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Improving workforce development and STEM education  
Twelfth annual John Hazen White Forum on Public Policy

Thursday, July 27, 2023

UNCORRECTED TRANSCRIPT – CHECK AGAINST RECORDING

PANEL 1

MODERATOR: DARRELL M. WEST

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JOHN HAZEN WHITE, JR.

Trustee, The Brookings Institution; Executive Chairman, Taco Family of Companies

KATHARINE MEYER

Fellow, Brown Center on Education Policy, Brookings

PANEL 2

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**WEST:** Good morning. I'm Darrell West, senior fellow in Governance Studies at the Brookings Institution. And I'd like to welcome you to our 12th annual John Hazen White Manufacturing Forum. And I want to thank Johnny, Ben, Kirsten, and Liz White for their generous support of this forum. Johnny actually is a trustee at Brookings and we appreciate all that he and his family have done to support our work. We are also live webcasting this event. So a warm welcome to all of our viewers from around the country as well as around the world. I also want to welcome all of the Taco employees from Cranston, Rhode Island, who are tuning into this event live. So we appreciate your interest in this topic as well. We are going to be archiving the video for this event on the Brookings YouTube channel. So anybody who wants to watch it at their convenience will have the opportunity to do so. Over the last few years. There has been a renaissance of manufacturing in the United States. There are many new jobs that have been created, and there have been some extraordinary investments that have taken place as well. And so all of that really strengthens the future outlook for the sector. Today, we're going to look at issues of worker shortages and also ways to improve workforce development and STEM employment. Yesterday, we actually published a paper at Brookings on this topic and present a number of ideas for improving workforce development. That paper is available at [brookings.edu](https://www.brookings.edu), so you are free to peruse it at your convenience. In the paper we identified several important problems. So for example, 45% of U.S. STEM employees with doctoral degrees are foreign born. And so it highlights one the importance of immigration to the future of manufacturing and the future of innovation in America, and two the need to continue to produce people who have skills in that area. There are worker shortages in several key areas, such as semiconductors, robotics and advanced manufacturing. So we need more engineers and software designers. But it's not just people at that end of the workforce. We also need electricians, welders and pipefitters to build the new manufacturing facilities that are underway. The federal government is investing a lot of money in rebuilding the domestic manufacturing capability, but there are worker shortages that are making it difficult for those new facilities to get built and then staffed properly. So that is definitely a challenge. Only 19% of our current engineering graduates are female. So clearly we need to do a better job on that front because we need more engineers. And one way to actually get more engineers is to improve our efforts both based both on gender as well as race and ethnicity. And so the labor shortages that we are seeing pose considerable risks in maintaining the US edge, both in manufacturing as well as digital innovation. So among the particular suggestions that we make in the paper is one effective implementation of the chips that the U.S. is going to be investing billions of dollars in rebuilding our domestic capability. We need to make wise decisions in that regard. There already are a few issues that have popped up that we'll discuss today. We need to pay attention to STEM education because manufacturing increasingly has a technical component and needs people with technical skills. We need to improve STEM access among a broader array of individuals. We need to think about apprenticeship programs and the way that they can provide pathways in the manufacturing community. Colleges in many places are playing a key role in terms of workforce development. We're also going to need to prioritize what we call lifelong learning. The nature of jobs is changing so rapidly now that people are going to need to upskill their talents at ages 30, 40, 50 and 60 virtually throughout their entire adult lifetime. So we need to figure out ways to get them into online programs, certificate programs and other ways to develop their credentials. Immigration reform is tied into the future of manufacturing and the future of technology innovation in America that is long overdue in the United States. We're not terribly optimistic about the short term ability to do that, but this needs to be an issue that the country addresses. And then finally, we need to manage all of the very complicated geopolitical tensions around the world just because that is creating so many problems in terms of the global supply chain, security risks and just the future of relationships across. A variety of different countries. So if you want more details on both how we see the problem as well as some of the ways that we think would address those issues, I'll refer you to our paper at [brookings.edu](https://www.brookings.edu). So to help us think about all these issues on our first panel, we have to distinguish experts. John Hazen White is the executive chairman of the Taco Family of Companies. He has run this business for more than 25 years. He has thrived in this business by demonstrating imagination, persistence and creativity. And as we will discuss in a moment, he is a big believer in workforce development. Katharine Meyer is a fellow in the Brown Center on Education Policy at Brookings. She writes extensively about higher education, workforce development and STEM training issues. We have set up a Twitter feed at hashtag [STEMworkforce](https://twitter.com/STEMworkforce). That's hashtag STEM workforce. So anybody

who wants to post comments or pose questions, feel free to do so. And we welcome any comments or questions that you have. So, Johnny, I want to start with you. We're going to jump right into the conversation. So we are hearing a lot of talk about worker shortages in a variety of different areas. But I'm just curious, you're on the front lines running a business. What are you seeing in this area? What kinds of skills are in demand and hard to find? Why is this become such a problem?

**WHITE:** Well, we're fortunate they're all to to an extent, and that our workforce has been so stable for so long. So the average turnover in our company is less than a half a percent for the last 30 years. So over 600 people, if we lose two or three a year, you know, it's about what it is. But in the last two years we've seen several things. One has been the exodus due to COVID. Anybody that could have the ability to retire did. A lot of people did. And the baby boomer exodus, I call it. So people in my age are retiring. So we are beginning to see turnover drawing new people in. It is more difficult than it ever has been because for for all the reasons that I guess are out there. But I think there's two things. There are geographic restraints, too, to finding, you know, replacement workers at whatever level they are, and there are skill sets. And so, for instance, our biggest problem now in terms of finding people is in the welding field. Okay? And and that's because we're in Rhode Island, which is where all the submarines are made, right. For for the you know, for the military. And when submarine contracts are let, you know, welders disappear, you know, an electric boat, no problem with that is the government's paying for that. So so I'm competing with the government for, you know, for for high paying jobs. Yet if you go to places like certain parts of Texas, the welders are on the street, you know, So it's a geographic issue to some extent. I think we've been fortunate to tonight, aside from finding new welders and and certain other specific jobs, we've been fortunate because our company has a reputation of a place as a place that people want, want to work. And I think I think that's you know, that's a that's that's something we've built over years and is now a true benefit to us. But I think people so our and also our rate of retention of new employees I think is higher than most most companies of our type. We're seeing a pretty, pretty high level of retention. Most of my peers and and companies around us and I think all over the place are seeing a very quick turnover and people go and I'm not quite sure why that is. I think it comes down to making your your workplace attractive for people to to be in for their they and their families to be able to grow and prosper is something I've always believed in. But it's the Wild West right now. And I can say that in terms of employment, particularly manufacturing, because we're all trying to figure out how to how to adapt to the current generations and we can talk more about that, but how to adapt to the current generations and and versus the old older generations. My generation. That was the old yeah, the older guys.

**WEST:** I would say old.

**WHITE:** Let's be honest here. I'm not supposed to say that, you know, I am. I'm old. But but it's a different world. And so we're trying to learn how to adapt.

**WEST:** Okay. One quick follow up for you that I want to draw Katharine into the conversation. I know both you and your family have long invested in workforce development. So what are you doing to train your workers for the jobs of tomorrow?

**WHITE:** So historically. Taco's had to take a learning center which became quite famous back in the nineties. It wasn't a very advanced, you know, training program for for workplace employees. And we taught everything from English as a second language to, you know, to math to CNC programming all the way through to English literature classes and, you know, cooking classes and art classes and really did everything for years. And now we're really having to refocus because that's not what's attractive to the incoming people at any level. Now, what's attractive to the millennials and to the Gen Z's and all of these new generations is the is the I'm going to use the word engagement. People want to be a part of what they're a part of, you know, a real part of and have a meaningful contribution. Because I think people are looking more at what companies are doing socially. You know, and and and to make a better world and all that, all of those things. And and so these are where we're having to adapt and and we can talk more about that after you know but the things we're offering now in terms of workplace education and development are a

little different old and they than they have been over over the last 30 years. Okay much more socially conscious and and and engagement driven.

**WEST:** Okay. So, Katharine, I want to bring you into the conversation. And I know you have written extensively about various aspects of workforce development. How can we make sure workers have the skills that they are going to need for the future?

**MEYER:** Yeah, I mean, I think the point that you made, Darrell, about lifelong learning is so important. Nobody can predict what exactly the skill set is going to be that you need in ten years. Maybe right now, it's we're discovering we need a lot more workers who understand AI and the technology behind that. You know, the way you get that is by developing workers who are able to kind of go in and out of the formal education sector. And, you know, having employers that are willing to offer that training as well, I think Taco is the exception. And that has invested so much in employee education that's really been on the decline in recent years where we've maybe seen some substitution as instead of doing in-house education, we have seen a lot of corporations invest in financial aid for their employees and those sorts of programs are useful to help them go back and get their training. And we also need to make sure there are systems available to take those students. We need to make sure that community colleges have enough support and they have enough instructors that are available to be flexible and to take on employees and or take on students when employees need to learn new skills. And that's challenging to think through the pipeline of staffing up community colleges adequately and making sure that they have, you know, experts who are ready to engage in that training.

**WEST:** So Johnny mentioned COVID. And Katharine, I'd like to get your perspective on this. We know COVID had a dramatic impact on every aspect of our lives, but I know you've done a little bit of work just on the impact of COVID on student achievement and student learning levels. And since that is so important in terms of the whole pathway issue. What are what did you see in your research? What kind of problems have come out of COVID? How should we be thinking about that part of it?

**MEYER:** Yeah, when we think about the effects of the pandemic on the education pipeline, I think about it in two ways. One is on the skills that students may or may not have acquired over the past couple of years. And the other is on sort of the pathways that they're jumping on. And so we know we've had numerous reports from the Department of Ed, the National Assessment of Education, Progress, the nation's report card, showing that, you know, if you look at eighth grade mathematics skills, they've declined dramatically. They're back at 19 or 32,000 levels. So it's basically as if No Child Left Behind never happened when a term comes to eighth grade mathematical knowledge. And when you think about those students, you know, they have about a couple of years before they're going to college. And it's a real question whether or not they're going to be prepared to take on college level science courses or mathematics courses. Are they going to get to calculus by the end of high school? So there needs to be a real purposeful effort focused on helping students accelerate their learning, invest in high quality tutoring and I mean high quality tutoring. These are tutoring efforts that need to be integrated into the school day. They need to be done in collaboration with teachers. You know, it can't just be these one off. Oh, we hired a tutoring company on contract and, you know, go use it if you want. And then also, you know, investing in summer school, extended learning know, there are a lot of efforts that can be done to catch students up. But that's going to be a real Herculean effort over the next couple of years as these students get ready for college. On the other side of the pandemic, we saw quite a few, quite a large number of students not enrolling. College immediately in the midst of the pandemic. So the overall decline in post-secondary enrollment in the fall of 2020, it dropped by about 10%. That's a huge decline. Now, things have since recovered. We're building back that pipeline from high school to enrolling in college. But we still have what I think of as the sort of missing cohort who graduated high school in 2020 and to a slightly lesser degree, 2021, who but for the pandemic would have been enrolling community colleges. They would have been more enrolling in workforce development training. How do we structure outreach and how do we structure financial support to get those students back connected to the formal education sector? I think that's going to be the big question over the next few years.

**WEST:** So, John, I'm just curious from your perspective how you saw COVID playing out, particularly in terms of employee needs, what they're looking for and how it has affected the company?

**WHITE:** Well, you know, by the by the way, I do encourage everybody to read this paper Daryl, you know, put out yesterday, because the statistics are are staggering in terms of the what's happening in the education in this particular the STEM area. COVID, COVID hit it a very interesting time because I'm going to go back to this baby boomer exodus. They're all for me because it COVID hit it about the time that we're in the middle of the baby boomers, the tail end of the baby boomers leaving. So. So it impacted the need to adapt to a new workforce by moving by moving that time up a bit. Okay. And and and take it you there was a lot of good that came out of the results that came out of the COVID time period, particularly in the sense of the things we learned to do quickly. You know, if you think about me again, being an old guy has always said we are not going to go to remote work. We're not going to go to remote meetings. We're not going to use teams and zoom. And I held firm to that until one day when I had to go to it the next day. Yeah, right. Literally. And so we we learned to adapt pretty quickly. And anybody, as I said, who had that, a lot of people had the chance to retire, could retire, did retire very quickly. And they just were saying, I'm not doing this right. And God bless. And I respect that. I probably would have done it myself. It could have. But COVID infected us in an awful lot of ways. Most most importantly, how to adapt and positively. And I want to just the most important thing that I've learned in my career, one of the most important things gosh, I've learned a lot of important things, but one of them has been what you talked about and what you talked about, which is the real attempt and desire to to help people become lifetime learners. This is so important. It always has been. I always wanted to hire people that I consider to be learners because they were broad. They weren't bucketed into a Sometimes some people have to be, but the lifetime learning is so important. And as we move forward, it's becoming more important because. Because with technology being what it is, people have to be able to do more. You know, and actually, the workforce that we're seeing coming in now and the people we love, thank goodness, the people we've had for the last three or four years have been this way. But the people coming in want to do more. They want to learn. Never forget the more people. This is something I've learned also, the more people learn, the more they, it seems to me, the more they want to learn. So to provide that, you know, that ability and that chance is just the start, and then people will take it from there. You've got to follow their lead a little bit. But that's that's not answering your question about COVID.

**WEST:** Actually, you did answer that as well and added other insights as well.

**WHITE:** That's just a pontification by an old guy.

**WEST:** Yeah. So, I mean, I've been telling people for a long time, like our old education motto was basically investing in skill development up through about age 25. And then after that you're on your own. That model is disappeared. It's going to disappear. And all of you who are younger in the audience, you are going to have to engage in lifelong learning. And Katherine, you had mentioned the community college role, it seems like in a lot of places and especially in the manufacturing area, I think this is the case. Community colleges have provided one of the primary pathways just because they're focused a little bit more on vocational education. They train people in concrete ways as opposed to kind of a liberal arts education type of approach. So what are community colleges doing? What role can they play and if people need. You engage in lifelong learning and community colleges are going to be part of that. Who's going to pay for it?

**MEYER:** Yeah, I mean, I'll I'll tackle in reverse order that, you know, obviously somebody has to pay for this education and community colleges do so much for their community. It's in the name. Community colleges are wonderful institutions of higher education. They badly need more support. And, you know, that comes at the state level, at states allocating more financial support to the community college system and, you know, perhaps shifting some of that even from the four year sector, recognizing the big work that community colleges do to to lift folks up economically. It also comes in the form of redesigning financial aid that supports all individuals and is flexible for

individuals, different pathways. You know, something that we've seen is that there is sort of a big push to increase college enrollment. In college completion, there was a big spread in financial aid programs targeting four year enrollment. We've now seen a lot of those expand to support community college enrollment, a lot of the Promise programs. Those have then been sort of the blueprint off of which workforce development promise programs have been launched. And so you think about Tennessee, where their Promise program was initially targeted at high school graduates and they adapted it to Tennessee Reconnect was a program targeted at workers 25 years and older who wanted to go back to school and was really effective at drawing folks back to school or just supporting people who are already appalled. And so I think as states think about how to target those programs, you know, expanding aid that's really dedicated just for those older workers is an important way to do that. And then just tying back to this enrollment point, sometimes being flexible, you know, sometimes those workforce programs need to have that age is lowered when you have, again, the pandemic effect, where we had this cliff of students who weren't enrolling, those are workforce students. So, you know, finding exceptions to the 25 year and older programs, maybe you lower that for a couple of years to reach that cohort.

**WEST:** So, Johnny, you mentioned that you're having to reorient your learning center and people are wanting different things and you mentioned employee engagement as a big factor. I'm just curious, what are the changes that you are seeing? What is it that employees want? What do they need? How are you kind of rethinking your model of employee workforce development?

**WHITE:** You know, it's it's interesting. We were talking about this this week in the strategy review session. And a lot of the focus is coming down to bringing people more into leadership positions. Okay. So so there's a multitude of of of things to be done in the area of education if people want to do, you know, a lot of the English as a second language or or let's say engineering programs or or different kinds of degree programs, we will do the employee reimbursement tuition reimbursement programs. Now with with the community colleges, by the way, these community colleges have been way underrated for way too long. And I think COVID and just prior since 2008, I would say maybe have come back to have really come into their own marvelous things. And so we'll we'll do that. But we'll also run programs within Taco that are specific to job skills, CNC programming or, you know, certain financial program, you know, management programs and whatnot. But also we're running, you know, real leadership programs now within and I never really thought about this, but you know, what's a fact is not everybody can be not every manager, not every leader can be a manager, and not every manager can be a leader. You know, it's it's hard to find them the right combination. But but I think everybody has leadership skills. And this is what people are wanting. They're wanting to be a part of whatever they're doing. They want to make a difference. You know, back in the day, let's just use this as an example. It's not real, but let's say we hired a new engineer 40 years ago and the guy showed up on Monday or the woman showed up on Monday for the first day. And, you know, in their khakis and their Oxford shirt, necktie and blue blazer and bag, lunch bag. Right. And we took them to their desk. And then 40 years later, they said, thank you for the career. Maybe oversimplifying a little bit, but but that doesn't happen anymore. People are coming in and they want to really be a part of everything, you know. And and by the way, I tell you, I have so many peers that I talk to, both that I know and many that I don't that I run into on airplanes and. Who say, Oh, what an awful time this year. You can't find good people. And they come and they leave and and and it's horrible. You know something? I love this because I love people. You know, I am not a business man. I'm just a I'm an arts major, you know, And and I love people. And what a chance to engage with people and help them to become a part of something really good. My objective is not to lose these people. It's to keep these people. And we're doing a pretty darn good job of it. But people want to be engaged. That's something that's just becoming more and more apparent.

**WEST:** So, Katharine, so joining us to talk a little bit about what businesses are doing, I'm curious from a public policy standpoint, like are there things government should be doing? Are there are new policies we need to be thinking about? Are there old policies maybe we need to tweak in order to make them more relevant for the contemporary situation?

**MEYER:** Interesting. So in terms of employee retention specifically or any policies.

**WEST:** Well just in general on these workforce issues.

**MEYER:** Well I feel very powerful. You know, I think there are probably I'd be interested to get your your input. You know, are there ways that there could be policies that incentivize companies to do more of this workforce engagement and workforce training? You know, are there ways that, you know, companies could, you know, you know, have an advantage to offer these services? And I don't know if that's some sort of a tax advantage or what that looks like or, you know, a sharing partnership. I think along those lines in particular, the more that we can encourage and support and connect these sort of workforce and education partnerships, that's just going to make it all the easier to help individuals in role in the community college know that they're partnering in this program with a particular business in the area. They have a clear sense of where the job is going to lead to. And so I think any policies that can encourage that and I think that also, you know, really speaks to this localized point that you were talking about, Johnny, about, you know, we need certain jobs in certain locations, and it doesn't do good to tell everybody like, you can go go be a welder. It's going to be a high paying job. And that's true some places, but that might not be true in your neighborhood. And so I think incentivizing these partnerships between corporations and businesses and the community college sector in a way that can really target enrollment and completion in the programs that are in demand in that area, those are going to be the most effective.

**WEST:** So, Johnny, maybe I could put that question to you. What is it that businesses should be doing and where do businesses need help from government, either financial assistance or policy changes or whatever, just to facilitate better workforce development.

**WHITE:** So take a stab at that in two ways. One is, aside from the community colleges, the other important one is, you know, trade schools. And for manufacturing companies like mine, it's really in part important to to pair up with the trade schools for for skill sets. Right. You know, because they're putting these these trade and going into the trades is becoming once again a popular thing because it's lucrative for people. And if they have a skill set that they didn't know they had or they thought they had, they can grow and develop it. And so plumbing, welding, all of these different electricians, electrical, you know, electrical. So so that's an important thing. But I want to go back to the government involvement, the tax base. Look, there's all kinds of money floating around out there for if I move this factory to that location, I'm going to get all kinds of per head benefits, you know, all that stuff that's real. Now, I'm going to say something that's kind of altruistic. Growing and developing people. And I only say this from 45 years of experience growing and developing people. Starts right here. I got to believe in it. And I can tell you that there's a lot of people that don't. Companies are run for money for bottom line at the expense of the development of livelihoods. And what I've learned, and I don't think it's different with the new generation, people say this generation is different. They're not as committed and all that stuff. Yeah, let's talk about that next year because, you know, I'll know more. But I really believe that if you love your people, commit yourself to their well-being, all the rest is going to happen because they're committed to you. The key to life is to is to have commitment both ways. So I, I to be very honest with you, in terms of government money. Yeah, it's out there and we've got some free education. I don't really want it. I really want to do this on my own so it's not cheapened by an incentive.

**WHITE:** When we had the learning center. I'm sorry, I'm talking way too much. I'm taking your airtime and I apologize, but I want to make one more point. When we had the learning center over the years, I used to debate with people about because we did it on our time, people had any course they wanted. We had 127 courses in a catalog in our learning center at one point, and we paid for them. I think with the cooking classes they had to bring their own pans or whatever, but, you know, ingredients. But, but we paid for the time and gladly. So I would debate with people. They would debate with me. I was a pretty ripe target in forums like this about justifying the cost. I never allowed a financial analysis to be done in our company to prove the value of the learning program, because I thought it would cheapen if anybody felt like I was doing this so that I was going to get this much more from them. Then it was cheaper. And I never wanted that. Never want it. It's about believing in people and helping them with their own abilities.

**MEYER:** All right. New government policy. We just start cloning, Johnny.

**WHITE:** It doesn't always work. I'm a great talker. But. No, it does. It does work.

**WEST:** Okay. We're starting to get some good questions from our audience. And I want to remind people, if you have one, if any of you have questions, raise your hands and we will get them in. Those of you watching online or we have our hashtag at hashtag STEM workforce so you can submit questions that way. We have a question from Noah Hodges, who wants to know what are the top areas for worker shortages that we expect or that we have now and that we expect in the future? And I think, Johnny, you mentioned welding was a problem. What are the other shortage areas that you're seeing? And then, Katharine, to ask you the same thing.

**WHITE:** Punt.

**MEYER:** I'm not going to be able to confidently say the top three. I think obviously the expansion of chips in the semiconductor industry, we're going to need a huge amount of jobs. And just to think creatively about all the individuals who go into actualizing the the goal of that law, You know, you're going to need people working at, you know, conceptualizing and building. And, you know, there's there's every level of that. So that's obviously a key area. And then obviously, AI is looming. And I'll hand it back to you, Darrell, to to talk about the workforce needs there. But think about workers who are both specifically trained in that skills, but again, flexible to learn as the technology adapts.

**WEST:** Okay. Gentleman here, I believe had a question and there's a microphone coming up from behind you. And if you could give us your name and your organization and then your question.

**AUDIENCE MEMBER:** Okay. Can you hear me okay?

**WEST:** Yes.

**AUDIENCE MEMBER:** All right. Thank you. I love Johnny. I love your comment about everyone has leadership skills and your group's desire to actually do this and in pursuit of the development of human potential. Do you see a future with AI and automation where we really need to develop that in everybody?

**WHITE:** It's a great question, and I have to tell you guys, AI is intriguing to me right now, and it's and it's a bit scary because I'm not sure where it's where it's going to go. But yeah, I think there's got to be uses for it. And how that ties into leadership, I'm not sure because if AI replaces people, then I think leadership side of life is kind of going to go out the door, if that makes sense. But but, but I also I think if I could go back one step technologically and talk about robotics and automation, they have allowed us to take a workforce of 600 people with a company at \$30 million in sales to take it to 500 million with the same people. So do you know my point here? There's been uses for automation, robotics for productivity and process control that have allowed us to grow the business from the same people. So so there's some so I'm only saying that because your question about AI, AI scares me to death because I don't know where it's going. Okay, I just downloaded ChatGPT yesterday on my phone because I've been afraid because I'm not sure what happens when you download it, but because it's probably more intelligent than I am. But you know, I think that the benefits, the threats that people talked about with with robotics and automation 25 years ago are probably the same things we're talking about with AI. It's how we utilize it. I'm not sure that answered your question at all.

**WEST:** I can jump in a little bit because we've written a lot about AI at Brookings as well. There are all these fears out there is going to take all the jobs is going to be widespread unemployment. I'm actually not worried about that, especially like on a 5 to 10 year time horizon. I think in the short run where AI is going to be used and it's going to transform jobs and in the nature of work is more to augment human performance as opposed as opposed to replacing it by augmenting it. What it



means is companies are going to be doing this, government agencies are going to be doing this. Virtually all organizations are in the early stages of figuring out how can I enhance people's ability to do their job. So, ChatGPT is out there. There are hundreds and thousands of other applications, some very specialized ways to improve worker productivity. If you need to develop ads for PR campaigns, there are AI enhancements that will help you do that almost instantly. Certainly in a matter of a few minutes. Every routine task that is manual in nature like those jobs are going to get automated so people who are at those levels are at risk of some job things. But the other thing that that I think often gets underestimated in these conversations is AI is also going to create new types of jobs. But the challenge there is going to be do people have the skills necessary to perform those types of jobs? So there's kind of this mismatch problem of they're definitely going to be new jobs created, but a lot of people currently don't have the skills. And so therefore that highlights what we've been talking about, workforce development. Like if people don't currently have the skills we need to train them so that they can apply for those new jobs and benefit from them. I think we have another question that has come in from Mike Paulus, and he says, Having spent my career in manufacturing, it seems like we have lost the younger generation. He feels like manufacturing has not done a good job of kind of branding itself with young people. Young people may have an old image of manufacturing in what factories look like. And so to extend his question, one, is that true? Have you lost the younger generation? And if there's any truth to that, how do you get them back?

**WHITE:** I think I think we still fight the the notion that manufacturing is old, dirty. Our parents didn't want us to go into.

**WEST:** Dangerous.

**WHITE:** And dangerous, I guess. Yeah. How do you. You just have to fight. Fight that battle every day. We do. And and by the way, in the replacement of our own workforce, we're getting young people all the time and we're bringing them in and we're training them and we're enveloping them in our culture with our values. And and they're becoming and we are having a lot of success at drawing them in from an engagement standpoint. So I think manufac I think this is more than a you know what, it's a case by case problem. If we look at it globally, sure, we've lost the young generations. They wanna start wanting to be doctors lawyers and and and whatever. But what the reality is on a case by case basis in our company we just keep bringing them in, training them and loving them and and we have a pretty good success rate of this at this so.

**WEST:** Katharine do you have any thoughts on generational change?

**MEYER:** Yeah, And I would I would say a lot of this comes from a national messaging and an appreciation for these jobs. You know, there should be an acknowledgment nationally that these are good jobs. They can be really good jobs with really good pathways and really economically beneficial to students and their families and to their life trajectories. Part of that is, I think, giving students more exposure to going back to giving students more exposure to these careers. During the high school experience, I think we shifted away from so much of the sort of academic versus tech pathways in high school to to more of an academically oriented program. And I think it's good that those pathways weren't so rigidly sort of split the way that they had been. But now as we reimagine the high school experience, how do we think about bringing post-secondary? And here I'm not just saying like post-secondary, like a college, but the post secondary experience, whether that's workforce bringing in opportunities for students to do internships, to do apprenticeships in high school, greater again, back to the community colleges, partnerships on dual enrollment, career and technical education through dual enrollment. So not just having your dual enrollment glass be, you know, college English or something like that or freshman composition. But, you know, let's have, you know, these dual enrollment classes in manufacturing fields and let students get early exposure to the careers that could really interest them.

**WEST:** Okay, great. Thank you. We have a question right here. There's a microphone coming up from where are you?

**AUDIENCE MEMBER:** Hi, I'm Jimmy from the State Department. Katharine, you mentioned the importance of like companies paying for workers to do school. France has been doing that. We had ultra announced. Germany has been doing that for decades, I want to say. What are the challenges in American society that have made it difficult to implement those types of partnerships?

**MEYER:** Yeah, I mean, I think it's it's it's good that John is committed to workforce development, but, you know, there isn't always that sort of ethos of supporting workers. And so part of it is like just trying to encourage people that this is, you know, a social pressure change, you know, trying to encourage company leaders to do this because it's the right thing. Maybe not all of them are going to be swayed by that. Maybe some of them do need some sort of an incentive program. But also, I think as we strengthen, you know, the way that workers can organize and communicate with leadership in their organizations, they can talk through, you know, what are their priorities and what investments do they want the companies to make.

**WEST:** And if I could just add on to Katherine's answer there, I the big difference I see between other countries, especially like Germany and France and the United States, is that it's a cultural difference. In America, we have a long tradition of individual responsibility, individual attributions, like you're responsible for your education. The country as a whole is not responsible. There's less of a sense of shared responsibility or social responsibility. And I think as we move into a digital era, that is going to be important to change because in order to build support for the new types of programs that I think we are going to need for workforce development and kind of upskilling people in terms of what they can do, we're going to need more of a shared sense of responsibility, which includes helping people pay for these courses. Like now, you know, we invest in K to 12, we invest as a country in higher education. We're going to have to invest in lifelong learning. Like that cannot just be the end of the individual responsibility of the person. Here in the front row, we have a question.

**AUDIENCE MEMBER:** I'm Bob Hershey. I'm president of the D.C. Council of Engineering and Architectural Societies. What can communities do to increase the level of math, education and orientation toward new technical things?

**WEST:** It's a great question. And we also have another question that came in from our audience on this whole math issue. And we know in COVID, kind of math scores have dropped. It seems like we're facing a crisis here.

**MEYER:** Yeah, crisis is the word. It's it's bad. And I think part of it is just continuing to communicate to communities how much students did not learn foundational math concepts and how important recovering those foundational concepts is going to be for their ability to build on. You know, there's a reason why we sequence mathematical courses. You need to understand algebraic concepts before you can move into calculus or, you know, there are a whole bunch of different pathways. And so one is raising awareness to, like I said, investing in tutoring. I think there has been a tremendous amount of resources poured into schools to help with pandemic recovery. And by and large, they're investing in a lot of really great efforts to support student learning and recognizing that supporting student learning can take lots of different forms. A lot of districts are investing in better facilities. We were talking in the green room before about air conditioning and how you can't work when you don't have air conditioning. You can't learn when you don't have air conditioning either. So you know that that's more of an aside on that. There are a lot of different ways you can invest pandemic relief funds, but particularly in tutoring and tutoring requires committed tutors. And so people in the community can volunteer to be tutors and mentors for youth in their community and thinking about ways that, again, that's integrated into the school day. It's regular students have a reliable tutor, like there are benchmarks for what good tutoring looks like, and that needs to be the model that schools lean into.

**WEST:** The question back there.

**AUDIENCE MEMBER:** Hi, my name is Camsie McAdams, and I work for Discovery Education and Tech Group. I wonder if you if anyone on the panel could talk to the role of certifications. So I'm thinking, you know, we talk a lot about post-secondary options and we community college comes up immediately. Right. But a lot of kids that I'm meeting are taking like an 18 week certification. In health care I.T. or they're getting a, you know, radiology certification and almost all the certification. Programs are private for-profit. And high schools in general aren't aware of them. And I wonder if there's anything that you have. To say about that, just that like high. Schools or not, it's like not really an organized field out there. It's a little bit of a Wild West. And then also just to the role of you as an employer, somebody comes in with some interesting certifications. Maybe they didn't go to a traditional path through trade school, but they have some kind of interesting certifications. How does that look as an employer? And then is that something that you're promoting with your own workforce development?

**WHITE:** Yeah. So so if you remember, I was talking earlier about that there's different segments now, you know, in in career development, in employee development, and this is one of them. So yeah, certainly some people come in with certain certifications are, you know, you're going to bring in somebody who's who's certified and and a professional, etc., CFO, you know, these people have certain certifications, but here's where it becomes inside personnel. There are people who are developing their careers. They may be in the finance area, they may be in the area they could be in in certain segments of quality or manufacturing where there comes a point, if they choose to go to the next level in their career where certifications are required. Okay. A great example is quality. I mean, you can't just jump into a quality job and take it over. You really have to be certified in certain skill sets. H.R. There's all different levels of nature of of of required certifications, right? And they become legal to some extent. So then it's incumbent upon us to offer those certification capabilities, whether it's in-house or whether it's, you know, the tuition reimbursement thing to go someplace. They're important for for two reasons. One is, is for the skill sets and the ability for the for the for the for the job to be done properly, but also as an employee retention. Yeah, that's a huge by the way, employee retention through upgrading skill sets is huge. You know that's a huge it's always has been to me is is to provide the person the ability to grow and develop their own, their own careers and livelihoods. Yeah. Does that answer your question at all.

**MEYER:** Yeah.

**WHITE:** Yeah. No, I want to know from my perspective.

**MEYER:** Yeah, I'm not I'm not off the hook.

**WEST:** Now that we're going to move to the to the really smart one. I want to hear this one.

**MEYER:** No, I think it's true. It is. It is such a challenge to even start these partnerships between, say, the high school and the community college, let alone to start developing it with the the less organized for profit sector. And I think there are a lot of for profit institutions that are doing really good credentialing and training. You know, there are also some that aren't. And so I think we have good accountability and there are efforts to enforce more accountability on programs to to push them to have quality outcomes for their students. But, you know, I don't want to discount that there are excellent for-profit institutions that are really supporting a need where, you know, a community college can offer every possible degree. And sometimes you need to step in. I think it's just I see community college partnerships and stuff like that as the the easier one to pursue giving that it is a more organized sector and that high schools have limited resources to build those connections. And so it's harder to do that with a more disconnected sector like the for-profit sector.

**WEST:** So we have a question from Kate Campbell. She wants to know how can international students help to fill some of the gaps that we're seeing, at least in some of the areas where there are worker shortages are. And I think particularly kind of in in technical areas, in engineering and science areas, can international students basically help solve this problem?

**MEYER:** Well, I'll say on the higher ed side, there are large enrollment declines across the board in the wake of the pandemic. If you look at sort of the net enrollment loss, you know, relative to fall 2019, what has happened the next few years. But of course, that was not evenly distributed across all students. And the biggest declines were often in international students. And that was, you know, just because of a public health concerns about moving to a different country and just different challenges with the processing times of visas and getting students over here. And so I think, you know, as we recover from those barriers, we're hopefully going to see the enrollment of international students and increase. And that, you know, they bring a rich perspective to understanding STEM fields to any field. You know, the more you have a diverse set of perspectives coming out a problem, the more likely you are to design a solution that works for the diverse end users who are going to benefit from it.

**WEST:** And I would say kind of in STEM areas in particular, like there are two ways we can solve this problem. One is through international students and not only bringing international students here, but putting them in a position where they can stay if they're qualified and if they have skills that people need. The second way is to encourage more native born Americans to go into these fields. And the problem today is we're actually failing on both of these because we're cracking down on immigration. The geopolitical tensions are such that international students are not quite so keen to come to the United States anymore and they're worried about how it's going to play back home, etc., etc.. And native born Americans are not going into STEM fields. I know I used to teach at Brown, and when I would go into graduate programs in engineering or math or, you know, any of the technical areas, like 75% of the students came from outside the United States, like native born Americans are not taking these fields. They're not getting advanced degrees in these areas. So the challenge I see that America faces today, both in terms of manufacturing, but digital innovation in general is we're cracking down on immigration and we're making America less attractive to international students. And we're not seeing sufficient number of native born Americans going into these fields. Now, we can screw up one of these two areas and actually be okay in the future. But right now we're screwing up both of them. That is bad in terms of our own future trajectory.

**MEYER:** Actually, Darrell, if I could just quickly jump in, I think it's not we're also just having fewer native born, you know, students. The Great Recession was almost 18 years ago. And we're coming up on the demographic cliff where there was a large decline in fertility in the Great Recession. There just weren't as many children born. And we're just going to see declining cohorts in terms of size of 18 year olds, you know, starting in 2025.

**WEST:** Yep. Demographic problem. Yep. Right there. And there's a microphone coming up.

**AUDIENCE MEMBER:** Hi, I'm Paula Stern, and I'm representing today the National Center for Women and Information Technology, which the NSF founded about 18 or 19 years ago. When we saw that we were going to have all the shortages, specifically in computing science and in information technology. So this my question is following really prompted by you with your observations of who is participating in that subset, critically important for innovation in the whole STEM field. And I would like you to address the problem that while we have increased the number of women as well as men who are computer science trained and are able to participate and give back to the future through innovation, the percentage of women is still stuck at 24%. And what is it why that might be, even though we're we've increased the number. And I do think because of NSF studies, it has so much to do with culture, particularly corporate culture and particularly the tech teams, because they are not retaining these. Now we, we have counselors and in computing within the high schools around the nation trying to tell about opportunities. But I would really love to hear your observation on really the corporate world, not just on the factory floor, if you will, but really in also the tech teams that are creating the new digital future. Thank you very much and thank you for the opportunity to. Comment on that particular arena and try to really go down deep.

**MEYER:** Yeah, Yeah. No, I will say I think you're right that a lot of it is culture and different corporate culture. And we know I'm going to step back into education because that's what I know a little bit better. But we know that a sense of belonging is so important to again, think about for your students in particular, but to your students as well. In students retention in college, their completion

of their degree, and whether or not they're going to persist in a major. A lot of the sense of belonging comes from having mentors in the field that you can point to and who understand what you're going through. And so as we increase the share of women, faculty and staff of Black faculty in STEM, the Hispanic native faculty in STEM, so that students can look to a faculty and see a pathway for them that's so important to building a sense of belonging and pathway. You know, we know at the high school level how effective it is to have a same race teacher and how valuable Black teachers are not just to Black students, but to all students in the classroom. And we actually had a great piece on chalkboard recently about how Black teachers help white teachers better understand the culture of their students and just how impactful that is. And so if we then translate to policy, you know, how do we incentivize entry into the teaching profession? How do we incentivize that for folks who are trained in STEM, where they have such competing external options? You know, if you have a chemistry major, it's it can be hard to say I'll be a teacher versus I'm going to, you know, do a chemistry field. Part of that is paying teachers better. A part of that is maybe structuring financial aid. So there are incentives to become a teacher to work in certain districts. I think there are a lot of levers that we have to encourage folks to enter into teaching and to build that sense of mentorship and people that students can look to as they think about their careers.

**WEST:** Okay. That was a great closing question for this panel and a great closing answer to the panel as well. I want to thank both Katharine and Johnny for sharing your insights. Lots of great ideas. We're going to have a second panel so you guys can exit off the speech and we'll ask our next panels to come on. But thank you very much for offering your views. And Ellen and Annelies, if you can come up on stage. Have a seat.

**SCULLY-RUSS:** Thank you.

**WEST:** Okay. We are going to continue our conversation with two additional experts that we are pleased to involve in this conversation. So Annelies Goger is a fellow in the Metro program at Brookings. She writes about talent development in the United States and workforce development more generally. Ellen Scully-Russ is an associate professor of human and organizational learning at George Washington University, and she too writes about workforce training and ways organizations can deal with their employees. So welcome to our discussion. Annelies, I'm going to jump in first with you. I know you've written extensively about boosting our STEM workforce, and that's a topic that came up in the first session. But what are the big roadblocks here and how can we address them?

**GOGER:** I think we started talking about some of them in the last panel, but I think I would like to raise a few others that maybe didn't come up yet. So I think one is starting earlier. Right? And so even when it comes to early childhood education, we see massive disparities in access to quality and resources at that early stage. And that comes in also at high school. I think Katharine did a great job about talking about starting people younger. But but we really have we're not starting people at a level playing field. So whether that's a geographical disparity or racial income, gender disparities, like those not coming in with the same preparation, I think what I see in the chip sector, unfortunately, is a lot of focus on, you know, like graduate school programs and professors and that side of the pipeline. And that is important because there are ways in which we don't actually have enough resources there. But but who's even applying for these programs to begin with and what preparation do they have? I think starting earlier and those mentors when I was in high school and I was good at math, I didn't have mentors to even explain what an engineer did, right. So how could I, as someone who didn't have parents who went to college, get exposure to what those options are? I think that means getting those apprenticeship, getting into the workforce. And then I think the last question is really important, because when you show up at a workplace and it feels hostile or you feel like you're the only one on your team that looks like you, it really doesn't feel welcome and doesn't feel like a place that feels safe and that you can you want to stay. So I think we need to really look at both within the hiring process how how bias and discrimination fit into that process, but also within retention. I think John was was hinting at, you know, really looking at not looking at talent as a cost, but as as an asset and as potential. There's a lot of ways in which I think our whole management systems need to shift so that we can build those learning structures

inside. And I think Ellen can talk to those more within the corporate culture. How do you create that culture of learning, culture of feeling welcome culture in which ideas are part of, you know, that organizations can change and shift with with young people and people feel that they can, you know, when they have an idea that it's it's hard and that can get into the process it's valued.

**WEST:** Well that is a great segue to Ellen, who has written about the role of employers in workforce development. So are businesses doing enough to train their workforces?

**SCULLY-RUSS:** You want it. So no answer to that. Yes. Yes. No, I do not think so. I think there's pockets of employers who do a wonderful job at it and that are very engaged in the workforce development system, either internally or internally and externally. And I think we ought to applaud and amplify their efforts. But as a as a industry community here in America know, I mean, we talked about earlier, a gentleman here asked a question about, well, why why do we do this in France and not in America in terms of employer large scale employer involvement. And I think it has to do with it has to do with, you know, the individualized culture, but it also has to do with the institutional arrangements that have built up over generations. Right. That do not foster the industry partnerships we see in other parts of the world, like in Europe, for example, their labor relations system grew up at the guilds, right? And the guilds owned the work and they were the workers. And as the as the industries developed and became corporate industrialized and corporations came in, well, the workers had some power and some clout to ensure that there was an. Through a partnership there that continued to provide voice for workers at the national level, at the industry level, and at the firm level. And we see these elaborate education and training and certification systems that are integrated. They're doing all the things that we say we should be doing here in terms of articulation agreements and skill standards and certifications that are aligned right. Not to say that's a perfect system. They do have their biases built in and they do have issues of equity and inclusion in those systems, but the systems are there nevertheless to be developed to be improved. Right? We're still trying to develop them. If you look at Japan, for example, I think you said you represented the.

**AUDIENCE MEMBER:** State.

**SCULLY-RUSS:** State Department. So so but but if you look at if you look at Japan, for example, it was America that forced them to build up their their industry in a certain way. Right. And so they they they forced them to adopt the Demis principle, which is based on a very high level of employee engagement and problem solving that gets to some of the cultural things. Now, granted, it's not perfect. They're not a lot of women in there, but at least they have a culture of inclusion of those who are there and engagement, right. So which can be chipped away at, right. With the right strategies or with with determination and grit. Right. So so I think there's models that we can look to, but we're sort of at square one in that in building that institutional arrangement. Right. And I believe the way to do it is to take employers who are doing good things and the right things and have a really good mindset about this work and amplifying their work not just to promote their work, but to provide leadership in their own industries. It's not enough for a company to to to well, in this day and age, if we want to solve the problem, let's put it that way. It's not enough to have an individual company doing good things right. We have to leverage that good work and build broader systems that bring others in and connect up with these skills formation systems. I do not like to call them pipelines because that evokes a certain mentality, a certain framework from sort of practice and policy. That's perspective, that's kind of mechanistic, right? It's linear. We hand off the planning, somebody else does the work. We look back around five years later with a training program which, oh, by the way, is not what we need anymore, right? So we have to figure out a more organic model that builds an ecosystem where we build new relationships and connections and let new processes emerge and be amplified throughout a system and and be adaptive to current state of affairs in local communities. So I think we need to amplify the good work that's happening, connected up to a broader dialog and not replicate the linear workforce development system that's currently in place, but updated with new values, new strategies and new relationships right across the ecosystem.

**WEST:** Now the good news is Annelies actually has written about all these things, so I want to get your perspective on like, how do we build these pathways, how do we build these connections? What role does partnerships play? I mean, you've written extensively about several aspects of this.

**GOGER:** Yeah, sure. So I think the question about other countries is really important and, and culture is important. But I also think if you go to Switzerland, for example, which has among the highest innovation in the world, you know, they have you can they recognize that it's not just go away to college in this traditional academic path and then that's going to be an opportunity. We should just put everyone there, everyone through that one square hole. We're going to push everyone there and then they'll somehow create innovation magically. You know, they actually have they have the square hole. They have the round hole, which is like, okay, well, we have apprenticeships in high school. We don't we don't let people go out and fall through the cracks and then try to bring them back. We actually engage them. Young And then after high school you can get up to in some fields up to your Ph.D. in an applied learning environment where as part of your times on the job and you get formal credit for that learning. And I think one of the problems with the US system is that we treat that workforce training as it's not part of our education system. It's it's something outside of higher ed that doesn't actually get recognized in many cases formally as education and learning. So what that does is it creates this sort of two tiered system, one of which has status, has more resources, gets recognized, has degrees that people sought for talent based on the other, which is most people because the majority of Americans don't have a college degree. This other system, which has a lot of credentials, it's digital badges. Is it? All kinds of other things, some of which are really good and some of them are not. And nobody knows how to tell between them and learners don't know how to navigate them. Employers don't know how to tell the difference usually. So how do we start to really formalize some of that learning and recognize it? And so I think a lot of what I'm doing is focusing on one, recognizing prior learning, setting up competency based ways of giving credit to learning. So that's part of it. On that side is, is that if you want to value skills and learning, that's not in an academic accredited press room. We need some some ways of doing that at all levels of learning. The second part of that is industry engagement. And how do you if you're learning that in the classroom and also in the workplace, then there is really a more active role for industry.

**WEST:** So Ellen talk to me about these two tiers. So we have like a higher education system and then all this other stuff that's going on, credential programs, online learning and so on. Do we need to integrate them better? Are there ways we can use the the virtues of each of those approaches to build a more effective ecosystem?

**SCULLY-RUSS:** That's that's a great question. I mean, I'm a I'm a big believer in let's leverage what we have, right? Let's not try to go out there and build new things. Let's really understand the resources that we have and connect the dots in new ways. So I don't I don't see it as an either or thing. I see it as an ecosystem of loosely coupled systems. Right. And the question is, how do we couple. Right. How do we help create tighter connections? How do we loosen up some of the connections? Right. Like in higher ed between credential degrees and and certifications, for example, in some occupations or in medicine where you've got your scope of practice laws that are just so rigid and politicized. Right. So how do we loosen some of the coupling and how do we tighten it within the system? Granted, resources help, but sometimes the resources are allocated to things that are too soon. The system is not ready yet, so how do we ready the system to make it? How do we connect the dots and make these relationships work so that people are ready to engage in these bigger, politicized questions about what do I have to give up to make room for you to come in and do what you do better than I do? Right. That takes a lot of effort and and consensus building on the ground in local communities. And it happens, but it happens over a slower, more deliberate period of time. So how do we get people who know, understands systems, understands emergence within systems, understands the political nature of this work, to actually get out there and do the work? We don't really. We don't resource that. The other thing that we don't resource is the research that could be helpful. I mean, we do a tremendous job with some of the labor market systems that are emerging, some of the innovation that we see in mining new sources of big data to figure out what's going on in the labor market. But we don't really have a lot of what I call warm data, right? Data about people, data about workers, their learning pathways, their aspirations, their

motivations, their challenges. Right. That's what's missing. And so how do we how do we how do we resource that kind of information? How do we resource back to the day when we were doing, you know, really industrial research around what's going on inside firms? How is technology being adapted? What technology isn't working? Why is it working, how a workflow is being reorganized. We really don't know that from a systematic point of view in any industries, and a lot of industries are being totally restructured. Health care, for example. We don't know what's going on from a higher level perspective, policy perspective, so that we could resource a more aligned and relevant workforce development system in that in that arena. So I think there's a lot of good stuff going on. There's a lot of not so good stuff going on. And it's just how do we how do we get down in the weeds to really understand the trends and what's unfolding, where the system is ready for some intervention and what strategies might work.

**WEST:** Annelies, how do we get better data?

**Goger:** Yeah, I think labor market information that we have in the US, it's stunningly bad as she's saying, right, both within firms, but also just we don't really have consistent information about who in what sectors and regions are people employed and how our skills changing and how does when someone learns with this bundle of things versus that bundle of things, then what? What do we know about what happens to them? You know, are there particular things that are really effective and other things that are less effective? We don't have the infrastructure, so I. Think of this almost as akin to the digitization that happened in health care, where there's a lot of movement right now to digitize both the learning records side of really getting some systematic tracking of what our people are getting credentials in. There are now over 1 million of them. But how do we start to understand? You know, this one is this long and covering these skills and this one is much longer and those skills. But we don't have a way of tracking that. Even like in higher ed, you have iPads, for example, but the non-food credit learning isn't tracked in one place. So that's part of it. On the learning side and on the employment side, when employers are reporting their wages and who they're employing and how much they're paying them and all of that, it's done in a very, very onerous way for employers. That's every quarter, often very manual. I've done it for my father, who owns a lightning rod installation company. Every quarter he he takes his ADP report and hand enters that in Excel and then sends that to the state and putting that small business owner in the middle of that when you were already using ADP and you already have the data somewhere in electronic form. It's kind of crazy in today's economy. And I think we need to modernize this so that every pay period there's an automated way, a standardized way in which this data is reported so that we know we don't have to say, oh, ADP reported in the pandemic that this is happening in the labor market. And no, we can actually get data from like more recent data that tells us what's going on in the labor market that is more accurate, and then we can link it to the learning records and then we can have sort of the data science infrastructure set up. So you can use AI to say, hey, like it looks like people with your skills are moving in these directions. Like, here are some jobs that match your skill profile. I think there are some ways in which we could use technology like AI, to actually help give guidance to people based on the patterns of what's going on in the economy. But we don't have that foundation.

**WEST:** And if I could extend your answer just in one way, as America is moving towards a digital economy like the quality and in-depth nature of the digital data that we have on the workforce, on jobs, data analytics associated with how people are doing, like all the like the kind of information is just exploding, but we don't have it available to the research community. And so like 100 years ago when we were industrializing, there's this whole field of industrial relations where people had access to data, they analyzed the data and they kind of figured it out, like, how do we do a good job of, you know, running the factories? Today we have the data, but we don't have the research access that allows us to learn from that information. And so if somehow we could fill that gap, I think that would actually be very helpful.

**SCULLY-RUSS:** Back in back in the day, we also had resources to get into the workplace and see what was going on from industrial relations perspective and see the changes in real time and understand the shifts. Right. And we don't do that anymore either. If I, if I also may. Yes. Those big systems where we know the variables that are important to do the modeling, right, they're lacking



as well. I mean, if I go back to the warm data, you know, there's not much qualitative data. I mean, do we have all the variables that matter in our modeling? I don't I don't think so. I suspect not. So how do we how do we begin to even understand what what some researchers are now calling the unobservable factors and variables that matter for some of the questions around structural equity and inclusion in education and in the workforce. Right. So we know that a lot of the workforce programs, for example, produce good labor market outcomes for individuals from a variety of different communities and from a variety of different life circumstances. Right? But we also know that they don't produce very good results on the aggregate level for our our goals around social inclusion and labor market equity. Right. They don't produce good labor market outcomes for for many, many communities, people of color, for example, people coming from marginalized communities. So so what are we not looking at? Right. If we can look at the variables on an individual level and collect data to say, okay, this person is getting a leg up because of the training, but their community is not. So what are we not seeing? Right? That if we had more warm data to include more variables in our modeling, I think that we could move the time a little bit on the bigger question.

**GOGER:** Yeah, and I would add that I think within a company, right, there's a lot of talk right now about skills based hiring and that is the idea that instead of filtering out people by because you have a degree or not, you're going to look at, you know, what are these combinations of certificates and credentials that would be not necessarily like equivalent to that degree, but that that so that you have the skills that this job requires and matching people based on what the job needs. And versus what what might be embedded in a degree, but isn't necessarily when you look under the hood actually matching that job. So I think that employers also lack actually the information and systems that they would need to make those matches happen. And they don't when they put a job post, generally speaking, or when they're filtering candidates on the other side, they don't have the systems and the infrastructure they would need the information and data they would need to to be able to skills to hire based on skills and not degrees. And so i think it's important to think about h.r. Systems and how they are actually sort of built around minimizing time it takes to filter a bunch of people instead of based. And so they find proxies like degrees to do that. But that erases a lot of other people that actually could fill that job very well and may stay longer because they're local instead of getting relocating from somewhere else.

**SCULLY-RUSS:** But it also yeah, it also could could show that those systems don't really capture the full scope of the job either. Yeah right. And that the person doing the screening doesn't really understand the work. Right. Because they're not managing it, They're not engaged in it, they're not from that profession. Right. So, so that's the connections that I think it's sort of the next frontier in a lot of the infrastructure that we're we're building is how do we how do we connect people so that they have a conversation around what we need and how we how we best organize ourselves to support people.

**WEST:** Right. And I'm going to make a prediction based on what each of them have said, which is once we figure out how to take advantage of all the information that actually is available right now, but we actually haven't figured out how to utilize it. What technology is going to do to every type of organization is flatten those organizations, because if you think about the way companies are run, government agencies are run, you have like an entry level people. You have kind of mid-level people, many of whom are actually supervising, and then the executive level who are charting the future, thinking about the strategy and kind of setting the overall direction of the company. What the data analytics are going to do is remove the need for supervisors because we're going to supervise through data analytics as opposed to a boss meeting with the people who report to them and saying, Are you doing your job? And yeah, all you should do this versus doing that. With data analytics, we will actually know at a very precise level what's working, what's not working, how people are doing, where they need to develop new skills, etc., etc.. So technology is going to transform organizations. It's just we're not at the point where we figured out how to use the information to actually do that type of redevelopment.

**SCULLY-RUSS:** If I may just extend that a little bit, wouldn't it be great? What if, for example, workers could self-regulate with that information? Right. So that yes, do without managers, which,

you know, that's a that's a whole class of people that I think we need to be concerned about and how to integrate them back into the system in more effective and productive ways. But but but how do we get the workforce prepared to actually use the AI to self-regulate, to understand what's working so that they can fix it? I mean, that gets to the engagement issue right there, right? It's not that we've got the answer. Researchers could use it. Absolutely. Policy and program development. But if we really want AI to drive beneficial change to the workforce, we have to understand how I could be useful to workers and really taking ownership of their jobs.

**GOGER:** And maybe it's what you said earlier, Darrell, which is that we don't actually remove the managers, but their job shifts shifts away from the filtering stuff that like takes more time than they even have. And they're not it's not producing the results they need, but actually towards the more human pieces of managing. And so like every other job, I think that it's not like necessarily replacement but augmentation. And how do you how do you actually give them tools that they can use where they get what they need out of that tool? And then they can really focus on the mentoring and the human parts of that role and within an organization.

**WEST:** Okay. So Annelies, in your writing, you focus on what you call scalable solutions. So first of all, I want you to explain what that is and also just add like there are a lot of great innovations that are taking place in a number of different companies in terms of how they're handling workforce development, but not all things that work at a small scale, work at a large scale. So how do we think about this whole notion of scalability?

**GOGER:** Yeah, so where I see the most movement is actually at the state level because states have a lot of the authority in the US around higher education systems, around even employment relations and employment law. And so I see a lot of shift happening there. And I think what I'm trying to show is that. When like the first stage in innovation, right? You have a bunch of proof of concept proof points in policy. So you have a bunch of pilots of apprenticeship that's showing that if we try this high school apprenticeship in biotech in Indianapolis, which is where I was in March, you know, and you have high school students up there saying telling the real human story of like, hey, I went to Roche and I got here and I realize there are all of these things that I could do that I didn't even know existed. And now I have this. I still have the goal to go to college, but I've refined it and I'm making a better choice about my path because now I can put it into action and see my options. You prove the concept, but then how do you scale that is that is the problem. So we have a 100 10,000 flowers blooming and how do we move from that to. That's where I think the states have to come into play. And that's where some of the things we talked about in the earlier panel come in where in the US we don't have a way for we don't have a like an employer organization, an entity that if I'm employing biotech workers or workforce, I work with other biotech employers to, to figure out this. These are the pathways we're having the hardest trouble recruiting in. These are the competencies we need. We need that education system to provide that. And I think there's the scale comes into really creating some of those entities where they can represent the employer voice and employers don't individually have to create their own apprenticeship program internally because that's scale problem, right? Most of our employers are small and can't don't have the resources to build their own training program from scratch. So how do we start to build the actual pathways that an employer can be part of and they can sponsor someone that goes through that system? They can customize it a little bit. But there are a well-defined pathway like Brookings, for example. We have we started to build our own internal like hiring, you know, and advancement pathways. And and I one of my comments was, well, but there are there are great, let's say graphics design. There are organizations that already work across organizations on graphics pathways. Why does Brookings need to start from scratch and try to figure out what to teach people at each level of when? You know, could that be is some ways scaled by having pathways that are sort of a template in this field? And then you as an organization, you you you host that you you're have the employee and they're working up, but you're not having to create that from scratch. So I think it's about in in Switzerland, in Germany and other countries. There is that sort of institutional setup for scaling in that way.

**WEST:** So we're starting to get some questions from the audience. And if you have questions, we'll move to you in a minute. But Fernando Dominguez has a question kind of on the STEM aspect of this in particular, how can we attract more girls and women to opt for STEM careers?

**GOGER:** Do you want to go first?

**SCULLY-RUSS:** Sure. Well, first, I think we make a more welcoming to two girls and women. Secondly, we were talking offline earlier about the whole math question. Right. And I think we can apply this to science and engineering as well. And this is not to bash teachers. I think teachers do a bang up job in in very, very bad conditions. But we have to be able to teach kids how to use math and science in their everyday lives. I mean, that's how we learn these things, right? I like to tell my graduate students, you don't learn research in the classroom, right? You learn research by doing research, right? You don't learn math necessarily in the classroom. You learn by doing math in your everyday life. So why aren't the coaches teaching about geometry or or in when they're teaching them soccer? Right. Or giving them a problem in scouts that they have to use math for? Right. So so take it out of just the one context and have them be supported in learning it. I think some of the things that are going on in the in the robot bootcamps for the for the kids in in the summertime, I think that's fabulous. But it's also not accessible to many kids in this country. So I think those are the kinds of things that will incite, excite, incite. It might incite, too, but excite, you know, young people, girls and boys and people of all races and backgrounds to really engage in this work. But at the other side, I think, you know, we also have to make a welcoming culture so we not only have to work on sort of STEM education, right? We have to work on STEM how it's done right in the workplace. Right. And and infuse it with different values and make different connections and relationships so that everybody can relate through STEM knowledge, but in real kind of human ways. And that's going to take sort of shifts.

**GOGER:** Another angle I think we need to think about is, you know, if you look at where venture capital dollars go and who venture capitalists are, a very small share of that goes to women. A very small share of that goes to Black business owners or to Latino business owners. It's mostly going to white male business owners. So when your leadership is highly skewed by gender and race, then the ways in which all of your structure, your power structures within your your company as it expands, you know, it's it's going to still be limited. And so I think we need to also think about leadership, not just like I think hiring is and skills based hiring as all these things are important at entry level. But if we can't have a diverse leadership in our teams, then we are going to always struggle to retain people who who are not similar to that leadership. So I think mentorship and and power within that organization is important.

**SCULLY-RUSS:** And how do we dance differently with the leaders that we have? Because we're not going to just wipe the slate clean, right? So so how is it that we can so we think about mentoring young people, girls and diverse folks, racial diversity. We think about mentoring them into STEM, which is not very welcoming to them in the first place. Well, how do we get these kids to teach us as white people how to relate to them and how to relate to a new generation? Right. How do we open up the leader so that they don't always have the answer, but they're open to learning as well? And how do we create those developmental relationships that go both ways? And there's plenty of models out there for doing that.

**WEST:** Okay. In the second row over here, there was a gentleman with a question. You had a question? Yeah, there's a microphone coming up.

**AUDIENCE MEMBER:** Thank you so much. My name is Manu Betty. I am a Washington fellow at Howard University. My question is, most of times in your country, it's struggle to catch up. And then I thought, please, they notice that. But the reality are not the same feeling that what they learn at that school. So, according to you, how are education system to do to match these gap between the reality? At what place and less age are to be asked to bring to an extent at school. You know that we have my question is as in your capacity to use to go on Google to search skills in order to be able to to to face our job in terms of skills and and knowledge. But today of a lot information on

Google and we waste money many many times in order to be able to to be regard full and skillful in terms of job what we can do. Thank you so much.

**GOGER:** I think what you're really talking about here is the difference between when you're learning like concepts and theories and abstract things in a classroom versus trying to apply those things in a workplace. And I think that in the US we've kind of we've we've almost forgotten that that actually is a thing, right? That that that is a type of learning that people need in the workplace and that employers need. And so when I say that other countries have formalized work based learning and for what we would call vocational or trade school in other countries, that application of that theory is an actual formal education path. So I would say we need to build up that as a formal education path, as a that's the round hole that we we don't have in this country, but other countries treat that as a part. That's one path you can get into a high level job. And so whether that's cybersecurity, you can't really learn cybersecurity in a classroom alone, right? You really get good at it by doing it in the field. And it has to be either it's in health care or it's and it's applied in a particular setting which has different legal, you know, frameworks. So that application of tech in specific settings, it is really I think if we can unlock that as a country, that will really help us innovate and spread technology in, in a much higher scale if we want to talk about scale. So that's like that is so valuable. And I think we kind of still stigmatize it and devalue it when really it's at the forefront of of innovation.

**SCULLY-RUSS:** We also see, you know, in issues like the nursing shortage and the teaching shortage, that's that's the problem, right? They they weren't they learn one thing in nursing school or in school then and then they get into the classroom or they get to the bedside. And it's not that, you know, So and then they become very burnt out because they're trying to, you know, integrate what they what they thought the profession was with the practice. Right. And it affects them in real personal ways. And we get burnout. Right. And they leave. So so people who know me are going to say, oh, she's going to say it now, employers expect people to come job ready. There is no entry level system that helps people get over that that hump. Right. And education needs to do a better job at letting people know it's there. Because as educators, we're not in the we're not in the workplace every day. We don't know the challenges of being oriented and onboarded into a work environment. We should work closer with with employers to have a better sense of that. But employers also need to meet people halfway and have structured onboarding programs that expose people to the realities of practice because they're not prepared, nor should we expect them to be.

**WEST:** Hey, 15 years ago when I came to Brookings as a vice president, there was no orientation like it was all you figure it out right? And my program suffered as a result of that. But right there was a question, microphone coming up from behind you.

**AUDIENCE MEMBER:** Hi Thank you so much. This has been a riveting conversation. My name is Shaheen Bihari. I'm from Mauritius and I'm also with the Mandela Washington Fellowship program at Howard University. My question is, how might principles of game theory be utilized to create necessary behavioral shifts. To broker these institutional arrangements that facilitate the emergence of collective intelligences via intra and inter organizational learning ecosystems? And also, how might this scale? My next question without meaning to be too forward is do you have a book because I would buy it.

**SCULLY-RUSS:** I'm on a sabbatical next year I will.

**AUDIENCE MEMBER:** Thank you.

**SCULLY-RUSS:** However, that's a great dissertation question. I'm sure you're thinking about it, right? That's my professor in me is like, Oh yeah, come on, let's get let's do it right. It's really I don't I don't have an answer to that, which is why I think you should study it. Thank you.

**GOGER:** I was going to ask if you have an answer to that.

**WEST:** Okay. We have a question from our Twitter audience. So there's a microphone right over here.

**AUDIENCE MEMBER:** This question is from Corrine online. Can external incentives like grants be used to help connect the loosely connected sectors of education and workforce? And if incentives don't work, what can.

**SCULLY-RUSS:** I'm sorry, could you repeat that? I couldn't quite hear you.

**AUDIENCE MEMBER:** Can external incentives like grants be used to help connect the loosely connected sectors of education and workforce? And if incentives don't work, what can.

**Goger:** I would say we have too many grants. We have too many grants from too many different foundations and government programs and stream. There's 43 education and training programs in our country and across nine federal agencies. A lot of that. Some of it is formula based, but a lot of it is grants. And it's grants are not great in many ways for systems building because it's a three or four year grant and then it runs out and you lose the people that build all that capacity and you can't retain it. And so I think like if you think about apprenticeship, for example, we have so many pilots because we have so many grants. And I think the question is, how do you actually first of all, if you're going to keep granting, start to really build some collective impact structures within foundations of philanthropy so that you don't have this like competing philosophies, I mean, the field is so disorganized, there's not a shared vision, there's not a shared language, and that's really undermining system building. It's burning people out because these pilots are going to the same 20 conferences by different funders. And I think, you know, that's just I have it's a bit of a pet peeve right now that when we're having philanthropy stand up, something that is trying to prove a concept, but we don't have funding mechanisms to systematize things, I think that we need to start to really think about that and all those certain things you could think of. If Grant is being good at just kind of like startup costs, right? But when it comes to really building systems and institutions, I think grants are not the answer.

**SCULLY-RUSS:** I agree. I agree.

**WEST:** Okay. Right there's a question.

**AUDIENCE MEMBER:** Again, it's Paula Stern representing the National Center for Women in Information Technology and actually all underrepresented groups. But the NSF wanted the word women in it when they founded us.

**WEST:** And if you could raise the.

**AUDIENCE MEMBER:** And I my question goes back to the data collection and the morass that you all have to operate in, and so do our researchers. And it's I was thinking about the Department of Labor and the EOC, with whom we dialoged over many administrations, and just trying to extract information from the the category of tech worker. There is a plethora I don't know what the numbers are that conceivably you could extract and say that's tech or that's IT, that's computer science, but it can also mean something else. Now, has that improved at all? Is there is there a way to have our Department of Labor and improve that categorization so as to help us going forward with with with the data that we need to inform what works and what doesn't?

**WEST:** We have to redo all of our data systems for a digital economy. Most of our majors, most of the information we collect is still designed for industrial system, which is disappearing, and there's a wealth of information out there that we don't collect that's proprietary. The companies have it, but other people don't have access to it. And I think this is a big challenge. And we're the problem is we're having to make policy decisions on what we think will work based on either no or inadequate data.

**Goger:** Yeah, and I fully agree.

**AUDIENCE MEMBER:** Has that not gotten any better?

**WEST:** No.

**GOGER:** And and the issue is partly that how we think about data is still stuck in silos of of agency ownership or funding stream ownership in rather than data is a public good right. If I if there's information about me I own that data the government stewards it. And so when it comes to data sharing and privacy, we can start to really think about data in a more modern way that that it can move across agencies and funding streams within certain privacy, you know, constraints. And I think when it comes to like you talked about tech occupations.

**AUDIENCE MEMBER:** Health care.

**GOGER:** Right? And then there's emerging industries where you have a lot of new occupations coming about. That's where you have the worst harmonization around the content of the job, the skills and the job and the company, the company. And I really do think that right now, for example, when I say modernization, like right now, what we'll do is we have like over a hundred surveys to employers to gather that at a point in time instead of these sort of regular reporting that is standardize across states like not even states don't even report the same data across each other about basic things like earnings in the same way in a the same using the same definitions. Right. So I think that how do we get it from the employer? If we could automate some of that and standardize it and it would both make it more efficient for the employer to report it, but also we would get much we could start to make better decisions about that because we could start to see where there's, you know, could start to harmonize. And so maybe this gets back to that culture, a question about individual versus collective. But I feel like in some ways our allergic, you know, policy, our allergies to like standards and frameworks is is kind of biting us because we're so obsessed about local control, local control that we're get this like, you know, we're not looking at apples and apples and that when it comes to data, that's problematic because you can't compare apples and pears. So we have to kind of think about the balance between standards and harmonization and customization and like where we are on that pendulum when it comes to data, I think.

**WEST:** We have a question from Liana Ferrara. Then she wants to know what soft and hard skills and social emotional skills are needed for students. You want me to repeat the question?

**SCULLY-RUSS:** Oh, well.

**WEST:** Or you could call a friend as well.

**SCULLY-RUSS:** Call a friend, I like that.

**SCULLY-RUSS:** I hesitate to classify social and emotional dynamics as skills, Right? I mean, I think I think we have social relationships and we have emotional experiences and we have emotional responses. Right. And and to codify those as a skill and to use them instrumentally. I'm not sure that gets us where we need to be, especially in this era of of of people really wanting to feel included and involved in the workplace and of other leaders and older generations having to take a look at their their biases. Right. You don't have a real conversation around these issues by, you know, some of the communication practices that we were taught, you know, coming up as young professionals. Right. You have a real conversation with somebody that's hard and that requires inner subjectivity. It requires emotional regulation. It requires openness to learning. It requires deep reflection on our own biases and assumptions and our own thought patterns. So I hesitate to call that skill. But can it be taught? Absolutely. And so how do we teach that? How do we how do we engage kids in those kinds of conversations and coach them in a way that they understand what they're doing and they understand the consequences of taking different approaches to this? Right. So I think we can teach it, but I would hesitate to codify it.

**GOGER:** And I would say, you know, that part of the issue is this question of what skills that might be true today, but tomorrow it might be different. And I think we can't build institutions on that question. We have to be thinking about what kinds of processes help people learn throughout their lifetime and what kinds of management practices help cultivate that learning organization instead of like, is this the skill that's needed now, which is going to be a moving target in a in a very fast paced world? It's about building that culture of learning that's critical of an honestly who gets a job based on skill anyway, right? Like most people get jobs through people that they know. That's right.

**SCULLY-RUSS:** That's right. Absolutely.

**WEST:** Okay. I want to add one quick footnote to that comment. I think we live in an era of mega change in the sense that there are large scale transformations taking place at a variety of different fronts. So we've talked about technology, geopolitics around the world. Business models are changing. Demographics are like there's a lot of stuff happening. And so the skills that I think young people need to develop now, given this particular era, are things like persistence, resiliency and adaptability, because things are are going to be coming at you that we didn't anticipate. You know, we didn't anticipate a pandemic. We didn't anticipate the financial collapse of 2000. Like, there's all sorts of big things that are going to be happening in the business world. There are geopolitical things that disrupt supply chains and create havoc for businesses. So learning how to be adaptable, learning how to be persistent, learning how to be resilient in the face of these challenges, I think will be a very important part going forward. Ryan Haas has a question about a workforce development board. So a lot of local communities have these workforce development boards where employers try and come together with educators to figure out what employers need and then what educators can do to help provide the skills. So his question is how can workforce development boards and agencies do a better job building the competencies that job seekers actually need? And I would just add to that question like, are these workforce development boards actually doing a good job or are there things we need to change about them? I'm curious if you have any thoughts on that was context.

**GOGER:** The U.S. invests about a fifth in active labor market programs. Employment and training programs compared to the OECD average. Are industrialized countries average a fifth. And when we meet with local board leaders that are more innovative, like on a monthly basis, every time we meet, it's like our funding got cut, our funding got cut, our funding got cut. And that's partly because unemployment is very low. And when the formula is based on unemployment and we owe and unemployment's low, they get less money. So so if we want to take investment of work. Sports. Seriously. Then we need to we need to invest in it. And if you look at what we invest in, in higher ed and public higher ed even versus workforce boards and noncredit education in the community college space, more broadly, it's way out of whack. So I think we need to look at where our money goes. First of all, if we really want expect boards to have any kind of I mean, when I look at you, I heard the other day that states are spending, I think almost twice just state employment programs are almost twice the size of our funding streams. So like then what power does that board have? Right. So that's one thing. And then I think the other question is we really need to think you said education and employers, the employers on the boards don't actually shape the curricula in the local community. They can try to they can try to sit and talk to them, but they don't have actual legal role and authority to power to say, you know, in cyber, they we need competencies in these things at this level. They don't have that power. They're not empowered to actually shape curricula. And I think that comes back to what I was saying earlier about scale. But like we need structures where employers and educators literally have are designing those competencies together and not just sort of like we hope that somehow by osmosis it'll go from the employers to the education system.

**WEST:** Okay. Here's a question right here.

**AUDIENCE MEMBER:** Thank you. Jimmy from State Department again. My question is, you talk about inequities in education, like between women and minorities and also high brow and low brow education. To what degree are these inequities, you think, symptomatic of larger cultural problems,

potentially like fundamental fundamentalist Christianity in America? And to what degree can we make change without decoupling from these cultural forces that are at play?

**GOGER:** I'm not sure I totally understand the question.

**SCULLY-RUSS:** I think might.

**GOGER:** Okay, go ahead.

**SCULLY-RUSS:** Understand the question. So there's lots of stories out there about how people should learn and what people should learn and why they should learn it. Right. And so a lot of them, you know, are embedded in deep cultural biases. And I think the fact that our education systems are rooted to zip codes do not help that situation very much. I live in Loudoun County, Virginia. That was the epicenter of the parental rights movement in this country. They were the ones on TV screaming at the school board, right? Youngkin our governor got in on one issue and that was fix the school boards, make them teach with the parents, want them to teach. Right. And the way it's structured, the school board, really, if they want to be reelected, they have no choice but to play hardball on some of these cultural issues. Right. And and negotiate at least this library staff and and what can be taught and what can't be taught. Right. So I think, again, I get to relationships, right? If we close off communities and communities generate their own resources for education, well, then the story in that community is going to prevail in the school system, right? If we want to build a more inclusive society on a state level or a national level, we're going to have to figure out how to decouple the funding and who controls what goes on inside the classroom and make a broader playing field. Again, I have to go back to relationships and connecting the dots if we allow for these enclaves to continue. And I don't I'm not bashing the, you know, the conservatives. Right. Because I think, you know, they have some arguments against liberal ideology and no one's talking to one another. Right. And so and they don't have to. Right. Because we can go to social media to talk to whoever we want to. We can stay in our neighborhoods and influence our school boards. Right. We can move to certain. Some of us can move to certain communities. Others cannot. Right. We're kind of stuck. And so until we we address that, it's can we go back to some structural and scalable things and reconfigure it a little bit? I think that's going to be a problem.

**GOGER:** think the only thing I'd add to is I think there's a geography question here. Like, there's there's a lot of disparity between old industrial areas that really struggle with basic economic development and more urban, more wealthy areas. And what has happened over time. And that's kind of filtered into our cultural debates like an us versus them. And and I think that, you know, ironically where I'm seeing some of the most innovation in and learn is in red states. And and I think part of that is really trying to think through that question again recognizing learning like it's not just a policy question is set. Like if I have become an expert and let's say in the building trades, let's let's use the trades even as an example, I can make a master deck or piece of furniture and I can build a whole career off of that. But I don't get degreed and I can be like a master builder or a master at my field, and I'm not getting actual credit for that learning. So I don't feel valued by society and I don't feel included by society. So I think a lot of this sort of work based learning emphasis needs to start thinking about if I, if I haven't gone to college, but I feel like I actually do know something and I contribute something valuable to this economy, how do we start to really rethink how we look at learning and and skill in these kind of culturally inflected ways that privilege people that went to Duke and Harvard or whatever, but not people that actually build an expertise over a lifetime through hands on learning.

**SCULLY-RUSS:** Interesting. On the way over here, I was thinking about just my own background. I have I have four siblings. I'm the only one that went to college and they've all got fantastic careers, right? My sister, she's top in marketing interfacing with the government on. Issues in this country. She's affecting policy. She has a high school diploma. Right. That's just one example. My brother has a certificate. He's the associate director of a major university taking care of smart buildings. Right. So. So what happened between the time I graduated from high school and now? Right. Where? Now, granted, you know, we we we grew up in a very sort of small white community. We



were privileged. Right. So. So that's one part of the story. But what's the other part of the story? How were they able to do it? 40 years ago. 50 years ago. And we can't do it now. What happened? That's a great question. Right.

**WEST:** And I would just add to that my three siblings and myself actually had successful careers. But 40 years ago, life was a lot easier. The cost of college was cheaper. Health care costs were lower by the first house was lower. Like today, it's much more difficult because of all these changes that have taken place. Okay. I have a closing question for each of you from Roberto Renato, who asks, How should we balance vocational training on the one hand versus college education on the other? And I will extend that question just by saying, how do we evaluate the role that each is playing? Like, do colleges need to adapt given the workforce development needs that we have? And how do we assess vocational training as an option going forward?

**GOGER:** Want to go first?

**SCULLY-RUSS:** Yeah. I kind of hope for the day where that distinction isn't being made. Right. I mean, granted, it's there now. Right. But but I mean, you need. You need to develop concessions, conceptual skills. And that's what academic training is good for. Right. But you also need to be able to apply it. And it's not. I learn it. Then I do it right. It should be integrated. So so we should be able to learn to do and to think about what we're doing and to take on new concepts and apply them to what we're doing so that then what we do changes hopefully in a better way. Right. And so and so I like to talk about informal and incidental learning in my research. And and it's it's we like to think about formal learning being one thing and informal learning being another. And I like to look at it as a duality, right? One comes into being in the in the in the doing of the other. Right. So, so our formal education affects how we do things and how we think about things as we're doing it right and as we do things that draws on our formal education. And it it becomes it has the potential of becoming deeper and and you creating new meaning from it. Right. So, so it's a duality. And so I think I think a lot of times some of the you know, you talked about the the tension between the standardization and the harmonization. Right. I think some of the standardization that's gone on in in academia has gone a little too far because they don't they've said that they've put up a wall between these two things. So the challenge becomes how do we take the best of both and integrate them in different contexts? And I think that's the path forward, how we do it, you know, now.

**GOGER:** Yeah, I think I already talked about the applied versus conceptual and, and we need both and we need to value both. But I would say, you know, if I think about it and I actually think that when it comes to STEM, we're really in a crisis in our country that is going to determine our future as a country. Ah. I mean, we are we are really not producing enough people that can get to that level. And a lot of it is going back to these historical inequities that we have. And because the younger generation is more diverse, they live in different places. They're not having access to those traditional degrees as we had in the past. We need to find more ways, as many ways as we can, to get as many nurses as we can, for example, and as many cybersecurity engineers. We are in an urgent, urgent situation. And if we don't invest and take those seriously and give them value as as that is equivalent to a degree like figuring out how to make sure that we have multiple ways into that job, we are going to really suffer as a as a country, both in terms of our innovation and our competitiveness. And part of it is also really revisiting this distinction because there's really a lot of baggage there. Like vocational means, working class, right? But if you're thinking about these semiconductor plants, if we think of it as a manufacturing blue collar job, is it that really or is it a tech job? And where is the blurring of the sort of imaginary around what these jobs are and who's doing them and how that articulates with? I feel like we do need to move beyond the vocational versus academic because that's our tracking history that we know failed. But instead of just saying, well, just do academic, I think we need to think about what is the language we are using to talk about the more applied experiential hands on learning that is valuable and needed in society and like culturally value it, but also like value it with credit. So I think it's an urgency that we need. We need to think about it as a crisis, in my opinion. And like if we allow our differences to prevent us from responding to that, you know, what is our future, right? Like if we can't give people off the sidelines and into good jobs, that's our failure as a culture and as a society.

**WEST:** No those are good points. We need more engineers and we need plumbers, electricians. Yeah. Annelies and Ellen, I want to thank each of you for sharing your views. Great job. And thank you very much. Thank you.