year offered the Advanced Placement Test in computer science. Only 2100 schools.

But more disconcerting still is this, that number is shrinking not growing. It is 25 percent lower than it was five years ago. That means that four decades after Bill

Gates and Steve Jobs were teenagers, we still live in a country where you have to be one of the fortunate few to be exposed to this field at an early age. And that is true even though I would argue that computer science is to the 21st century what Physics was to the 20th. It is the foundational science for the potential advances of the future, whether you're talking about computers or biology or chemistry or microbiology or any field in the life sciences. It is absolutely fundamental.

And it's not just that computer science isn't offered in most high schools. It's that it's not recognized in most states as a course that will qualify to help a student meet their math or science requirements for graduation. 41 of our 50 states today fail to treat computer science as either a math or a science course. It will get you just as close to graduation as it will if you take woodworking.

I love wood. But it is not the future of our economy. We feel it is time to put a stake in the ground. We should aspire as a country to ensure that by the end of this decade every high school student in America has the opportunity to take part in a computer science course before they graduate from high school. It doesn't mean that every high school student should be required to but they all should have the opportunity to get exposure to and learn what is important in such a vital field. And we have some specific ideas in our proposal about investments that can help accelerate that.

The third of the four ideas that we believe merit investment focus on expanding computer science capacity in our higher education institutions, community colleges and four year institutions. The facts are clear. If we're producing only 40,000 Bachelor's Degrees in computer science while we're creating 120,000 jobs every year that require that degree, we need to grow computer science in colleges and universities. We are going to need to invest as a country in more professors who can teach computer science in more departments that focus on computer science. And our public community

colleges and universities are going to need to help lead the way. And a time when the state budgets are so constrained perhaps especially when it comes to higher education, we need to find some creative ways to increase the level of investment.

And then the last area that we believe would make a real difference is to focus on the college completion crisis that currently exists in the United States. This is the great crisis that far too few Americans have had the opportunity to think about. And one of the things we should all aspire to do is to help focus more attention on this problem. When most people of my generation, especially in a place like Washington, DC talk about a young person going to college, it usually inspires an image of someone leaving home. Moving into a dormitory, perhaps working part-time like I did when I was in college, but being a full-time student.

That still exists, but it exists for only 25 percent of the young Americans attending college today. The reality is that our demographics have changed. And three quarters of the young Americans who are attending college are having to do so when they are juggling work, perhaps a family, a complicated life and college study at the same time. And we should be clear; the problem today is not that Americans are failing to go to college. They are starting college in very high numbers. The problem is they are not finishing.

And one sees this so clearly in the available data. If you look at the American population that is in community colleges today, if you look at the people who have signed up and enrolled in two year certificate programs, we find that less than 30 percent of them finish that two year program in three years. And only about half of the students who are enrolled in four year degree programs get that four year degree in six years. We have not yet adapted and evolved our system of higher education to meet the needs of a new generation of people. A generation that can't necessarily find the time to

attend one class from 9:00-10:00 on Monday and Wednesday mornings and a different class from 2:30-3:30 on Tuesday and Thursday afternoons. They are trying to go to work and earn a living and use that to help pay for their college.

In fact, in community colleges today 60 percent of the students who are attending are in fact holding jobs that require more than 20 hours of work during a typical week. And at a time when most of us think about the ratio between students and faculty, there's another ratio we need to start talking about. That's the ratio of students and counselors. You know what that ratio is across the country? 700 to 1. That means that if you walk across community college and four year campuses today, every time you shake the hand of 700 students you should have the opportunity to meet one counselor. But what it tells you is that most students don't get a lot of time with counselors to help them navigate their way through their college education.

There are some relatively straightforward steps we can take that would make all the difference in the world. And I know from Stan Jones, we'll have the opportunity to talk about some of them in this panel. What we propose in short, is that we invest five billion dollars over the next decade and spend 500 million dollars a year and get the money into the hands of the states that want to take action, that want to innovate and want to improve STEM education in the various ways I have described today.

And of course, I appreciate full well that if you come to Washington, DC in September of 2012 and you have an idea that's going to cost money, you better figure out how to pay for it. And that's what we've done. What we therefore propose is a second step. It's a step that's needed to meet the economic issues that we face today but it's a step that will pay for the opportunities of tomorrow. And that's high skilled immigration reform.

We're proposing two steps in particular. The first would be to add a new

and additional quantity of 20,000 visas per year that would be focused on STEM disciplines that would supplement the existing number of H1B visas. But importantly these visas would be more expensive. They would cost a sponsor $10,000 per visa. And believe me, we've done a lot of work to think through from a cost perspective what is feasible, what is feasible for a big company, what is feasible for a small company, what is feasible for a mature company, what is feasible for a startup. I believe this number is economically feasible.

And if those 20,000 visas were used next year as they almost certainly would be at a cost of $10,000 per visa that would raise $200 million. But we should also address the green card backlog that has become so enormous. And therefore what we're proposing is that the Congress recaptures 20,000 green cards per year over the next decade and make them available for people who are working in STEM fields. And those should cost $15,000 per green card. And if they are all used, those would raise $300 million per year.

And if you put that all together it really would enable us to do two things. First, it would enable us across the economy in the business community to start to fill some of these jobs that are simply sitting open today. And we'd get people to work in these jobs by bringing them from overseas and we'd let them put the multiplier at work that we know is also applicable today. Typically over five additional jobs for each of these engineering jobs we fill. We would ensure that these jobs stay in the United States by filling them here. And we would bring together the financial resources that would enable the Federal Government to provide the investment to the states to make the various STEM investments that I've described.

Put together it does offer us a new path forward. As I've had the chance to talk to people about these ideas, I've become increasingly optimistic that we actually

can get something done. I've become increasingly optimistic that in the next year it's actually feasible, it's actually realistic to ask the Congress to consider and pursue this type of new race to the future. Oh there will be many additional ideas that undoubtedly should be added and things should probably be adapted as they always should and they always are.

But the critical question is can we get something done? I had the chance to talk with Republican leaders in Tampa and Democratic leaders in Charlotte. I had the chance to talk with people in both houses of Congress. Frankly some of the ideas that you see here today are ideas that evolved and changed and that we adapted based on the good feedback and the suggestions and the constructive criticisms that many of these people offered.

But it left me with two conclusions overall. People are increasingly aware of this problem. They understand that the future of our job growth is at stake and more than that the future of the country's technology leadership is at stake as well. And second, people do want to find a path forward. One of the things I've learned from all of the various anti-trust and intellectual property negotiations I've handled over the years is this, sometimes when a small problem proves intractable you have to make it bigger. You have to make the problem big enough so that the solution is exciting enough to galvanize people's attention and generate the will to overcome the hurdles that have been holding us back.

I believe that if we can combine what we're doing with respect to education, with what we need to do with respect to immigration, we have that opportunity ahead of us. We need to do something new. We need to try something different. Maybe we'll find something even better but we're pretty excited about this path forward. Thank you very much.

MR. WEST: Okay. First of all, Brad, thank you very much for those comments. That will help launch our discussion. So, I'm going to start with Michael from AEI.

So, you've written extensively about education reform and the importance of teacher recruitment. What do you think is the most important thing we can do to address what Brad has called this national talent shortage?

MR. MCSHANE: Wonderful, that's a great question. Thank you so much for the invitation and if you haven't had a chance to read the White Paper, this is highly recommended, and full of really interesting information about this critical problem that's facing the American Education system today.

Whenever I think of the STEM issues in the country, I think about teachers. Because we know that teachers are the single most important factor in school in determining student achievement. So, we need more STEM teachers and we need higher quality STEM teachers. And there was a really interesting data point in the White Paper that I'd love to point out. And there was a survey done that said only 45 percent of American high school graduates graduate ready for college math. And only 30 percent of graduates graduate ready for college science.

So, before we can even start to talk about some of these programs at the high school level for high flying students to take AP computer science when we talked about college issues, we need to talk about this fundamental issue of math and science skill. And so, when we talk about teachers, I was struck by the fact that Microsoft has so many job openings, 6,000 openings 3400 of which are in research or in development or in engineering. And if you think about it in kind of stark terms, our school districts are competing against Microsoft for that talent.

Now, Microsoft has a particular advantage, very nice campus in

Redmond I've been told amongst other things but one of which is that they can alter their compensation strategies based on labor market needs. So, if they have a shortage of engineers and need to attract more, they can increase the pay for engineers to try and recruit more.

Unfortunately, in many cases as codified by state laws or in labor contracts that exist, we have locked teacher compensation into step and lane pay scales that do not differentiate based on labor market value of skills. So, for example, I graduated from college with a degree in English, was a high school English teacher. And so, the labor market value of my degree was probably right about what I was paid as a high school teacher. Now, the person down the hall from me that graduated with a degree in engineering or in math and science, chances are that person's labor market value was well greater than what mine was. Yet we were paid the same.

So, it's not surprising that in many cases we are flush with English and Social Studies teachers but we have shortages of teachers in math and science. So, I think one of the fundamental things that we need to do is rethink the way that we recruit, retain and compensate teachers to be able to deal with this changing labor market, and have the teachers we need to get the skills to get kids where they need to be.

MR. WEST: Thank you. So, Nicole at Georgetown you work on the demand for occupations through the year 2020. What are the trends that you're seeing and what do we need to do to fill some of those unmet needs?

MS. SMITH: Well, I'm just going to take up a little bit on what Michael left off on. I first want to say thank you for having this forum. I think it's really timely we're discussing this now. But one of the most important trends that we notice is that shortages do exist and it's something that we sort of spoke about early in the introduction.

We demonstrate the shortages by looking at wage information. And we found that over the last maybe about 30 years STEM occupations have managed to have a wage premium over all other occupations, especially occupations in, unfortunately, teaching. Occupations in some types of health care, occupations such as health care supports and maybe some of the other types of production occupations. So, that's one of the things we've noticed.

But I think the workforce data tells us something very interesting about STEM and I just wanted to switch a little bit about that. When we talk about STEM, at least at Georgetown and in my center, we're thinking of the science, technology, engineering and mathematics component of the job market. So, it includes computer science as well as it includes the mathematics occupations and some of the finance occupations that embrace a lot of math skills and require a lot of math skills.

But what is startling about the STEM workforce is the high percentage of foreign born workers. In general, about 17 percent of STEM workers are foreign born. And if you look specifically at computer science it's about 18. And some of the life and physical sciences, it's 25 percent. And that's really interesting to me because the next question you're going to ask yourself is why. And when you look at the composition of the foreign born workers, it tells you a little bit about why. I mean, a lot of those are successful in STEM tend to be Asian American. So, there's a whole Asian American component in that and as well as Caucasian American.

But we found that we are still lagging behind. We are 16th in science compared to some of the OECD countries. We're 23rd in math. And if you look at other definitions that don't only look at OECD but some of other developing countries we're actually 31st in science.

So, the issue here is we are turning to capture a lot of our STEM

workforce from other countries that have a much greater focus on science and engineering early on. To other countries that pay particular attention to the value of STEM competencies early on are able to transfer that in the types of degrees they obtain. There are a few papers that came out recently that compare the graduation proportions of the United States with, let's say, India and China. How many STEM graduates do we graduate?

And of course there's the question of well, how many of those Indian graduates are actually useable as there's talk that only 25 percent were work friendly or able to function in this capacity. But a significant issue for us as well is what we tend to call diversion where a lot of students who are STEM capable and who perform well in STEM tend to not have the incentive to work in STEM occupations for various reasons. For wages is one example. But we found it is also interest and values that are peculiar to STEM that we need to ensure that when you're teaching STEM that this takes fore or else we're going to lose a lot of the STEM workforce.

It's particularly worrisome for women, where out of every 100 women who enter and obtain a BA in STEM field; only 12 will actually persist in STEM. Five will persist in STEM, work in a STEM field with a BA degree and only three will be working in a STEM field 10 years down the line. So, the attrition with women is startling and it's really very surprising, I guess, even when you look at the wage opportunities available to STEM.

STEM is still the best equal opportunity provider in that if you have a STEM degree, the other types of things that matter in your wage opportunity just seem to crumble away. People with STEM majors, on average, earn you know the premium irrespective of their race, irrespective of their sex, irrespective of gender and that sort of thing. So, even though STEM pays well, we find that there is a lack of persistence with

women and minorities in STEM and that's some concern.

MR. WEST: Okay. Thank you, Nicole.

So, Stan, your organization works to increase the number of Americans with college degrees. What are the challenges that you're encountering and what are our possible solutions?

MR. JONES: So, and Brad talked about our challenge is not having more people go to college. In some states and some areas that's true, but this recession, among other things, has brought a record breaking enrollment across this country. And I've often said that access to college is kind of in our DNA. We've provided huge opportunities and that's why we have record breaking enrollment, so much so, that if you look at the class that started college this fall, it's bigger than it's ever been. It's more diverse. It has more African Americans, more women, more Hispanics, more first generation students that we ever had. And so, we should be congratulated for that.

But if you fast forward to graduation day, if you went to a four year college, only half of those students are there. And if you went to two year college, only a third of those students are there. And the diversity that we were so proud of when that class started is largely gone by graduation day. Many of those African Americans and Hispanics and first generation students didn't make it to graduation day.

And if you look at the STEM disciplines it's even more true. We are making progress on having more people start in STEM, not enough, and that still is an access issue starting. But only about one out of four of those STEM students graduate in a STEM discipline. We lose about half of them that don’t graduate. And the other half we lose because they switched disciplines while they were in college and the equity that I talked about is even more true in the STEM disciplines.

As Brad very clearly pointed out, there aren’t significant numbers of

minorities that are completing STEM graduate degrees. So, this is really a challenge, not of access, although that's important but it's really a challenge of having true access and true success. And that's why we're pleased that Microsoft, as a major worldwide corporation, has really lent their voice to this very important issue facing this country and facing the next generation of young people.

MR. WEST: Okay. So, Brad, both Nicole and Stan highlighted this problem of lack of women and minorities in the STEM pipeline and the attrition problem and so on. So, I'm just curious, what do you think we can do to address that particular problem? Because it's harder to address the broader question of the STEM pipeline when 50-60 percent of the potential audience, for various reasons, seems to be not doing these areas.

MR. SMITH: I think there's a number of things we can and need to do. Many of them relate to the things we've been talking about. I actually think it starts with reaching people when they're younger. That's why improvements in K12 are so important.

It's why it's really important to have role models for girls. To have people who are succeeding in, say computer science, or engineers, or engineering, or the life sciences who are minorities volunteering their time and working with these young people so they can really open their eyes to these opportunities. There's a program that one of our employees started called TEALS, technology education and literacy in schools. It brings people who are working in engineering at Microsoft and other companies into schools to team teach computer science. Oftentimes in public schools where there are large minority populations, but where otherwise these kids just don't have exposure to this kind of discipline.

I think there's more that the business community can and should do.

Certainly in Washington State, one of the things that we've found through some of our non-profit work is the difference it makes when you involve people who are pursuing a particular career to create a practical project. So that, taking a math course is more than just doing equations on a piece of paper or on a computer screen. But they're actually participating, as they have in Tacoma, Washington, in the math calculations that go into the design of a building. And then they go get to see the building being built.

I think part of what we need to do is help people appreciate that sometimes this work may be hard but it can also be a lot of fun. I think if we can reach people earlier, then we can focus on the rest of the things that we're talking about. Getting more of the right teachers into schools and taking the kinds of steps that will move people, perhaps especially minorities, through the community colleges, and four year colleges and universities at a faster pace.

MR. WEST: Okay. I'd like to throw out a question. Any of you who want to address this, feel free to do so. Brad noted at the very end of his talk that sometimes we need to make problems bigger in order to galvanize action. So, I'm just curious either in the education area or in the immigration area, what are the things that we can do to actually galvanize action?

I mean there have been lots of things written, lots of ideas that are proposed, our real challenge is getting action. How can we get action either in education or immigration reform? Any one of you who wants to jump in, and don't be shy. You're among friends.

Stan?

MR. JONES: Well, yeah, we work with Governors and States and legislators and I think one of the key things is actually people don't know of the problems that we're really facing with college completion. The fact that we have a very successful

access agenda and a very unsuccessful success agenda. And so, it's really having states collect and report data. It's paying for results, not just paying for people sitting in seats in colleges and universities, but actually progressing through college and completion.

Brad did a great job of pointing out that you have 700 students per counselors at our community colleges and a lot of our four year access institutions aren't much better. And for those students, they may know if they want to be a teacher or a nurse and how you get that done. For many of these careers that we're talking about in the STEM fields, people don't know about those careers. Don't know how to get that done and we give them a huge course catalog and not access to counselors. And they wander and they stop and they drop out.

And so, we think you need much clearer pathways through college into the job market, into STEM fields. It's pretty simple. You work on having students pick majors and career objectives rather than courses as a way to get someplace. But having done that, the faculty and the colleges really need to lay out: this is the best way to graduate. Kind of a default pathway semester by semester, plan to graduate in a timely way. And we're starting to see that movement in colleges and across states along kind of the primary areas that I mentioned.

MR. WEST: Nicole, how can we galvanize action?

MS. SMITH: I think part of the issue is recognizing the extent of the problem. If we were to look at how significant, how many STEM jobs there are, in general they're about five percent of the economy. So, only about five percent of the economy can be really classified as science, technology, engineering, or mathematics jobs, but STEM competencies, the types of skills you learn in mathematics classes and in computer science classes, those competencies extend to close to 40 percent of all jobs

across disciplines. Across the traditional STEM disciplines even into non-STEM disciplines. So, part of it is recognizing the extent of the problem, the extent of the shortages we face.

And then the second thing, I think, is to have some sort of federal attachment or political will in that regard. In 2010 when we passed healthcare, you know regardless of our opinions as to whether the Affordable Care Act is good or bad, regardless of that, at the same time we surreptitiously passed the SAFRA bill. You know there was a little bit of education reform in there that amongst other things also provided a certain amount of money for HBCUs and Hispanic serving institutions. But in there, there was recognition that many healthcare services were also undersubscribed. So, there was recognition that we lack doctors in certain types of disciplines and therefore there's a full policy there to provide financing and funding to medical doctors who want to become general practitioners and would not necessarily specialize.

So, if you're going to be a GP and you want to work in an underserved population or underserved location, then you can actually get help from the Federal Government to pay for you to graduate in that capacity. I think while I recognize, and I'm going back to one of the things that Brad raised, while I recognize it's important to start earlier to capture some of our students in STEM much earlier so that we can leverage their interests, part of the issue and the rationale for that is at the fourth grade many of us are at the same level. A lot of students when you test them in the fourth grade were essentially doing well irrespective of socioeconomic status. And it's when we get to the sixth grade and eighth grade testing when all hell breaks loose.

But part of the issue here as well that's beyond starting earlier, again, is the interest and values of the individuals. Lots of women who graduate with STEM majors still choose not to pursue STEM jobs. If you face them with the fancy office in

Microsoft and you say, okay, well here's where you're going to work, they still wouldn't do it for various reasons. Their outgoing college survey would say that money is their last interest. Women are hardly ever motivated by money. They care about family, they care about quality of life, so those are the things that we also have to improve to ensure that people are going to persist particularly for different types of populations that might not only be motivated by money.

MR. WEST: Michael?

MR. MCSHANE: You guys got the good ones. I think just what Microsoft is doing here is a good example of how the private sector can play a role in this, can work in schools, can expose not just students to those working in STEM fields, but those working in STEM fields to students. And see the relationships that can be developed between those two.

And I think that could have two possible positive outcomes. One, is just social, a transfer of social capital. It's better for people to understand those that are struggling in schools and it's better for those that are struggling in schools to see positive role models. It's a great thing.

But also as we talked earlier, a lot of the issue of education reform is a political one. And some people may not be as acutely aware of the struggles in some of the schools as they could be. So, any exposure that we can have of individuals especially in powerful private sector interests of the plight of these students and the issues that are going on, the more informed electorate that we have, and the better change we have, I think, of pursuing the types of reforms that are necessary to increase the quality of their education.

MR. WEST: So, Brad, you're the only who mentioned this topic of making the problem bigger. So, we galvanize action by really producing a crisis, I take it?

MR. SMITH: Yeah, I think we have the opportunity to do two things. I mean, one is, I do think we need to shine a light on the rapid growth of unfilled jobs. Everybody, I think, in the country shares a desire to keep these jobs in the United States. The best way to keep the job in the United States is to fill the job in the United States. Fill it with a good person, it will stay here. But we should recognize that it's a real risk factor for the country to have the number of unfilled jobs growing the way it is.

I do think that the second opportunity that we have is this combination of issues. The reality is that the immigration and education issues are, to some degree, opposite sides of the same coin. The coin itself is about the need to have people with the right skills to do the work that the country needs to get done. That really provides the foundation for future economic growth. And, you know, it will require additional people from outside the United States in the short term but let's use that to help address the broader and to some degree deeper and longer lasting problem that we face with respect to our educational system.

It also gives us the opportunity to connect with people who may not have seen this connection or to connect with people who care more about one issue or the other, but bring them together.

MR. WEST: Okay. Stan.

MR. JONES: Yeah, I'd like to comment on that because you know I think of what Brad said, I think that really the thing that maybe has the highest interest in terms of a broad policy is this concept that he talks about is that right this minute we have these significant shortages. And how are we going to deal with that knowing that the pipeline is going to take a while to build out and fill.

And so, right now maybe for the smart immigration policy to extend visas to graduates of some of our colleges and universities to fill those jobs, charge companies

for the benefit of doing that. Use that money, in essence, to grow the pipeline I think is just a really unique strategy and I think it really calls out for some serious attention.

It's a way for some of us to advance an agenda on the pipeline in ways that are unique. And so, I think that that's just a major point I wanted to highlight.

MR. WEST: Okay. I'd like to draw the audience into this conversation. So, if you can raise your hand. We have a question up front. There's a microphone that's coming over to you from here. If you could ask a question, give us your name and your organization or affiliation please.

MR. ZUCK: Yes, my name is Jonathan Zuck from the Association for Competitive Technology. It occurs to me that people have suggested the best way to get healthcare reform was to put all the members of Congress on everyone else's healthcare plan. I wonder if we should institute a STEM education requirement for politicians given all the things we've been hearing lately they could all use it.

But I really enjoyed your two part plan, Brad, and as somebody who currently represents small businesses, I think it's true that small businesses are well able to afford that type of plan as well. I mean, I'm sort of unique. I got to learn to program when I was 12 years old but my actual degree is from across the street -- it didn't have anything to do with computer science, but I went on to become a professional developer.

And I wonder if, in addition to the long term plan and the short term plan, is there something we need to do to deal with the organized labor part of the political side of this to deal with the midterm plan. Is there a retraining thing? Is there better issues associated with autodidacts that often find their way into a STEM or computer science in particular? Is there something that we need to do with folks that are already in the labor market to get them into, to become part of this plan, or are we going to face constant opposition from organized labor that we're in some measure responsible for the caps to

be placed in the first place?

It feels like politically that's still a hurdle that we need to get over and is there a part of the plan for this midterm piece?

MR. SMITH: Personally, while it's not part of the proposal we made today I do think that you raise a very important dimension. I do think that there are additional steps that we should explore taking that would focus on worker retraining and other efforts that would help people who need to move from one part of the workforce to another.

We actually see this, in an interesting way, firsthand ourselves because Microsoft runs a number of certification programs with respect to our technology and our technology tools. In fact, it's probably the single largest certification program in the United States. And I've had the chance, for example, to learn a bit from what it has meant for one very important group of people who are moving in the workforce and that's veterans leaving the Armed Forces.

One so often sees, for example, veterans who actually have learned a great deal about information technology in the Armed Forces, but they don't have the types of certification that are going to readily transplant or help them seek employment. So, what we've done is focus some of our non-profit efforts on the veterans' population to help them get certification. And then we see that that actually does make a difference. It does help people get a new job.

I know it's a complex problem. I mean, there's people here who know far more about it than me, but I think that you're right to call out this part of the issue and to suggest that we also need to look for sort of next generation efforts to improve worker training.

MR. WEST: Okay, there's a question right here. There's a microphone

right behind you.

MS. STERN: Thank you. I'm Paula Stern and today I'm asking a question on behalf of the National Center for Women and Information Technology. And I want to thank you enormously for a fabulous speech. It's the best speech on this disconnect that we have in this nation. And it was powerfully done with lots of great data and the report is terrific. And I won't call out the wonderful people like Sean Kelley and other people at Microsoft who've been doing really hard work on this subject.

I would like to bring a question to the report more than your speech because the report seems to go back to the question of STEM, and STEM, and STEM. Though you really focused on computer science today and I must say started with diversity which is quite a bit different from rising about the gathering storm and other problems where just diversity was about diversity and immigrants not about gender diversity and underrepresented minorities. But one of the footnotes is footnote 21 which goes to the --

MR. WEST: Now this is tough question. We're getting into the footnotes. Be careful, Brad.

MS. STERN: He's going to be able to knock this out of the park. It goes to the really serious issue that we don't have adequate standards for the states, for the high schools to do, to focus our precious resources on computing science. And not spread completely through onto STEM.

It says, "Unfortunately, the draft of these standards released this past spring currently does not do enough to integrate fundamental computer science concepts. This must be corrected if these standards are to have the desired impact of providing students with the full STEM knowledge and understanding they require in the 21st century."

What are we going to do about getting those standards attended to for computer science? It's an orphan. It keeps falling through the cracks.

MR. SMITH: First, I want to tell you, this is the second time in my life that this has happened. The first time I was in the back of a car with Bill Gates and I had sent him the week before a Supreme Court opinion and he turned to me and he said, "Oh, I love that opinion especially footnote 12. That was my favorite footnote." And he didn't proceed to quote the footnote. And I will confess that I had no idea what he was talking about. Thank you for reading footnote 21.

I'll give you at least part of the answer. I'm not sure I have the complete answer. But I think part of the answer actually comes on page 13 of the report where we try to answer a related question which is what is computer science?

And because I think the key to integrating computer science concepts into these standards probably starts by having a more robust conversation about what we mean by computer science. And you can see on page 13, the nine or 10 bullet points that we've called out about the different parts of computer science. It think one of the things that this helps to do is to make concrete what we're talking about and the connection between some of these concepts and then what people can start to think about when they think about other STEM fields.

To me, this is all about, you know, really trying to persuade people that if they want to think about the future of science and technology and engineering and math, it goes back to the point that Nicole made earlier. Just as STEM expertise is relevant to a broader number of disciplines, so it is the case that computer science itself has become relevant to other STEM disciplines.

MR. JONES: You know, just very briefly a lot of states have increased their math course requirements and science course requirements which actually is a

good thing but in doing so, they pick classic math, algebra, geometry, and trig several thousand years old and classic sciences, also several thousand years old. And computer science is not that old.

And so, I think that's one of the reasons this has happened. But clearly as nine states have done, computer science could be adopted as a science or math. In addition, colleges could offer dual credit programs, online programs to high school students to pick up a computer science option and as well, could offer certification programs. Because we would have a shortage of people to teach computer science in high school, but could offer certification programs to math and science teachers in high school.

So, this is good that it's called out and I think there's some good possibilities.

MR. WEST: Okay.

MS. STERN: That's what I wanted to do. To call out the fact that our standard setting groups have got to really set a standard.

MR. WEST: Okay. Thank you.

Christine has a question from our webcast audience.

CHRISTINE: Sure. Thanks, Darrell. David Hirsch, who's a reporter who focuses on technology and education issues wants to know; it's real brief. Can the panel comment on the recent STEM visa bill in Congress and why were 20,000 instead of 50,000 visas included in the bill as proposed.

MR. SMITH: I don't know if I have the answer as to why the bill was crafted the way it is. I mean the real problem is that the bill was defeated or at least it didn't get the votes needed to pass.

To me what it illustrates is two things. One is we have been trying and

trying to get something important done in Congress when it comes to visas and green cards. And we keep getting close and then things keep getting stopped before they get across the finish line. And this has been true in the House; it's been true in the Senate. It's been true for visas and it's been true for green cards.

I personally think that there are probably a variety of ways that one could craft legislation that would be very helpful. Certainly helpful to the ability of people in businesses to fill jobs and the numbers might be higher, they might be a little lower. They might focus more in one area or another, but it would start to move us forward. And what we just see is we just can't quite get it done. And we're trying to break a log jam here. We're not alone. I mean it's not like this is the only issue where nothing got done this year.

But we do need to do something to break the log jam over the next 12 months or I really fear that we run an increasing risk that jobs are going to start to migrate elsewhere.

MR. WEST: Other questions? Right up here, up front we have a question. There's a microphone coming up to you.

SPEAKER: Hi, (inaudible) from Brookings. We did, my co-authors and I we did a report on H1Bs and we actually analyzed, not only the demand for H1B workers, but looked at the funds. Because what you're proposing today is very similar to what is already there for the H1B program but it's only been a billion dollars over the last decade and distributed by the NSF and the Department of Labor. And what we've seen is not necessarily in the skill areas or the places that are most needed.

So, I guess what I want you to elaborate more, you mentioned in your speech and I noticed in the paper about how would it be distributed because we know you've mentioned that to states. Would there be a competition between states who could

prove capacity? Because sometimes money could be just there, but not used for the right purposes so you could build.

MR. SMITH: We deliberately stopped short of trying to specify every detail, in part because we appreciate how much these kinds of ideas benefit from contributions from a number of people. But I would say a couple of things.

First, I do think that money would be spent most effectively if it moves to the states. I believe the money would be spent the most effectively if there is some element of competition. I can certainly tell you from the perspective of say my experience in Washington State, the positive impact that the Race to the Top Initiative had.

Interestingly it motivated the state legislature to take new steps to improve our education system, including steps that had been stuck in the legislature for a decade. Even in an application that failed to qualify in the winning category, so it wasn't until the second try that the state won. But it was interesting to see the way that a competition would focus people's minds on considering new steps.

And we've seen this not only at the state level; we've seen it at the local level as well. One of the things that we have done, that Boeing has done, that others have done in Washington State is create a non-profit called Washington STEM. And it has raised money and then it provides that money to local schools and school districts that want to innovate and do new things. And in the same vein, I think one of the ironies of the country's K12 system is that we spend so much money on it, but there's actually so little money that would be considered discretionary. It's all committed to things in advance.

So when people have the opportunity to seek an additional influx of money, I think that they're prepared to really step back and think about doing some new things. And I think this is true not only in K12, one of the things that I find so interesting

about the college completion issue is that some of the steps that could really make a difference are relatively straightforward. And what we need to do is call attention to the opportunity and motivate people and that's what this kind of competition can do.

MR. JONES: Yeah, if I could -- since Brad's formulating how this might work I want to encourage him on the two fronts. I agree that the state-- I mean the states have the primary responsibility for higher education as they do for K12. You know they're the ones that authorize colleges and universities. They're the ones that are the primary funders and so I think that's a logical area. States have also historically been kind of the ground where educational forum starts. And then that moves up to the further level. So, I think that that's a really important thing and I think we have some great Governors out there both Republicans and Democrats that could lead such an effort.

And the other part that I want to encourage him to do is the part that he spoke about. That even to apply states fellow -- I was stunned to see states pass legislation that had been blocked for a decade that essentially took all the blocks out from charter schools so they could go statewide. That required teacher evaluation, that required better reporting of outcomes and data, and required accountability systems. All that happened before the first dollar went to the first state and I think that that's a great part of that kind of strategy.

MR. WEST: In the back, on the aisle?

MS. HUGHES: Hi, Debbie Hughes from the Business Higher Education Forum. Building on what you just said, Brad, what role do you think industry should be playing in this? I mean, you've set such a wonderful example, but if you had to message out to your colleagues in industry, should they be building STEM alliances, building the discretionary funding so that the school districts have funding going to universities? What's your vision for your policy?

MR. SMITH: I think it's a great question and I think that there's a big opportunity across the country for businesses to do three things. First, I think we have the opportunity to use our voice. We are the ones who so often see this problem firsthand. And that's obviously what we did as a company in stepping forward and using our voice today. I am very hopeful that more and more business will do so. Again, what I've found in Washington State is that the political equation changed when the business community said that education is our top priority.

Second, I think that business can and should use, or at least consider using some of their money. Corporate philanthropy is very important across the country. Our department at Microsoft is responsible for Microsoft's corporate philanthropy. We announced last week, Steve Ballmer, our CEO and I announced that we were changing the focus of our corporate philanthropy to address this problem, the opportunity to provide for youth in US and around the world. We announced that we would invest $500 million as a company over the next three years with the goal of reaching and helping 300 million youth worldwide including 50 million in the United States.

I think there are a lot of opportunities for companies in effect to combine, if you will, doing some good for themselves by building the workforce and doing good for others as well. So, I hope that people might consider that. And third, I think there's an opportunity for companies to give a little bit more thought to this unbelievably powerful resource they have. It's called the time and the interest in volunteering that employees across the country increasingly have.

A few years ago we expanded our matching gifts program. We've always, for 30 years, matched employee charitable donations up to $12,000 per year. We also said that if an employee volunteered time with a non-profit, we would donate $17 for each hour that the employee served as a volunteer. And what we found is that our

employees have this real thirst to get involved in their community. And this is, I think, something very true of people, say employees in their twenties as well as older. But I find especially in the newest generation of employees, they want to make a difference in their community and they love the opportunity to connect what they do at work with what they do in the community.

And I think, when you combine the voices, the financial resources, and the time and energy that exists in the business community, there exists such an opportunity to make a difference. At the end of the day, if there's one thing I've learned in almost 20 years at Microsoft, I've just come to the view that the business of any healthy business is people. And whenever you can do something that invests in your own people and invests in other people in the community you build a stronger business. And I think that's a view that's spreading across the business community.

MR. WEST: We have a question up here. There's a microphone coming from behind you.

MR. TSANG: James Tsang. This is question for Professor Smith. I have heard twice in the last two years from this stage, in fact most recently Jared Bernstein, claim that looking at BLS wage statistics for sciences, that there's no shortage. I gather there's a problem with the overlap between sciences and STEM and I was wondering if you could fill me in so I can nail this mistake next time I hear it.

MS. SMITH: Well, here's the issue. Part of the issue is how we define STEM occupations. So, even if you look at all of the STEM graduates, you look at everybody who's graduated in STEM and you put them on the left. And then you look at every STEM opening or every STEM job and you put them on the right and then you put these together, you're going to find that they're almost equivalent.

Well, people don't work like that. STEM graduates are not actually all

going into STEM jobs. So, what is happening is that when you expect all these STEM graduates to go into STEM occupations, they're diverting to other occupations. So, we have less, we have a smaller actual number of STEM graduates going into STEM occupations. And what that's doing is it's forcing STEM employers to sort of up the ante with respect to wages just a little bit in order to compete and offer more competitive salaries to get the smaller scale.

So, in short -- I guess in a mechanical sense, if you look at only demand from the perspective of where the jobs are and look at supply from the perspective of how many graduates there are and you assume that every single graduate will be going into a STEM job, you'll come up with answers like that. There's no shortage because they're both equivalent. But it just does not recognize, first, that everybody doesn't go into a STEM job because you graduate with a STEM degree. And second, the wage information from an occupational perspective, occupation to occupation. We're not trying to just find averages and take the median because you know you lose some information there. But from an occupation to occupation basis, particularly across one's lifetime, individuals who start off start off at lower wages. But as you add years of service and experience the wages go up. Even across there, across occupations, across ethnicity STEM still pays pretty well.

MR. WEST: Other questions? Right here we have a question. The microphone's right behind you.

SPEAKER: (inaudible) is my name. What I'm interested in knowing about is what choice of course in high school, if you want to go into math or into science, physics or chemistry, or whatever you want to do in the real sciences, what offer do you have for promotions when you get out of that science?

In my time in high school the math and science courses were harder.

And so, therefore people avoided them. But there must be a payoff where if you choose to major in math or major in chemistry or major in physics there must be a payoff of some kind. So, if you join Microsoft, for example, what offer do you have for promotion in that field? And if you offer them a promotion they might go into it?

MR. WEST: Is this because you're looking for a job?

SPEAKER: No, I'm not looking for a job. I'm 94 years old.

MR. WEST: Thank you. Thank you. Brad, what's the payoff here?

MR. SMITH: I guess there's a few things that I think it's worthwhile for today's high school students to think about. First, this is an area where the jobs are in general and frankly computer science in particular. I mean, if you look at the computer science numbers as distinct from the STEM numbers overall it's so clear that this is where the jobs are and are going to be.

Second, these are good jobs. I mean these jobs pay well. And I very much appreciate Nicole's point that there are many people who value other things even more than the salary, but if you do value the income you should think about this. If you look at the students who graduated from college with a Bachelor's Degree in computer science four months ago, they've now started work. You know, it's the fall. Typically their starting salary is more than $100,000. Typically they're eligible for a bonus of another $15,000 or $20,000.

Typically, especially if they're in our industry, but in fact in many industries, they also get stock compensation. In our industry those college grads, right out of college, are getting a stock grant of about $50,000. So, these are good jobs that pay well.

Third -- and this is in some ways I think the most important thing we need to address. This can be a lot of fun and really gratifying work. One of things that I've

seen over the years in the people who come to Microsoft and it's true in many companies, but they come because they want to change the world. And they know that if they create a new app or a new feature that a year later it is something that can be literally in the palm of hundreds of millions of hands around the world as people use these devices. Or it can be on laptop computers in use by hundreds of millions of people.

So, if you're a young person and you are interested in a job, you want to earn a good living, you want to have a positive impact on the world, and if you want to have some fun, this is a great opportunity. It will require that people do a certain amount of hard work. And I think your point is well taken. But my point is the work leads to great rewards in all kinds of ways.

MR. WEST: I think this guy is ready to come out of retirement.

MR. SMITH: All right.

MR. JONES: Yeah, I want to expand on that because it's probably obvious if you take a job at Microsoft in computer science, that's a good thing. But Brad's message is also much broader than that. That he talked about the whole STEM disciplines, but also if you think even about the hierarchy of degrees is that we are under producing two year associate degrees in technical areas, in STEM areas and also in computer science. And even one year certificates that are offered by the computer science industry and many students that might get a one year certificate from a community college will earn more than a two year associate degree and can earn more than a student that graduated from a four year college.

And for many students this is the difference between having a viable economic future and not for many first generation students. And so, the math and science that comes through high school is a very important foundation to have students have those opportunities.

MS. SMITH: And just to elaborate on what Stan just said. STEM and computer science in particular is the only certificate that on average pays more than some Bachelor's Degrees and some AA degrees especially in education.

MR. WEST: You just did a study on that didn't you? Hot off the press.

MR. MCSHANE: Well no but your -- oh I'm sorry. I was going to say your point is well taken. Imagine what you just heard of the compensation package from Microsoft or similar fields. Imagine if you are a District Superintendent trying to hire math science or computer science teachers. I mean that's what they are -- you're looking for that same basket of people. So, it's something we really need to think about how we can do that moving forward.

MR. WEST: Okay, there's a question right here on the aisle.

MS. MCADAMS: Hi. I'm Camsie McAdams. I'm with the US Department of Ed. And I'm just curious, nice to see you in person. I'm just curious a little bit about this middle skill worker, these jobs that you're talking about with the two year degrees, maybe the certification. I've met some really cool people that work for Microsoft and other companies who came in as a tech fixing computers and who now have been in the company for years and years and years and getting those promotions and the additional training.

But what work have any of you done to engage the CTE community or the vocational ed community to really get them looped into this conversation because that's a lot of where that sort of pathway starts. And I just wonder whether they're looped into your work and if they aren't, then I would suggest maybe they need to be.

MS. SMITH: Well, I'm going to answer this because my Center at Georgetown, we recently just won a bid which is going to partner with the CTE community and I guess focus on jobs and opportunity and developing pathways for CTE

and looking at information technology and computer science because they actually separate those out in the CTE community. So, we've spent a lot of time on that.

With respect to what you're talking about middle jobs there's a tendency, I guess, in the STEM audience and we are you know a STEM audience, to view STEM jobs as being BA and above and just a Bachelor's Degree and above. But you know, a lot of STEM jobs are actually middle jobs that are also in manufacturing from an industry perspective. So, there's a lot of technical and competency skills that are required for some of these middle skill manufacturing jobs where a student with these types of competencies will do much better especially if they have a certificate in it.

So, we are partnering with ACTE and the State Directors and the NCLA to try to figure out how we can gauge, you know, responsiveness from that team to look at the middle skills as well in STEM.

MR. JONES: Yeah, and just to add to that, the 30 states we work with, they collect data on one year certificates for example in technical areas. They report that, for many of them it was the first time they did that. When they're setting their objectives for producing degrees they include that now. And so, that's recognition that those are important certificates to do.

But more than that, it gives me a chance to highlight the Tennessee technology centers which have a 75 percent graduation rate for one year certificates compared to community colleges that might for those same one year certificates have a 20 or 25 percent graduation rate. And because they're highly structured programs, they're block scheduled. You go Monday through Friday 8:30-2:30. They embed remediation. It's a much more integrated curriculum. They pay attention to placement. They have an 85 percent placement rate. They use work keys as an entry level to also include, improve their math and English skills before they graduate.

But some of the technology models out there are very well structured in terms of producing well qualified graduates in a timely way.

MR. WEST: Okay, I think we have time for one more question. Right here on the aisle.

MS. KLEIN: Hi, Andrea Klein. I'm a development consultant working with non-profits that supplement the schools. My question from the industry standpoint and even from academia, what kind of suggestions or possibly creating integration models to facilitate a teacher's ability especially I'm thinking when you get to high school it's kind of late. If we're looking at kindergartens like using Sesame Street, incorporating thought patterns of IT as the way to go, fundamentals of computer science in that elementary age so they build upon it, I think that we're not doing enough emphasis on the younger age to gear them up for the older age.

And I think that, I started out in financial investment America and went to IT, and I felt it was the best education I received after higher ed. I actually have two certificates from Microsoft as a requirement for an ISP with whom I worked. And my question is if we know that there is a great shortage, what are tech companies willing to do to create those modules that you use internally? To work with DOES, the Department of Employment Service and so forth in getting people up to speed especially in the retraining department?

MR. SMITH: Well, I would say a couple of things. First, you know you talked about early learning and I agree that that is extremely important. I happened to do work in the Seattle area when my wife and I co-chaired the United Way to expand the early learning opportunities and I think that first of all, as passionate as I am about technical skills, I think we shouldn't overlook the fact that we have a great many very young people in this country who are not at this point in their second and third and fourth

year of life getting the grounding in just basic counting and reading and those kinds of skills as well.

And that's one of the things that we as a company and as an industry, I think, have been more supportive of. I mean obviously there's been a great deal of work that has shown that one of the biggest problems is if people are behind when they're five years old, they're likely to be behind when they're 15 years old as well. So, I think we should start by recognizing that it's hard to write a paper on a computer if you don't know how to write. And it's hard to read an article on a computer if you don't know how to read. So, I'd say let's start with the basics.

Second, I think your question goes to a second aspect that I don't think our industry has done a great job to date in addressing, but about which I'm much more optimistic of what we're going to see between now and say the end of this decade and even over the next three or four years. And that is really bringing technology into classrooms in a way that improves learning. There was a big movement to get computers in the classroom and then people found that they were in the classroom, they were just on table at the edge of the classroom where they were the most expensive paperweight in the classroom.

And you know, it is just so clear when we look to the future of say the combination of touch technology, gesturing technology, tablet technology, electronic books, the ability to annotate, the ability to see things on a screen and see it at the front of a classroom, I actually do believe that we're going to see some big steps forward that will make technology a more natural and effective part of the learning experience for a generation of people who basically are going to be going to middle school and high school over the next decade or so.

Then I think we have the opportunity to do the third thing which you're

pointing to which is what I would call the more technical education that we started with in terms of investments in STEM. If we can do these other two things we have a much higher and stronger foundation on which to build. And so, that's why I would look at these things together.

You know, as for additional steps that we should take, I think we have to be open to good ideas. I mean frankly one source of trepidation in doing what we did today is we don't claim to know all the answers. We have some thoughts on some answers, but I actually think we just need a broader dialogue across the board about perhaps some additional steps that we and other companies ought to consider taking.

MR. MCSHANE: I think something to continue what Brad said. I think we really need to think about how we can use technology to increase the reach of effective teachers. If we look in the future that we're going to have STEM teacher shortages, if even when we train more people they're going to be going to these really well compensated jobs and we're going to have fewer teachers, how can we leverage technology to take best advantage of the teachers that we have? To have them reach the broadest audience so that the greatest number of students can have a high quality STEM education.

MR. WEST: Okay. Thank you. I want to thank Stan, Nicole, Michael and Brad for sharing your ideas 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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