Please stand by

>> Hi everyone, thank you so much for joining us today welcome to the National Girls Collaborative Project, computer science education. We appreciate you being in here early we are going to start in about four or five minutes, so in the meantime please do introduce yourself in our chat -- in the chat box you can let us know your name organization and location. As well as answering our question any programs successes and challenges, around equity and access. And we will be getting started in just a couple of minutes. Thank you so much for being here.

>> If you are just joining us thank you so much for being here this is the National Girls Collaborative Project with Microsoft philanthropy around their guide for computer science education. You will be getting started in just a couple of minutes. In the meantime please do introduce yourself in the chat box let us know your name organization and location. And answer our check in question. Be sure your program sections and challenges around equity and access, and we'll get started in just a couple of minutes, thank you so much.

>> Hello. If you are just joining us today thank you for joining the National Girls Collaborative Project national webinar with Microsoft philanthropy around computer science education. We are waiting for some other folks to join, so please in the meantime go ahead and introduce yourself in the chat box, I think everyone has already done that, it's great to see the span everyone is calling in from. You can also, if you would like, there will be opportunities to ask questions at the end of the presenters' time. You can connect your audio by going to meeting in the upper left-hand corner. And running through the audio setup wizard in case you would like to ask verbal questions at the end of the presenter chat. However, we would ask that while the presenters are presenting, that you remain muted so do you that by clicking on the microphone up at the top. Thank you so much for joining us we'll get started in just a minute.

>> Thank you so much for joining us. For today's webinar with the National Girls Collaborative Project entitled Microsoft philanthropies and their guide to inclusive computer science education, we are so glad to have you all here with us today, we have a very full webinar. My name is Erin and I'm the director of strategic partnership for the National Girls Collaborative Project. A couple of quick housekeeping before we get started here. If you haven't, if you have joined us, please do introduce yourself in the chat box there, let us know what organization and location you are tuning in from today. We will be having this meeting is being recorded. So you will see that will be acceptable to everyone so if you do have any sound issues throughout the recording or if you lose internet connection or anything like that it will be recorded and you can watch the recording after. We also have closed captioning will be starting in just a minute. And I want to go ahead and thank everyone for being here today. We do have a check in question as well if you would like to answer that check in question while we're getting started today. We're asking what -- share your challenges and successors around equity and access,

We also have the ability to connect your microphone you can do that bying to meeting in the upper left-hand corner.

And running through the audio setup wizard. And connect your audio, but please stay muted while the presentations are happening. You can do that by clicking on the microphone so that there is a line through it at the top. And we will go ahead and get started right now. So I'm going to be introducing my agenda here feel free to we will start with vision and goals. From there I will introduce Microsoft philanthropies we'll hear a little bit from Microsoft we'll guide you really into the bulk of the presentation here today, which we'll be talking through the guide to computer science education. You will have received that link to that guide earlier, so I do want to share it again with you here. Let me grab it and put it in the chat so that everybody will have access to that. And you can refer to it as we go through the presentation. So the link to the has been put into the chat box now.

We'll have time for questions. So you can ask -- either type your question in the chat, it will be captured and then fielded to our presenters. Or you can unmute yourself at that point and ask your presenters about that. And then finally, we'll have a closing. And we'll go ahead and move into the portion where we talk just briefly about the National Girls Collaborative Project. So our vision is to bring together

organizations, that are committed to informing and encouraging girls to pursue careers in STEM. So this is really a perfect example of how we do this. So all of you, you can see there's a long list of folks on the -- within the chat who are working on exactly that, really supporting girls to pursue STEM careers. So we definitely hope that you use this chat as a way to connect with one another as well.

We do -- we reach that vision through three primary goals. The first is to maximize access to shared resources within organizations that are interested in engaging girls in STEM, then to strengthen the capacity of the program by sharing exemplary practice and research and program models. For example, for example this webinar today is a perfect example of sharing that exemplary research that Microsoft philanthropies has worked with several other organizations in putting together, in terms of computer science, inclusive computer science education. And finally, we leverage that network to create greater equity.

We do have a robust network of collaboratives across the country. Here you can see all of the green are existing collaboratives where we have a collaborative in those states. So if you are not part of your state collaboratives, please do, we encourage you to go to the national collaborative project website, click on the get involved, and you can click on a map that looks just like this and click on your state to find the contact information. If you are one of the blue states and you're interested in getting involved with national girls collaborative please reach out to us you can email us at NGCP project.org. It is now my pleasure to introduce you to really the main part of this webinar, which is hearing from two of our great speakers. So I'm going to go ahead and give you a little bit of background on them.

So Greg Bianchi is a senior program officer for Microsoft philanthropies, he works on the digital skills team, where the mission is to increase equitable participation in high quality computer science education, so that all youth are future-ready. prior to joining Microsoft Greg worked in the K through 12 system and nonprofit organizations on state divide STEM initiatives we also have Dr. Joann a Goode in the college of education studies at the University of Oregon. She can her career in education as a high school computer science teacher in a large diverse urban school, and she builds on this experience to research how educational policies and practices can foster equity, access and inclusion in K through 12 computer science education.

Joann a has directed multiple National Science Foundation sponsored research projects and built equity focused sflorg computer science high school course and is a co-author of book on computing which was really by R released by MIT press in 2008 and 2017. You can see we really are -- we really are a -- have fantastic figures here today that bring a lot of expertise to this area.

So I'm going to go ahead and hand it over to Greg, who is going to talk to you about Microsoft philanthropy.

>> Thank you Erin. I'd like to begin by extending my gratitude to the National Girls Collaborative Project for hosting this webinar and for the broader work that you're leading thanks also to Joanna Goode whob a great partner on this work as well as others who contributed to this guide, including CS for all. Finally a big thank you to all of you who joined the webinar. Joanna and I appreciate the opportunity to discuss this critical topic of inclusion in computer science education.

As Erin mentioned I work on the digital skills team at Microsoft philanthropies. Our mission is to increase equitable participation in high quality computer science education. And we currently do this work in 40 countries worldwide. I'll briefly share some of the highlights of this work and then will dive into the inclusion guide.

So why focus on computer science education? Knowledge of computer science has become fundamental to students' future careers. By 2026 there will be a estimated 3.5 million computing jobs open in the United States, and these jobs cut across all industries, from agriculture, to health care, to transportation.

And with this shift we need to ensure our technology workforce is representative of our society as a whole. Achieving a diverse and representative workforce requires us to address every step in the pipeline. Beginning as early as kindergarten and even pre-K.

The most recent code.org CS access report, in course access. Schools with higher percentages of underrepresented minorities and higher percentages of students eligible for free and reduced lunch are less likely to offer computer science.

Additionally, from AP data we know that only 28 percent of high school students who take the advanced placement computer science exams are girls. And only 22 percent of the students are students of color. So the need to broaden both access and participation in computer science is very real.

At Microsoft philanthropies, our approach to advancing equitable computer science education has three components.

The first component is to generate interest and belonging so all youth, and especially those historically underrepresented in computer science, can see themselves as computer scientists.

This is accomplished in part through partnerships through youth serving organizations such as girls who code, the Boys and Girls Club, 4H, and others.

A second component is to build capacity in school systems at state, district and school levels.

We are proud to support organizations that help drive this change, including code.org, CSTA, CS for all, and our Microsoft philanthropies TEALS program the final component is the systemic change we look in partnership to accomplish through pllz and advocacy work at the state and federal levels.

This includes our ongoing advocacy for code.org's 9 policies to make CS fundamental.

An example of capacity building work is the Microsoft philanthropies TEALS program that involves direct partnership with schools.

In this program teachers are trained with paired industry professionals to launch and grow CS in their schools. This includes a range of support models such as coteaching and lab support.

To give a a sense of impact, launched in 2009, TEALS has now grown to include more than 500 schools, 18,000 students, and 1500 volunteers from over 500 different companies.

Beginning this year, Microsoft philanthropies has parpted with nonprofits such as CS TA co.org and CS for all to develop new guides for computer science education.

Today's focus will be on the guide for inclusive CS education. And I invite you to also explore our CS is for everyone recruiting toolkit as well as our computer science professional development guide.

These can be found at Microsoft.com/digital skills.

With that I'd like to hand it over to Joanna to take us through the inclusion guide.

>>

>> Our apologies it looks like Joanna's audio is not coming through so we're just going to pause for just a second. Joanna we cannot hear you, so I can see that you're speaking, but it's possible that you may need to run through the audio (inaudible)

Okay Joanna I think we hear you now.

>> An you hear me now?

>> Yes, we can.

>> I apologize I just had to unplug it and plug it back in. How timely for this particular issue.

So I'll begin again. Thank you, Greg, and thank you Erin, for involving this computer science education guide as a topic of the webinar today.

And what I'd like to talk about is how educators can encourage and engage all students in computer science.

And there will be lots of content in these slides which will accompany the guide to inclusive computer science education guide.

However, we hope that this webinar will also be an archived resource for you.

So I'd like to begin by talking a little bit about my own personal experience.

My research in this area was sparked by my own teaching at a high school. The high school was a large urban high school whose student demographics mirrored California's demographics as a whole. Both in terms of race as well as socioeconomic status.

However, the computer science class did not reflect this wide diversity. Instead, I found that I had to recruit a group of girls from the swim team I coached to come in and be part of that space. And it was really challenging for me to recruit and retain students of color.

And I wondered, what is going on in computer science that makes this space so homogenous, even in a very diverse setting.

And so I joined with a colleague, Jane margolis, as a graduate student and began researching the

problem, why there are so few girls and so few students of color studying computer science in school.

And what we found in ethnographic study was that there were both structural barriers and belief systems that were going on that together really restricted which dunts could access this learning.

We were at three different schools, one school was primarily Latino, one school was a very mixed school demographically, but located in a white wealthy community, and one school was very overcrowded. And middle class African-American students as well as some white students as well.

And what we found was the inequitable offerings between schools really mirrored the alliance of racial enrollment. We found schools with majority white students had advanced placement computer science and high level learning opportunities while the schools attended by students of color offered low level courses that were basically typing but being called computer science.

We also saw that while some schools were technology rich, their curriculum for learning was not particularly engaging, and we would call it curriculum poor.

Alongside those structural barriers we found that teachers and students themselves often mistook having prior experiences with aptitude towards computer science.

And we turned this preparatory privilege, where people would say oh, well, these students have what it takes, they're made to be computer scientists, and when we talked to the students it turns out that they had access to robots, their parents had sent them to computer camps in the summer, and they really had a lot of prior opportunities to develop this experience.

So one of the most interesting findings of this particular study was that after we interviewed hundreds of students and teachers and counselors, administrators, to talk about computer science education, in high schools, what we found was that they would often end the interview by saying, well, what is computer science, anyway.

Really, conveying how challenging it was to create opportunities in the space without a common understanding of what is computer science.

So recently the computer science scaetion education community has come together and tried to flesh out what it is that makes computer science a topic that's appropriate for K-12 learning and for learning in informal spaces.

And the definition that folks came up with is thinking about the study of computers and the principles and practices used to make them do useful things for society.

And there are two different strands of thinking about these knowledge and skills. The concepts, which are computing systems, networks, and the internet, data and analysis, algorithms and programming, and impacts of computing, known as the core topics, if you will, of computer science, but there's also a list of computer science practices that are often infused when doing computer science, and also important to explicitly teach students and engage students in doing.

So these practices include fostering an inclusive computing culture, collaborating, recognizing and defining computational problems, using abstractions, creating computational artifacts or programs or projects, so building with computational tools.

Testing and refining those artifacts, and then lastly, communicating about computing.

So I'd like to point out that this is different than students learning programming or just learning coding and staring individually at the screen, and coding all day.

It's a much more interactive, broad approach to computer science.

So in my own work, we take in the results from the stuck in the shallow lens study. About 10 years ago I worked with colleagues to develop a program called exploring computer science, in which we thought about, well, how can education reform efforts, curricular structural and policy efforts, support inclusive learning opportunities for girls and students of color in computing.

And we really centered equity at the heart of all the work that we do in supporting this high school course.

And we think about curriculum, and what culturally responsive curriculum can best engage a wide diversity of students. We think about professional development and offer two year professional learning program for teachers, in which they can think about their teaching practice and not only develop the computer science content but, since many of these teachers are not trained in computer science, that is also a part of

professional development.

We think about policy, this which policies can best support teachers and schools in enactmenting this course. And which sorts of assessments help learners and teachers create pathways of learning beyond single topic areas.

And this course in the last 10 years has reached about 3500 teachers, and has also served as a a Hub for studying exactly how do we broaden participation in computing and how can research and practice come together to develop best practices for other classes and other education settings to be inclusive of all learners.

So this particular graphic is our attempt at thinking about what does equitable participation in computing education look like.

And how can we consider the different dimensions that are important, and really thinking about authentic participation.

So as you can see, these three graphs are interlocking and to begin with, we need to have access to courses or learning opportunities in informal spaces.

So is CS available to all students to begin with.

Next, we need to consider the diversity of students who end up in that learning space.

So does student participation reflect school demographics or maybe the demographics of the organization that's working with children.

And lastly, thinking about inclusion, once students are in this learning space, are they all engaged and learning the content.

So that requires culturally responsive teaching and learning, engaging curriculum, and a universal design to teaching and learning.

The rest of my comments on this webinar will think about these three different dimensions and the particular strategies that will go within those dimensions. So thinking about access and diversity, and then within having a more inclusive learning setting, we'll think about learning space, instruction and curricular materials.

And provide related resources, and some examples along the way.

So to begin with, thinking about this core level of access. What does it mean to have hack sees to computer science learning.

In elementary school, integration of computing lessons often takes place across subject areas.

In the inclusive guide we have a case study about an hmentry school which integrates computing in bilingual English language arts, for example.

So rather than only having separate lessons, elementary school aged children, ighs a perfect time to layer computing into other areas.

For middle and high schools, computer science courses are typically stand-alone courses and not part of the core required curriculum.

There are some exceptions to this, Chicago public schools, for example has recently adopted a graduation requirement, so this course is required at the school curriculum.

But for most schools, since it is not a requirement, that means only some students have access if there are not enough seats for all students.

And of course, an informal learning spaces, access is dependent on the availability to participate in programs, and it widely varies depending on capacity of individual organizations.

And thinking about diversity at a K-12 school level, the entire school ecosystem is really responsible for bolstering CS learning opportunities.

Again, since computer science is often not a core part of the curriculum, it takes a suite of champions, administrators, counselors, teachers, families and students, to all come together and support CS learning opportunities.

Further, we found that counselors can be gate keepers or excellent champions for CS learning, as they often are the folks who decide who goes into computer science classes and who does not go into computer science classes.

And as we can see we have a quote from Leslie arenso from NCPI that is particularly compelling she notes if you change the way guidance counselors think about who is right for computer science, that changes

who they recommend for the course.

And then you have students giving it a try who never would have done that before.

So getting beyond an opt in and trying to think how do we actually recruit and steer students towards computer science, particularly girls and students of color, who for many years have been steered away from computer science education.

And in all learning spaces, attracting CS learners is a core part of diversity. Again, we have a comment from a teacher who lets us know, I tell students the people behind the cool technologies we use should reflect the same types of people who use it.

So generating a steady narrative about how CS is creative, and is critical to solving real world problems, attracts students who are interested in the social context of computer science.

We've also found that role models and other guest speakers can connect with students in different ways by talking about their work and experiences. So the teacher is not the only person who can share how computer science can be connected with the world.

Further, we found that enlist ting students themselves, and current CS learners, to appropriate CS education with younger students through peer presentations, is also effective.

There's nothing like kids sharing their excitement with other kids to really pull students into further learning.

And then lastly, we suggest that teachers, educators, might address intersectionality by introducing students to female role models of different races and ethnicities. Students might benefit from knowing how being a woman and person of color is experience is computing and computing education, and of course the girls collaborative fabfems resource is an excellent place to get started to make some of those connections.

Thinking about inclusion, now, and beginning with learning spaces, we note that learning spaces are particularly important because as Frida a Mclear says from kaporr center, students in classroom every day so those signals can be very powerful reminders to them; who does which types of computing, all the different ranges and applications to have computer science.

So featuring these real world applications, displaying student concepts and contributions, and also considering how learning spaces can really impact what sort of teaching and learning can take place.

So can learning spaces promote collaboration, and hands-on activities.

One myth in computer science is that all learning takes place on the machine, and there's very little table space to do more unplugged activities or collaborative activities.

So making sure that there are spaces to do both online and offline learning, to the extent possible, is ideal.

We also know that it's important to design learning spaces that are accessible to students with diverse abilities. And that make sure technology resources support the needs of students.

I saw In the introductory comments that connectivity is often a barrier to students in computing. There are lots of offline and unplugged difflets and resources available, so if accessing the internet is a challenge, then perhaps finding other resources to allow students to engage in learning, that would be more accessible to all.

In thinking about accessibility, we also want to, as Dr. Maya Israel says, look for a curriculum that has threads of universal design rather than choosing a narrow curriculum and trying to make it inclusive.

So what we're trying to do is consider students with a range of abilities a and disabilities, and make sure that the spaces themselves and the technology is accessible and accommodating as possible.

So in physical spaces, support accessibility to CS learning environments for all types of people.

This might mean wide aisles or wheelchair accessibility. It might also mean having spaces for learning specialists that might accompany children, particularly in school spaces, but also in informal settings.

Lessons should account for students of varied abilities and use accommodation, assistive technologies, and other approaches to make computing accessible for students with disabilities.

And we're fortunate to have many resources be developed in the computing world to increase access, particularly for blind learners, we have bless for all core language for cojumper and these technologies allow students to access programming in ways that students who do not have visual impairments also can access those concepts.

And finally, it's worth pointing out that since students themselves in computer science are designing and creating these new technologies, are building web pages, it's important that they themselves from the very beginning are taught principles of universal design as they begin working in this field, so they can understand that they are creating for a wide audience and not just for able-bodied people.

Next, I'd like to talk a little bit about instruction, and how in particular inquiry based instruction has been able to really foster student learning in the classroom.

We found that teachers and educators that emphasize the problem-solving process, and emphasize how different perspectives and approaches can result in multiple solution, they tend to spark students' ownership over their own learning. Students really become much more engaged.

So one example I've seen of this is asking students to list their locations they go after school, and combining students in small groups and having them create the most efficient carpool route home. As you might imagine this creates much discussion about local community knowledge and which routes maybe to avoid as well as a efficiency.

And it showcases the multiple solutions, as well as teaching students about what we would call in computer science a minimal spanning tree.

So thinking about those connections wherever students can add in choice, and see that this is a problem-solving process and not just finding a correct answer, is particularly compelling for student learning.

Encouraging creativity and supporting a growth mindset is important.

As well as encouraging risk-taking and showcasing mistakes as learning opportunities.

One popular teaching strategy lately has been holding up student work or pointing to student code and saying, look, this is my favorite bug of the day. What can we all learn from this mistake.

And showcasing the problem-solving process again as something that is often riddled with missteps and mistakes, but part of the process.

And related to that, helping to scaffold supports for learners is also a necessary part of guided inquiry.

Also important when thinking about instruction, particularly in this space which has been very homogenous in terms of student learners, is thinking about how we can make teaching and learning culturally responsive.

And for this, we have leaned on the work of Dr. Gloria gladson billings who talks about the three Rs of cultural responsive teaching, rigor, relationships, and relevance. For rigor, it's important to maintain high expectations for all students.

And in particular, to counter the stereotypes about who is interested and who excels in computer science.

In terms of relationships, it's important to build relationships with students to identify opportunities to connect learning to their experiences.

If you don't know who students are, it's more challenging to make those authentic connections.

And then lastly, the third R, is relevance. And for relevance, how can educators connect to students' cultural experience and realities, and include real-world topics as part of their instruction.

And one example of that might be as students hook at robots or do coding of robots, instead of having canned activities where robots kick balls or try to make goals, instead we found that having students program robots to dance to their favorite songs becomes a way of bringing in students' personal interests and a whole lot of fun.

And also, reach those same computer science topics that the lesson is trying to teach.

Also important is acknowledging how issues of power and privilege in the CS realm have a history of marginalizing groups of people.

And we can think about this in many different ways. Teachers I work with often talk about how students will bring up the fact that robots are often replacing some of their parents' jobs, so maybe learning about robots is not just a one-sided topic.

And so having students think through issues as data and surveillance and privacy and net neutrality and online voting, and the sociopolitical topics, not only are relevant to students' lives but also help students examine how policies and collective agency forces might come together and disrupt these forces from within.

One example of this is the recent work in algorithmic bias and how algorithms are reflecting different

races and genders faces with disturbing levels of misaccuracy.

And thinking about how to engage students in these conversations, as they learn about algorithms, is an important part of studying computer science and providing a more culturally responsive approach.

And thinking about the curricular materials that supports this type of instruction, again, materials that allow students choice and a variety of aesthetics and features in their work is helpful in students having this engagement.

Hands-on, project-based learning.

We've also found that having one touch experiences with computer science, while it's very important, is insufficient to allow them to see the progression of CS learning.

So if they learn how to code, well, what's next. Where can they think about where to look to learn more. Either in the school setting or in other places.

So thinking about this progression of learning through curriculum selection.

We also recommend selecting materials that highlight diversity and inclusion in meaningful ways. That showcase the different engagements with computer science.

And including lessons that build on cultural as sets, knowledge and interests of students.

Lastly incorporating learning materials that are accessible for students of all abilities allows for the scaffolding and multiple onramps to beginning to study and learn about computer science.

One example that I've seen very recently in my own work that has shown a lot of promise for demonstrating inclusion through curricular materials is electronic textiles curriculum.

And electronic textiles is really fun in that it combines students learning about circuits, learning about crafting, and learning about coding to make these interactive soft and coded materials, so they can be ugly doles, they can be hoodies, and what's been really fascinating to see is how allowing for students' choice, allowing for students to really have a lot of selection when it comes to aesthetics and design, encourages students to step up and to complete projects all the way through.

Even for students who maybe didn't put that amount of effort or weren't supported in ways in outer computer science topics.

So this particular idea of selecting curricular materials that goes beyond let's just teach students how to code, but what is the curriculum, how can it draw in students' interests in particular.

And so as we get to the end of this overview, I would like to show some gratitude for this amazing group of practitioners, researchers, and advocates of computer science education. All of these folks gave us ideas, feedback, and helped produce this guide that Microsoft has generously put together.

And I am very appreciative for all their wonderful ideas as I think this guide really showcases the deep experiences and insights these people have brought.

And I would also like to let you know about the set of resources which is throughout the guide that are also broken up into the areas of diversity, access, and then inclusion in terms of accessible learning and universal design.

Instruction, and in closing, I would like to let you think about the phrase computer science for all. Which is very prevalent in policies and in practices nationwide now, as computer science education is prevalent in formal and informal education spaces.

And in thinking about the for all students, and for all children, it's important to remember that these particular inclusive practices and policies are essential, that one size does not fit all, but instead we need to really keep those three Rs of the rigor, relationships and relevance with students as we think through our ac a sees, our diversity, and our inclusion.

And I will stop here and thank you all for your attention, and happy to answer any questions.

>> Thank you Joanna, that was fantastic. I know, I'm sure everybody else is just sitting here in awe as I was. And it's always great to see so many familiar names because the National Girls Collaborative Project has worked with many of the people you've mentioned here in terms of really stellar folks who are doing a lot of incredible research around a equity and inclusion.

So thank you for all of that.

We will go ahead and move into some questions. I will invite first of all folks if you have additional questions to go ahead and either type those in the chat or you can raise your hand by going into the little

button with the person who looks like they have a hand up, if you want to ask a question.

If you raise your hand, I can -- I'll basically call on you, and then you can unmute yourself and ask your question. But in the meantime, we did have some questions come through the chat.

And so we'll go ahead and just start with that through there.

The first question is for Greg. And that question I think -- you know what I can't remember who it came from so if this is your question and you want to elaborate at all please feel free to put that in the chat.

But Greg, why diverse and equitable, what are the outcomes we can share that will encourage funding, policy change, et cetera.

And they're thinking in terms of in business terms like the return on investment or ROI.

>> Great thanks and I saw that came in from Brent Cummings so thank you Brent for the question. As why diverse and equitable we believe all students and really all citizens benefit from a foundational knowledge of CS and the opportunity to fully participate in computer science from school to career.

And when we look at awr data whether that be industry data or school system data it really shows the need to address that. Because we're not at the point where we have CS for all.

We have gaps that require us to focus on groups to increase the full participation in computer science.

Both in our school systems and in industry.

I mean, and as for the business case I think it's a good question, and what I'd say to Brent is that I think all the great businesses are customer-obsessed. And part of being customer-obsessed means that you understand and meet the needs of the users of whatever product you produce.

And you know, we at Microsoft fully believe that in order to really meet the needs of those customers, we need to have teams of folks here that represent our broader society.

And I'd say that shows up not just as a business case, but it even shows up if you trace it to the CSTA standards. Just reading a few of the CSTA a standards, you can find seek diverse perspectives for the purpose of improving ar -- usability products, discuss issues of bias Joanna raced a great point the product where --

There was the algorithmic bias that surfaced in the first AI facial recognition bias is where we need to do better as an industry and society as bell to have more participation in CS.

And also that we do a lot of deep work also on the policy side to drive policy state-by-state that really help advance computer science education, and I also refer Brent and any others to the code.org state of CS policy report that really lays out outcome linkage as states implement computer examine science policies how those in turn lead to increased participation in the school system, and then from there to the workforce.

So thank you, Brent, for that question.

>> I thank you Greg for that response, that was wonderful.

Okay, for Joanna, we have a Karen, she said she has your book since it first came out as a CS teacher since 1985 she found that the challenge still ongoing, she asks what is being done to change the education system.

Sew thinks that Brent that question that came earlier was great. She said that 60 percent of your funding goes to CS education science, or 60 percent -- 60 percent of STEM jobs are in CS.

I think it's kind of what's being done on that educational system change. And Greg you spoke about it a little bit but maybe Joanna you have some other additional insights.

>> Sure. Nice to hear from you Karen. There are a few efforts that I think are particularly promising within the school system.

One of them has been a new approach that the National Science Foundation has forwarded, which is researcher practitioner partnerships.

And this is a group of efforts that are connecting people who are doing the research, the policy, and then the practice, meaning classroom teachers who have an incredible amount of knowledge on this topic, and who are the true champions of this effort.

And I think that these collection of partnerships are letting us know exactly what's working and what's not working in a variety of spaces.

And related to that, there is increased statewide attention in thinking about, well, what state-wide policies can really broaden participation in computing without having unintended consequences.

And an increased focus at the state level has shown great promise in making change happen fairly Swiftly, and along with professional development to support teachers and enactmenting that change.

I think that model of top-down at the state level, adopting standards, informed by teachers and stakeholders, as well as the bottom-up of supporting the schools and creating these opportunities, is really the direction that holds the most promise in making that level of institutional change.

>> Great, thank you, Joanna. We have a question from Sam and I know I put this question -- actually I think some people responded to this question in the chat box.

But I'll ask our presenters and and any other folks who have experience with this as well. Sam wonders does anyone have favorite curriculum for moving from offline activity to online activity, their current is not robust enough for a good transition. So any recommendations there.

>> That's a great question. I don't know if I would have curricular recommendations as much as pedagogical recommendations.

And one of those might be to look at different representations of unplugged activities to thinking about what might those representations look like in terms of coding blocks.

Before getting onto the screen. And having some bridging activities that go in between.

But you might have to develop them yourself, as we look through computer science education, because it is such a new area.

There are not as comprehensive of a set of resources for those sorts of bridging activities as we would hope for.

So perhaps you can create those.

>> I'd add to that Joanna also part of what's great about a lot of the offline activities is of course you don't need the internet access but also that many of them are very hands-on.

Similarly I think in bridging to online curriculum it doesn't mean you need to give up the hands-on pieces, and there are many curriculums that include physical computing and thinking about make code, and others that allow students that continued hands-on piece that is really I think a key component of the offline learning resources.

>> Great thank you both for your input there. So we have another another kind of comment question from Karen Norris. She said our party this year was amazing Joanna you mentioned I can definitely say in thinking in terms differently about how we approach robotics rather than having the robot kick a ball or something to having it dance to a favorite song that's great and agreed that was really incredible.

She said third grade teachers -- there wasn't enough follow up. Her question is how do we require time for ongoing computer science.

>> I think that is one of the most challenging questions we have.

And this is particularly true in the K 5 setting where again things have to be layered on instead of a stand-alone course being carved out.

There are some curricular resources you can find in the guide that provide more comprehensive learning experiences.

And I think the hour of code is a wonderful exposure and awareness.

But I think back to thinking about what does it mean for learning pathways, and how can we think long-term, maybe one lesson a week over the course of a year, that has more long-term engagement for students to see that this is not just a one-time activity, but there's an ongoing courses of curriculum that they can interact with.

>> Yeah, and I'd add to Joanna's comments that in particular, I think where the computer science learning objectives can be tied to other content areas standards, you create some room on that plate that elementary school day.

So whether it be a computational thinking concept that also applies to math or to the next generation science standards, looking for those intentional a linkages helps create a little bit more space and opportunity.

Because you're addressing not just computer science, but also learning objectives in other content areas. And there's some curriculum that have been developed at middle school that really are built from the ground 1 that in mind.

And I'm thinking of project guides which is growing up thinking scientifically and integrates computer science and science or the bootstrap math in computer science integrated work.

>> Great that was a perfect question into -- or perfect response into our final question. Which comes to us from Brent. And he says, should CS be taught as an independent subject. So Joanna, I'll let you, Joanna, and then Greg if you'd like to comment on that question.

>> So my response would be it depends where I think in middle school in high school it makes sense to teach CS as an independent subject. Because that's how those schools are typically organized as a collection of independent subjects.

I'm compelled by the argument that we value what is in the curriculum as a society, and if we value computational knowledge for all students, then it should be present as a stand-alone course.

For K-5 I am more in tuned with what Greg just talked about, which is the layering of computing as part of the learning of other subjects.

Much like what teachers already do in elementary schools already, teach knowledge on top of one another in an interdisciplinary way.

>> Yes, and I'd just add to that by saying yeah, I think it's both, right? And I agree with Joanna, and certainly at middle school and high school, those independent courses are key, and we do need to have those in place.

And we can also look for other opportunities to bring computer science and computational thinking into some other subject areas, but that's most critical at K-5 because we don't necessarily have those elective spaces for computer science. And because we know that capturing the interests of our youngest students at an early stage really will help continue to drive students to explore computer science, see themselves as computer scientists, and begin to contemplate careers in CS.

So my answer is I think we need both.

>> Great I'd like to -- that concludes our question and answer portion. Folks, if you have additional questions I'm sure that we can make some connections. Or rather, probably most relevant to you would be check out the Microsoft guide.

And that link was provided early in the chat, I'll put it in there one more time, just so everyone can have it.

Sorry, let me just grab that really quick. I will make sure actually you know what probably more impactful will be that we make sure that that is sent along with this follow-up. As a reminder this webinar was recorded so you can access it that way.

I do want to just say a very, very special thank you to our speakers, Joanna Goode and Greg Bianchi, as well as Microsoft philanthropies and Microsoft for everything that they are doing in this space around equity and inclusion.

We also want to give a special thank you and shout out to Andrea a Latiner one of the collaborative projects champion board members who really kind of facilitated this and made this all possible. So a very special thank you to our speakers today.

Thank you also to our participants for being so engaging and asking so many wonderful questions and all of the tremendous work that you are doing. And for caring about equity and inclusion in computer science education.

So with that said just as a reminder this will be recorded, you will receive all of the slides as well as the chat, so all of those links. We will also include the link to the Microsoft guide to inclusive computer science education. So that you can use that and share it, and definitely send that along and try to increase the use of the guide itself.

So thank you again to everybody who participated. You will be linked out to a survey which we'll just be asking you about this webinar and requesting feedback. So please take the time to go ahead and fill out that survey, it helps us in terms of identifying really wonderful webinar content and topics to be able to share with all of you.

So thank you again to our speakers Greg and Joanna, and we hope all of you have a wonderful day.
>> Thank you.
>> Thank you. Bye, everyone.