THE BROOKINGS INSTITUTION

CITIZENS OF THE FUTURE: INNOVATIONS TO LEAPFROG GLOBAL EDUCATION

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Session 1: Accelerating Progress in Education to Develop Citizens of the Future:

Keynote:

VALERIE SMITH
President, Swarthmore College

Presentation:

REBECCA WINTHROP
Director and Senior Fellow, Center for Universal Education
The Brookings Institution

Moderator:

EMILIANA VEGAS
Chief of the Education Division
Inter-American Development Bank

Session 2: Unburdening Teachers: Harnessing the Power of Community Expertise and Technology:

GREP TOPPO, Moderator
Senior Editor, Inside Higher Ed

DAVID CALLE
Founder, Unicoos
Top 10 Finalist, 2017 Teacher Prize

MANOLO DIAZ
Chief Executive Officer and Co-Founder, Yogome

ALISON NAFTALIN
Founder, Lively Minds

HADI PARTOVI
Chief Executive Officer, Code.org

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ANTHONY BLOOME
Senior Education Technology Specialist, USAID

RACHEL HINTON
Head of Education Research
Department for International Development (DFID)

MANDEEP SAMRA
Lead, Ed-Tech and Innovation Hub
Department for International Development (DFID)

VICTORIA TINIO
Executive Director
Foundation for Information Technology Education and Development (FIT-ED)

Deep-Dive 2: The Education Workforce Initiative: Harnessing new approaches for education workforce design and implementation:

JU-HO LEE
Professor, KDI School of Public Policy and Management
Former Minister of Education, South Korea
Chief, Education Workforce Initiative

LIESBET STEER
Director, Education Commission

AMY BELLINGER
Lead, Education Workforce Initiative

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MIGUEL BRECHNER
President, Plan Ceibal

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JENNY ANDERSON, Moderator
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JU-HO LEE
Professor, KDI School of Public Policy and Management

Former Minister of Education, South Korea
Chief, Education Workforce Initiative

VICKI PHILLIPS
Chief Executive Officer in Residence, Educurious

MARY CATHRYN RICKER
Executive Vice President, American Federation of Teachers

VISHAL TAREJA
Co-Founder, Dream a Dream

Session 4: Education Innovations in Practice:

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LINDA LIUKAS
Founder, Hello Ruby

CLAUDIO SASSAKI
Co-Founder and Chief Executive Officer, Geekie

KARIMA GRANT
Executive Director, ImagiNation Afrika

Saul/Zilka Room:

JUAN MANUEL LOPERA
Co-Founder and Chief Executive Officer, Aulas Amigas

JANE DIMYAN EHRENFELD
Executive Director, Center for Inspired Teaching

RODRIGO DEARMAS
Co-Founder and Director, UYRobot

Session 5: What is Next for the Education Innovations Community?

MARCELO CABROL, Moderator
Manager of the Social Sector
Inter-American Development Bank

JAVIER GONZÁLEZ
Director, SUMMA
Affiliated Lecturer, University of Cambridge

DAVID ISTANCE
Former Senior Analyst, CERI, OECD
Nonresident Senior Fellow, Center for Universal Education

GINA LAGOMARSINO
President and Chief Executive Officer
Results for Development (R4D)

ANNA PENIDO
Director, Inspirare

SAKU TUOMINEN
Founder and Chief Executive Officer, HundrE

P R O C E E D I N G S

MS. WINTHROP: I am so pleased to welcome everybody on this beautiful, beautiful Monday morning. It is not thunderstorming or raining as we had feared. So, this is sign of sign of good things to come for the day. Many, many thanks especially to all of you who have travelled far and wide to join us. Greetings to the many people who are joining us on webcast. I think we have hundreds and hundreds around the world. So, thanks to all of you for joining us too. It's a real pleasure to be here with my friend and colleague Emiliana Vegas. We are co-hosting this year our annual center's Policy and Research Forum with the IADB's regional dialogue and it's a real pleasure. So, thanks to your team for being such collaborators.

MS. VEGAS: Thank you everybody. As Rebecca said, I am Emiliana Vegas. I have the honor of leading the education division at the Inter-American Development Bank, where we support countries in Latin America and the Caribbean to help achieve learning and skills among all its youth to help the region meet its full potential.

We are especially pleased to welcome ministers and authorities of education from Latin America and Caribbean who are here today to join us. Education innovators from all over the world, funders, policy makers and practitioners to explore the promise of leapfrogging in education. Please note that there are headsets for simultaneous translation below your seats, if you should need them.

You can find your headsets under your seats for those of you who need it and

then you can follow simultaneous interpretation channel to English. Channel 10, Spanish. And you simply click on the arrow.

To take to social media and to carry on the conversation in English and Spanish, with the following hashtag #FutureEdu -- number sign.

Today's symposium is focused on the Citizens of the future: Innovations to leapfrog global education. This topic is especially important to us at the IADB because we are the region that has achieved the fastest growing rates in enrolment but yet our children and our students are not getting the skills they need to succeed. In all the international assessments of student learning, Latin American students are in the bottom end of the distribution.

So, we want to learn from innovations that can help our region make this jump and not follow the normal trajectory because if we continue in the path we have been, we will really never reach the levels of learning that we need to advance.

This is also a very unusual event. You will have the chance to listen to experts, ask them incisive questions to be listened, and even to experiment and interact with innovators. We encourage your active participation and invite you to collectively reflect on the next steps to strengthen and make real the community of innovators of all kinds.

Because when we talk about innovation we do not just talk about technology. We speak of a creative way to face challenges with which educational systems and teachers have dealt with for years. And also, the new challenges to come. And we also speak of opening ourselves to alliances and collaboration among different stakeholders, different sectors to ensure that every young person develops the set of skills they need to be successful and reach their full potential.

We are very happy to work with the Center for Universal Education of Brookings. QE also cares deeply about this topic. Has been leading the research agenda led by Rebecca here on leapfrogging in education and this symposium serves as the launch of their book 'Leapfrogging Inequality - Remaking Education to Help Young People Thrive'.

In this first session, we will have several remarks on this topic to get the discussion going and then have a discussion together.

MS. WINTHROP: Thank you Emiliana. I want to introduce our first speaker, Valerie Smith who is President of Swarthmore College. You will have her full, long, distinguished biography in your program and your packet. She is a noted scholar on African-American literature and she was at UCLA and at Princeton prior to coming to Swarthmore. But that's not why we asked you, Val. Why we asked you to come speak is because Swarthmore College, for many of you who may not have heard of it, I am sure everyone in the room will love it after you speak but not necessarily everyone around the globe has heard of Swarthmore College.

It's not only my alma mater but it is a liberal arts college very -- not many places around the world have liberal arts education. It's often that higher education is much more technical or specialized. And Val and Swarthmore College has thought a lot about what types of competencies and skills and learning environment is necessary to educate leaders for the common good. And we really thought that that insight and what she can share with us, having thought long and hard about this, is helpful for framing the debate about what could and should citizens of the future look like and how should we think about educating them. And so, with that Val, please welcome to the stage.

MS. SMITH: Good morning, everyone. Thank you so much, Rebecca for inviting me to be here today. I am honored to be able to address this distinguished body of ministers and authorities of education from Latin America and the Caribbean, education innovators, funders, policy makers, and practitioners.

As the product of a liberal arts institution and someone who has spent her entire career as a professor in liberal arts institutions and now President of a liberal arts college, I have had many opportunities to think about the goals and the values of liberal arts education. Today I would like to speak for a few moments about some of the ways I believe liberal arts institutions prepare students for life.

First and most significantly, liberal arts colleges and universities have as their primary mission the goal of teaching students to think and to think critically in preparation for an uncertain world. In that regard, they differ from more career focused higher education models. No other type of institutions so effectively prepare students to distinguish fact from fiction, valid arguments from suspicious claims.

We teach students to think critically, to write, and to speak persuasively to solve problems and to work collaboratively with others. Contrary to all too common assertions, employers across a wide range of areas finance, engineering, business, public service, media, and healthcare to name only a few are eager to hire graduates of liberal arts institutions precisely because they possess these talents and abilities.

Equally important is the gift of developing the lifelong habit of intellectual engagement. As Fareed Zakarai has written and I quote 'because of the times, we live in all of us, young and old, do not spend enough time and effort thinking about the meaning of life. We do not look inside ourselves enough to understand our strengths and weaknesses and we do not look around enough at the world and history to ask the deepest and broadest questions'. The solution surely is that even now, we could all use a little bit more of a liberal education.

When we do our jobs correctly, our students graduate with the love of learning and a sophisticated understanding of how they learn that enables them to appreciate art, music and dance, and to assess arguments about the fundamental claims of scientific discovery, political propaganda or economic models.

Secondly our institutions prepare students for the unexpected, for life's unanticipated disappointments, developments and opportunities. In contrast to the linearity of the vocational or technical educational models, liberal arts institutions offer students a less targeted more expansive preparation. We proceed from the assumption that students are better served by being introduced to a broad range of disciplines before selecting a specific area of concentration. We push them beyond their zones of comfort and require them to gain some familiarity with multiple ways of knowing.

At a liberal arts institutions, a student who wants to study economics to prepare for a career in business or finance, for example, would also be required to take courses in the humanities, in the creative and performing arts, and in the natural sciences. This approach expands the students' intellectual horizons and deepens their preparation for the vocation they might ultimately choose. It equips them to adapt to the uncertainties of life and work they will inevitably confront.

Now I make this claim with confidence because I have met individuals who have shared with me how their broad liberal arts education has enhanced their skills in their chosen profession and enabled them to seize new opportunities. Take for example the lawyer turned educator turned entrepreneur. Or the investor turned musician. Or the engineer who founded a liberal arts college. All of these people attribute their ability to seize new opportunities to the intellectual self-confidence their education gave them. Their education taught them how they learn and reassured them that they could learn what it would take to meet life's new challenges.

And the third goal of a residential liberal arts institution and this is the one on which I would like to spend the most time on this morning in my remarks. The third goal of a residential liberal arts institution is to help students develop into productive and responsible citizens. They acquire lessons relevant to this goal both within and outside the classroom.

In a club, they might learn how to become a project manager, to lead a team, to manage a budget. In the residence hall, they meet lifelong friends and learn to negotiate differences in personalities, values, and living habits. These co-curricular interactions often provide opportunities for personal, intellectual, and ethical growth that maybe as significant as the lessons they learn in the classroom.

I want to take a few moments to tell you today about a program at Swarthmore College that exists at the intersection of the curriculum and co-curricular activities and exemplifies how the liberal arts helps to form the citizens of the future. Students in our Presidents Sustainability Research Fellows Program are learning to use the resources of a

liberal arts education to contribute to the common good especially in the area of sustainability.

This innovative program matches 12 students a year with staff, faculty, neighbors or alumni mentors who help them identify a campus or a local sustainability challenge and to research, develop, and implement a project in response to that challenge. The students commit to a yearlong academic course with an associated internship. During that year, they learn to bring about change in a large organization and they gain invaluable experience with project management, communications and advocacy.

Redesigning the colleges waste management system, implementing a campus carbon charge, developing greater energy efficiency in the design and construction of new buildings. These are about a few of the initiatives that our students have undertaken. Through this program they learn to take responsibility for the community in which they live, to use their academic talents, to solve persistent problems, to work collaboratively with others and to communicate the importance of their solutions to audiences of specialists and non-specialists alike.

One student whose name is Sasha, is a Spanish major from California. In this year she worked with administrative and facilities maintenance staff to design a more efficient waste management system in one of our administrative buildings. Now we have set a college-wide waste diversion goal of 80 percent by 2022. Campus-wide, we are now at approximately 40 percent. Sasha's work moved the building to which she was assigned to 64 percent. Not bad for one year's worth of work.

But the success of her work can be measured beyond this waste diversion goal. As Sasha describes her project, one can tell that the she is especially intrigued by the unanticipated lessons she learnt. Her work taught her the value of building and sustaining community. As she put the waste diversion project in place, she forged meaningful relationships with maintenance and administrative staff and she also helped these employees from different areas of campus forge meaningful relationships with each other.

In turn, these results have prompted her to reflect about how the amount of

time we spend doing work relates to our goals for sustainability. To what extent, she asks, do our workplaces, and I quote, 'demand so much from people that we have created a system that forces us to sacrifice stronger social relationships, health, and the environment for our work'.

Her ability to peel back the layers of her project, to turn it, and to come at its key questions from different perspectives is a mark of the liberal arts mind at work. So, through this program, she is learning project management, collaboration, and effective communication. But she is also developing an openness of mind that will allow her to seek out and receive the unanticipated lessons that life has to teach.

Many leading liberal arts institutions have expressed a commitment to both recruit an increasingly diverse population of students, faculty, and staff and to cultivate more inclusive communities. This commitment also helps us prepare students for lives as productive citizens. We recognize that higher education is an engine of social mobility that has the capacity to improve the life chances of individuals from less affluent backgrounds.

To achieve the excellence to which we aspire, we recognize that we must seek and recruit talent from across the nation and the globe and from every socio-economic group. But perhaps even more important, at a time when our local and global communities are all too fractured by racial, ethnic, socio-economic, and religious differences, and when people from opposing ends of the political spectrum seem increasingly unable to communicate across their differences, residential liberal arts institutions provide students with rare opportunities to work, play, and live in communities with people different from themselves.

This is a meaningful opportunity especially in the United States because across our countries, communities, and school districts remain strikingly segregated. But as we have come to recognize diversity is just the first step. We must to more than open the doors of access to our institutions. Indeed we must do more than ensure that all students have access to the range of opportunities we provide.

If we want to build truly diverse and inclusive communities, if we want to

prepare students to build, sustain, live, and work in inclusive and diverse communities, then we must also provide them with the tools to recognize their common humanity with people whose experiences and perspectives differ from their own.

That means that even as we empower them to speak their truths, to give voice to those whose voices have been traditionally silenced, they must also embrace the value of empathy and humility to be able to acknowledge the humanity of those with whom they disagree or those they do not understand. That means being able to stay in difficult conversations with those whose views differ from their own. To speak for themselves while learning also to hear the other side.

A liberal arts education is valuable then because it teaches students to think critically, prepares them to adapt to change, and empowers them to collaborate effectively at work and in their communities. These life skills are not easily measured by conventional matrix such as the salary earned at the first job after graduation. A more proper measure of a liberal arts education is how well it trains students to think critically, to be flexible and nimble when faced with unexpected circumstance or opportunities, to adapt to multiple career paths, and to interact productively in diverse communities.

Those of us who have benefitted from or who have dedicated our lives to teaching at liberal arts institutions must tell the powerful story of this educational model. In that way, others will see how a liberal arts education can transform the lives of those it touches and prepare them as citizens to solve the most persistent and complex challenges that face societies across the globe. Thank you.

PRESENTATION: By 2030, over half of the world's young people will reach adulthood without even the most basic high school level skills. But this doesn't even take into account the broad set of skills needed to thrive in a fast changing world.

How should education systems react? Traditionally, educational progress around the world has followed one linear path and the pace of change is quite slow. Inspired by examples of rapid change in other sectors, we chart a new path forward for education -

Leapfrogging. This type of progress though requires us to look at new models of teaching and learning that complement what exists today.

To explore the potential of today's innovations, to support a global leap forward, we compiled a global catalogue of education innovations. We also created an evidence-based pathway to assess innovations' potential to support leapfrogging. Though gaps remain, we are hopeful that education innovations can play a meaningful role in ensuring all learners are equipped to thrive now and into the future.

MS. WINTHROP: Thank you. Thank you to the comms team. Now I don't need to give the talk, you got the synopsis of the book. So, thank you all of you again for being here and thanks Val for, sort of, charting out for us, you know, what might be a vision for developing citizens of the future.

And what I want to switch now is to talk about some of the research we have been doing over the last three years. Really trying to think about how, how would you do that, how would you transform education systems to make sure that all kids get that broad suite of competencies and capabilities that Val talked about.

And this question on the screen is the question that we have been thinking a lot about. You know, is it possible to leapfrog in education and what is the role of education innovations in particular to rapidly accelerate progress? We have been writing blogs and articles and reports and we are very happy to share with you the culminating piece of the research is this book 'Leapfrogging inequality' which we are launching today. And I would be remiss without thanking many, many people who have participated in its development. Including especially my co-authors, Adam Barton and Eileen McGivney.

And before I dive in and what I am going to do is, sort of, walk you through some of the key questions that we asked ourselves in this research process to lead to this -- that informed the book. But before I do that, I wanted to just to poll the audience on a couple of questions. I am going to put up four words on the screen and I want you to just raise your hand. I will list them one by one, I will say them one by one. Just raise your hand if they

resonate with you in terms of your perception of the education systems in your country or the countries you work in. I have begun to ask audiences in all the talks I gave recently, these questions. So, we will see how similar you are to the other folks I have asked.

Okay. Raise your hand if you think and feel that education systems are resistant to change. Just raise your hand high. Okay. There is like three hold-outs. No, they are not resistant to change.

Okay. Raise your hand if you think education systems are cutting edge. Not one. Oh, this is worse than other audiences. There was always a couple of people.

Okay. Raise your hand if you think education systems are innovative. Yeah, a couple. The back of the room. This is where the optimistic people are at the back.

Raise your hand if you think education systems are political. Yeah.

So, one of the reasons that I -- this actually is very similar, you are a little bit more negative than most groups on the cutting edge piece. But that's okay. We will take heart. This is, you know, only a conference about education innovation and innovators in the room. Most groups that I, you know, talk to have similar feelings. And there is a narrative, I think a public narrative and certainly in this country and many other countries, that education systems are just not innovative and they are hard to change.

There was a magazine article in a popular US magazine called Time magazine a couple of years ago that said, for those of you who have read it, you know what I am talking about, that said if you transported somebody from 1850 and brought them to today, to the world today, and they would walk into a hospital, and they wouldn't recognize anything. They wouldn't recognize transportation systems but if you brought them to a school, they would immediately feel relaxed and familiar and this is comfort.

And things -- basically the message was things haven't changed in a 150 years. Which, I have to say, I read it and I was at first quite defensive and I said, well, they don't know what they are talking about, education is different, things have definitely changed. The population we are educating has massively changed. It's much more inclusive.

And then I thought, okay, stop being defensive. What is it about other sectors that has this public narrative of transformation? And so, the very first question we asked ourselves in this process was this one - what can we learn from other sectors? And we looked at a bunch of different sectors. And you can think of many examples. You know, if you think of the information sector, you can think of many examples of transformation.

I like to think about, sort of, the days when I only used a physical encyclopedia to look up information. So, you know, physical encyclopedias is to Wikipedia. And, you know, we asked ourselves, would we know if we had a Wikipedia moment in education? Would we recognize it if it hit us? We looked at banking, I mean, we looked at telecommunications, landlines to mobile phones.

We looked at banking. And I want to give you an example of how transformations in banking have really helped people's lives. There is a group of people in the world who focus on financial inclusion. And what they are very worried about is making sure that all people, particularly low-income and poor communities have access to bank accounts, have access to credit.

And the switch from building physical bank branches out in remote areas, which was one way to get access to bank accounts, to mobile banking, in the case of Kenya and we have Darius, Minister of Education here from -- works in the Ministry from Kenya, will know what we are talking about, in four years doubled the amount of people who had access to bank accounts and access to credit. So, a very swift time. The pace of change for financial inclusion was going slowly. Then mobile banking and it just shot up.

And that idea, which we are calling leapfrogging and others do call leapfrogging also, is the one that inspired us. And we defined leapfrogging and others do too in other sectors, although in education there is not -- hasn't been a defined concept of what education -- what leapfrogging would look like in education. So, again our inspiration from other sectors. Leapfrogging is really defined as rapid, non-linear progress, jumping ahead, accelerating quickly, often bypassing old legacy infrastructure. Not always, but often.

And at the core of leapfrogging in other sectors is innovation. Innovation in technology, innovation in how people work together, innovation in expectations. And so, the next question we asked ourselves is this one -- what can education innovations tell us about leapfrogging? And we defined an innovation as an idea or technology that breaks from previous practice and is new in a context, if not new to the world.

And we spent a lot of time and here, I would Adam and Eileen and many wonderful interns are to thank, scanned the globe for education innovations. And really tried to see what we could learn and we relied heavily on organizations that we call innovation spotters. These are organizations who have either the whole or part of their mandate to search for, highlight, sort of, identify highlight and showcase and sometimes fund education innovations. And you will be hearing from some of those organizations later in the day.

So, what did we find? Well, we developed, as you heard in the little video, a global catalogue of education innovations with almost 3,000 education innovations in it from a 166 countries. And you will see that education is happening everywhere. In fact, education is innovative. There is lots and lots and lots of innovation happening in education. The dark blue are where there is most innovations and the lighter blue countries where there is least. And again, this is just a snapshot. This is by no means a comprehensive map of all the education innovations out there.

And poor and rich countries alike are innovating, high-performing, and low-performing education systems are innovating. It's as if people are searching for new ways to do things. And we would hope, in part, that's because of the need to develop citizens for the future. Young people with the types of skills and competencies that Val talked about.

So, I always get asked, when I tell people about this. Well, what do you mean? What are they doing? What are these education innovations doing? So, I am going to give you five really quick snapshots of examples of education innovation and then we will talk more broadly about, sort of, how we think about leapfrogging.

One, is LEMA which is the Literacy and Math Education lab. I am purposely

trying to pull from the many examples in Latin America because we have many Latin American policy makers in the audience. This started in Colombia and basically what it is, is a non-profit who works in communities and leverages the resources, human resources that are inside communities and leverages the many, many hours that young people are out of school. I have a colleague, Kathy Hirsh-Pasek, who works on this topic, thinking about who can you make out of school time support and complement the learning that's happening inside school?

In the United States, if a child between 0 and 18, 80 percent of their waking hours are outside this classroom. I would venture in the developing world that's much higher because you have shorter school days in most countries, almost 90 percent of time is outside the classroom, waking hours.

And so, this innovation did just that. It hires literacy coaches, could be an educated sibling, could be a community member, could be a parent, could be a teacher, who develops local literacy and numeracy games and plays them inter-generationally often. In the countries it's been evaluated, it's across five countries, big boost in literacy scores. But also something else. The kids are developing some of the skills that Val talked about. Team work, collaboration, working with each other, having a dialogue across different members in their community.

So, that's one example and we argue that for leapfrogging, we really need to do that types of things that LEMA does more often which is diversifying the people and places where learning takes place.

Sometimes innovations are schools themselves. This is an example from Brazil. NAVE schools, there are several of them, are technical and vocational schools and they have really transformed how teaching and learning is done, to, yes, certainly have direct instruction but to make space for what we are often calling playful learning pedagogies because it incorporates a whole bunch of different student center pedagogies that includes iteration, experimentation, working with teams.

And these schools are again not traditional academic high schools, they are

high schools, they are vocational technical schools focused on digital skills for the new economy. And they, you know, they learn their high school subjects. So, for example, in biology class they would work together in groups to develop a game, a digital game for how the circulatory system works, et cetera. And lo and behold, these schools beat out all their academic high schools for top scores in their respective states on their academic secondary leaving exams.

But not only did they really have good learning and academics, they had all sorts of other skills and competencies too. And we think that idea of being able to accomplish both at the same time is really crucial for leapfrogging.

Another example comes from South Africa. And this is an example of partnerships with employers that really transform how student learning is assessed and recognized. These are high schools that serve very marginalized poor kids but at the end of the high school, the students have a learning experience where they spend a year within a company.

And the employers, yes, they look at their academic scores but the employers and the teachers work with the kids and mentor them as they are working on projects in the company and really assess them based, not just on their, academic exams but on what kind of people they are. Are they able to be flexible to work with others? And then the employers decide if they want to hire these folks. And 80 percent of the kids in the program get their higher education paid for by the employers and then go back to working with the employers which is -- far surpasses the average rate of that type of accomplishment in South Africa. Only about a third of high school students in South Africa even get an exam mark in high school that will allow them to go on to higher education. So, that idea of innovating around how you assess and recognize learning, we also think is important for leapfrogging.

Here is another example. Sometimes it's not non-profit. Sometimes it's not particular schools. Sometimes it's the government who is trying to transform whole education systems. This is an example again from Brazil called the Media Lab. A couple of years ago,

the Brazilian national government passed a law saying all children in Brazil need -- must be able to go to primary and secondary school. In Amazonas state, very rural part of the Amazon jungle, most kids were just accessing primary school. And the central government, you know, set out basic standards of what's required in terms of children's rights and then crucially, gave flexibility to the leaders to figure out how to best meet those standards.

So, the Secretary of Education of Amazonas state got creative. He took the teachers, broke them into two types of teachers. Lecturing teachers and tutoring teachers. And basically had content and structures in lecturing teachers broadcast with two-way video uplinked to a thousand little classrooms at a time. And the tutoring teachers did all those other things that teachers have to do during the day besides from delivering lessons. Classroom management, supporting kids, et cetera. And it's worked very well. Rapid, quick jump in the number of kids who are able to access secondary school.

And lastly, sometimes innovations are platforms. Educurious, we will hear from, I think, later in the day about day about this innovation, is a platform that really supports schools, public schools in the US with marginalized -- serving marginalized kids to help train teachers and support teachers and develop their capacity to deliver project-based learning methodologies for their kids. It also reaches outside of the schools and taps experts. They have an expert network and brings in, sort of, mentors to both work on projects with kids and build that social capital that marginalized kids often really need to thrive in their post-schooling life but don't often get a chance to develop.

So, those are just some examples. That's really a tip of the iceberg. There is many, many different types of education innovations. But they reflect, I think, some of the big trends that we saw when we looked across the global catalogue. 60 percent of the education innovations are focused on the most marginalized kids as are virtually all of the innovations I just told you about. Really reaching those who are left behind, which I think is part of the promise of leapfrogging.

Half of the innovations in the catalogue use Edtech in any meaningful way and

half don't. So, there is a mix. Technology and innovation are not synonymous. Half of the innovations try to do, what we talked about in the example of NAVE from Brazil, rigorous academic skill development as well as 21st century skills at the same time. 60 percent of the innovations are led by non-profits. Non-profits are really the engine of education innovation in the global education community.

Interestingly and, I think, Emiliana, maybe we will come back to this in the discussion, the example of Amazonas state from Brazil where an education system is innovating and transforming and leapfrogging, are far and few between. And maybe we just missed them. It could be that they are out there and our methodology didn't capture them but only 12 percent of the innovations in the catalogue were led by governments. And so, that's a question. How do we think about education innovation -- education really is innovative but maybe, most of these innovations are still on the margins of education systems and not yet at the center of an education system.

So, after studying this for a while, we thought, well, where does that leave us? How is all this information about education innovation going to help us leapfrog? And really we realized we have to figure out where are we trying to leapfrog to? Because just because something is innovative doesn't necessarily mean it's good. And it really depends on what our goal is for education because some innovations are going to help us more than others to get there.

And I am sure if we did a little poll in this room, we would have many different ways of answering this question. What is the goal and purpose of education? Some people say it's to get good jobs, some people say it's to improve people's lives, some people say it's to development citizens and leaders for the common good, et cetera.

So, part of what we did is step back and think, what are the big issues that most education systems are grappling with that leapfrogging will need to address. And we came up with the twin problems in global education. For this, we built a lot on our joint work with contributing to the International Education Commission and we basically have boiled it

down to two things.

Most countries, not every country, but most countries are grappling with skills inequality and skills uncertainty. On this side skills inequality, it's hard to see that gray is very difficult but this is basically the fact that most education systems do not deliver education services equally to their wealthy children and their poor children. And that we need to make sure that every kid can get the benefit of what today's education system has on offer.

The Education Commission estimates that by 2030, half of the youth population in the developing world, low and middle-income countries will not have the basic secondary skills they need to thrive. So, basic literacy, very basic numeracy, basic critical thinking, and problem solving. That is half of the entire youth population. And the pace of change, if we don't do anything different is quite slow. Could take decades, could take a century to change that with the current pace of change.

So, that's skills inequality. And while education systems are grappling with that, all education systems have to think about and reorient themselves to the types of questions that Val posed. How do you prepare young people for an increasingly uncertain future? In a world where it's unclear what the jobs are, where problems are increasingly complex, where there is fake news of all types. It's hard to decipher what is what. And just an example from the Future of Work studies, most jobs will have some form of tasks automated. So, in your daily job, the things you do every day, routine cognitive and routine manual tasks will be automated. This is a study that estimates between 50 and 70 percent of tasks within jobs will be automated. So, we are going to be asking young people, as they enter the world of work, to do very different things on a daily basis.

So again, those are our two big problems that most countries face and so therefore, our ultimate decision and frame at least for us for leapfrogging is to say, look what we want to do is leapfrog in a way that addresses both skills inequality and skills uncertainty. And for that you need these breadth of skills. The skills again that Val was talking about - academic plus 21st century.

And when we talk about skills, we are talking about capabilities and competencies and what you need is young people to not only learn knowledge and information which most education systems are well set up to do but you need them to be able to have the competencies and abilities to manipulate and use that information in different contexts over the course of their life. You need to -- we need to start educating lifelong learners. That is really, what we say at least, the goal of leapfrogging should be.

So, how to do that? How do we leapfrog? We ultimately said, you know, what we think you need to do in order to leapfrog is you have to transform what and how children learn. Now I want to pause on this for a moment because education is different from other sectors in various ways. And in other sectors, often you just jettison and throw out the legacy system. We are not using landlines very much anymore. We are using mobile phones.

In education, what would it mean to jettison a legacy system? It would basically be eliminating schools. Schools are the legacy system. We do not think that is a useful and productive way to go. And the idea of mass education in and off itself is relatively new historically. The idea that every kid should be educated and has a right to be educated is in exercising radical social equality actually and it actually has benefited society. Better health, better wealth, many, many things can be tied to the spread of mass education.

And so, with that caveat, what we say is we don't want to throw out schools but we want to change how schools think about tackling their job. Traditionally, most schools and mass education has expanded by first focusing on access, get kids into school, that's what I got to do. Then once they are in school, focus on, you know, are they learning academically. And then after that well, are the things they are learning relevant to their lives. And that's how education in the US expanded, if you look historically. It is how education in the developing world has traditionally expanded if you look at the legacy of the Millennium Development Goals. And we argue that you leapfrog you need to do all three at the same time.

And people will say it's too hard, it can't be done, you are asking us to run

before we can walk. And the benefit of being at a think-tank, you don't have to implement anything, is to say, well, you should try. So, we spent a lot of time scanning the landscape of existing evidence around what data says about transforming what and how children learn? And we came up with this leapfrog pathway. This is a very short synthesized summary version but I will just you through it briefly and we will go through each element one by one.

The two blue elements at the top are core elements. We think both of these are really needed in order to leapfrog to a place where all kids can develop a full breadth of skills. You need to transform teaching and learning so it's more student-centric and you need to alongside that transform how that teaching and learning is recognized. How you assess, how you progress, and verify that with what kid skills are.

Underneath that the green and the yellow are support elements. These are things that we think, given the scope and scale of the education challenge, are really important to leverage but are not absolutely necessary in every given context. You need to diversify people and places, you need to increasingly use data in a way that is results oriented.

This is what the real leapfrog pathway looks like and I will spare you going through every little box one by one and give you, sort of, the highlights from each. But I mainly am showing you to make the point that we set out a continuum. There are steps along the way, destinations along the way because of course, leapfrogging very much depends on the context from which you are starting.

So, let's go through teaching and learning. So, some of our arguments in teaching and learning is that we need to make room for playful learning pedagogies. That type of iterative, experimental team work pedagogies, in addition to direct instruction et cetera that allows children to not only memorize and remember information but also to be able to analyze, evaluate and create information themselves. And that's really the transformation we are looking out for teaching and learning.

In terms of what all the innovations that we studied are doing vis-a-vis that, a whole bunch of them, almost 70 percent are employing playful learning pedagogies. And this

is interesting. This is the part of why we have started to -- have a panel later today on teacher training but only nine percent of them are working actually to support and develop teacher's own competencies and abilities to deploy those playful learning pedagogies. So, what is that juncture about? We will talk more about that with Jenny Anderson and the panelist.

Secondly, recognition of learning. Again, this is about how you assess and progress students and verify and remember the example of Go for Gold, where the employers looked at exam results, yes, but they also had other ways of recognizing learning. Not very many folks in the global catalogue are innovating in this area. 15 percent of the innovations are really focusing on much more individualized progression. Only 2 percent doing the types of things that Go For Gold program did.

People and places. This is the example of adding to like LEMA adds to like a licensed teacher in a classroom adding to their ability to help children learn by bringing in different experts, different tools to help with the learning process. Again, LEMA did this with the board games, Educurious does this with the expert network, in some ways, the Media Lab at Brazil did this by splitting the teaching profession into two. And a lot of people, in education and innovations, are working on, what we call, unburdening teachers. So, really trying to help, take away some of the tasks that the teachers have to do, or do them in a way that is much more creative and helps elevate teachers so that they can focus on the instruction they need to do. And this includes things like tools that automate administration tasks, which we know teachers all around the world are burdened by. It includes crowding in expert, community help from the examples I gave earlier. It includes splitting the -- changing the different rules of teachers, et cetera. And we will have a discussion about this with Gregg after this session.

The other piece around technology and data, we used the SAMR model, which those of you -- I am sure, which Hadi in the tech space is quite familiar with, and others who work in the space are quite familiar with, it's Substitution, Augmentation, Modification and Redefinition. And we argue that educational technology that just substitutes for an analog function or augments what an analog function is already doing, could be fine, could be good, but it's not

going to transform what and how the kids learn. What we want is educational technology that modifies or redefines what's possible. Like in the case of the Media Lab, totally redefining what was possible in Brazil. Only 20 percent of the education and the innovations that we studied really used technology in a way that modified or redefined what was possible.

So, in conclusion, we are optimistic about the potential to leapfrog. There is a need absolutely to think very careful about the teaching and learning process, in particularly, the enabling environment about how to scale some of these innovations and bring them from the margins to the center. Thank you very much.

MS. VEGAS: Can you hear me? Yeah. Well, thank you both, Rebecca and Valerie for your rich remarks. There is a lot of content to go through. Before I, kind of, continue this conversation, I want to apologize for the translator for us because leapfrogging in Spanish is impossible for us to translate. So, I am sure -- I don't know how they are doing it. I wish we had a similar word in our language.

In any case, we have heard from both of you about the importance of orienting education systems to develop citizens of the future. And today, we will be exploring in-depth innovative approaches to unburdening and training teachers. Where do you see teacher's most important role if education goes to help develop citizens of the future? Let me start with you, Val.

MS. SMITH: Thank you. So, as I suggested in my remarks, I believe that the most important role teachers can play at any level of education -- I focus my remarks on higher education but I think, certainly, with earlier, students at earlier ages as well, is to encourage in them, the habit of active engagement with ideas, active engagement in their learning, what I refer to as critical thinking. And I think that the groundwork for that kind of active engagement where students are encouraged to question and to participate actively in their learning, not only to receive knowledge and information is something we can and should be encouraging teachers to do from the earliest ages. I think this is part of what goes into

helping young people grow into lifelong -- the role of the lifelong learners. So, I think that's the most important thing.

But I also hasten to say that the teachers at all levels would benefit from support and encouragement to figure out how to develop that capacity and expand it over the course of their careers.

MS. VEGAS: And just to follow-up with Val, before I go to Rebecca, given that you have been in higher education most of your career, we know that it should start in teacher preparation programs. So, teachers, as students being, you know, having the experience of being able to question and be curious and try new things. Do you see that evolving at least in the US where you are more familiar? And how hard is it to do that in higher education?

MS. SMITH: I think it's very hard. I think it's evolving to some degree but I don't think it's evolving quickly enough. I think in this country and sort of more generally, it seems to be me that we can and must do better to incentivize this kind of approach for teachers. I think that the teachers across K through 12 and even before the kindergarten years face an extraordinary number of pressures to serve many different capacities and needs that their students face. And they are not always receiving the support they need even if they have gotten that, sort of, preparation as they train to become teachers. I think to be able to continue that work beyond that is really -- it is not as easy as it should be.

MS. VEGAS: Certainly, and it is also hard in developing countries even more so. Let me go to Rebecca and -- you know, you mentioned the fact that few innovations come from the public sector. And I was very happy to see the innovation that you highlighted at the Media Center from Amazonas because actually, we are supporting that with a loan.

MS. WINTHROP: Well done, well done.

MS. VEGAS: It is exciting and they actually wanted to expand and needed additional resources and at that time, for us also it was risky because we didn't know if it was working. Now, we have evidence that it is in fact working. But we have a lot of government

officials in the audience. And can you tell us how you think the respective roles of government, the private sector, and the civil society can work together for educating our citizens of the future?

MS. WINTHROP: Right. Well, I find that sometimes when I talk to people, the word innovation and education, people automatically think about the private sector. And I do think that the private sector has an important role to play. But at the end of the day, it has to be the government who is responsible for creating and enabling an environment for education to take place, and they have to drive the education transformation. Non-profit sector and the private sector have different motivations and neither of them really have, sort of, the duty and the responsibility to take care of every single kid in their country.

So, often what we talk about and we have done this with my colleague, Jenny Perlman Robinson in our Millions Learning research is that really what we want is a flexible and an adaptive education ecosystem where the government is at the center, and again, I like the Brazil example, sets out big policies. These are the children's right to education. And it allows flexibility in how you get there, of course, with regulation and oversight. You don't just let anybody do whatever. And in that type of context, I think that partnership with the private sector and non-profits is really important. We saw that a number of the innovations were partnering, particularly the ones that scaled much more quickly were partnering in some way or shape they perform. The government was partnering with private sector and non-profits.

MS. SMITH: If I may ask something, as I was listening to your remarks during your presentation and even just now, I was so happy to hear you talk about the importance of partnerships across these various sectors. In the example from the program, it's what I talked about -- what makes that program successful is the fact that it depends upon partnerships that involve faculty but also, as I mentioned, neighbors and other staff members from across the college. What's so important to me about that -- the idea of partnership -- is that it shares and indicates that the responsibility for education is really shared ultimately and that it relies upon a, sort of, a distribution of responsibility across various sectors, and to the extent that we are

thinking about the future of our global community. I value the opportunities, to create opportunities for students to be able to learn from many different places and sites.

MS. VEGAS: Absolutely. You know, in the two presentations, particularly in Rebecca's, we, kind of, hear three words that are constantly present when we are talking about citizens of the future - leapfrogging, innovation, and technology. Are these three inseparable? Can we think of leapfrogging without technology? Can we think of innovation without technology? So, how do we, you know, advance and reach our goal of the citizen of the future? And do we need all three, I guess, is my question?

MS. WINTHROP: Do you want to go first, Val?

MS. SMITH: I would like you go first.

MS. WINTHROP: So, we thought actually a lot about this and got into some heated arguments with the folks who work in the EdTech space, who have -- I mean, good colleagues, good debates saying there is -- their argument was that there is no way you can scale education transformation without technology, and our argument was well, maybe but you also have education systems in places where they don't rely heavily on technology and they have really good policy.

And I think of Finland, as an example. They are absolutely innovating and doing all sorts of interesting things, and we'll hear about that from Saku later in the day. It doesn't have to be present. I think, you know, half of the innovations in our catalog used EdTech in a meaningful way. I think where we see EdTech being transformative, it's really about reaching the most marginalized kids faster and quicker in ways where governments are poorly serving them. Now you could have governments transform themselves and serve them better. That seems to be a long slog. So, I mean, I think you should try both frankly and see where you get to.

MS. VEGAS: Do you have anything to say or add?

MS. SMITH: Wow. I -- oh I think about this -- I guess I think I would be reluctant to say that you cannot distinguish these three categories from themselves. I guess,

partly because I think the space of innovation needs to be able to be open to lots of different possibilities. I guess, I am trying to figure out where -- I think my concluding remarks, sort of, raised questions about this because part of me is also thinking about the extent to which innovation is required to help enrich our -- the human dimensions of education and innovation, and the creation of opportunities. So, I just always want to be thinking about where the human dimension, the human contact, sort of, fits into all of this. Let's make sure that we are not leapfrogging the benefits of those individual, more intimate relationships as we think about the innovation in the future.

MS. VEGAS: That's a very good point. Let me just ask Rebecca to tell us if you have next steps on your leapfrog research before -- I want to take some questions from the audience too.

MS. WINTHROP: Yeah. So, yes, we do. We are primarily thinking about two, well, three things - one is part of, sort of, the dissemination of the book and we have this global catalog up online, although it is not very searchable and it is not very helpful. We often get requests. And if anybody has a request, people say, can you tell me, in Sub-Saharan Africa, all the EdTech innovations. So, we will start pulling that for people and putting it online. So, please send us your requests. That's a smaller one.

The second big one is to really do a deep dive into the first pillar of the leapfrog pathway - teaching and learning. And really, thinking a lot about teachers and teaching. Why is it that so few innovations are tacking teacher training and development? What are the effective, you know, playful learning innovations?

And thirdly, I should say is to look at the enabling environment. We are particularly interested in the demand side of education and leapfrogging, we did a hundred interviews with a hundred thought leaders for the book and all of them had examples of -- from Ministers of Education all the way down to classroom teachers -- had examples of trying to do innovative, very leap-froggy things, and parents pushing back, you know, in one way or another. So, we are particularly interested in learning a lot more on the demand side, you

know. If we could all leapfrog, would parents and students be ready? And maybe that's separate, maybe students would be ready, parents wouldn't. Who knows? We'll see. But we would love to hear any of your thoughts also or experiences you have in relation to that demand side.

MS. VEGAS: And before I go to questions from the audience, I want to mention that the IDBS is collaborating on a new and an innovation research laboratory for the Latin America and the Caribbean, and we have a webpage I invite you to see. It's called SUMMA, S-U-M-M-A Edu, E-D-U dot org and there, you can find a very actually a user-friendly website with what is the international experience and what works in education adaptive to Latin American and the Caribbean in three languages but also, the 50 innovations around the world that have been evaluated and have shown some evidence of the impact with guides as to how you could actually adapt them and implement them. Sorry. I highly recommend that. And now, let me take questions from the audience.

We'll start from the back. Someone with the mike, yeah?

MS. WINTHROP: I am sure mikes are coming but I don’t know where they are.

MR. KLEES: I'll see if I could talk louder.

MS. VEGAS: One second. No, the interpreters need you and also, the --

MS. WINTHROP: Mikes, mikes, mikes to the room. Is anybody out there? I bet you someone is watching on the screen. Tyler, can you run some mikes? Okay. Here we are. There we are. They have arrived.

MS. VEGAS: Okay. I think it's on too.

MR. KLEES: Hello, can you hear me?

MS. VEGAS: Yeah, do you mind introducing yourself and naming your institution briefly and then go ahead?

MR. KLEES: Steve Klees, University of Maryland.

MS. VEGAS: I am not sure, I guess it's not working.

MS. WINTHROP: It's definitely not on.

MR. KLEES: Steve Klees, University of Maryland. Maybe this is mostly for Rebecca but also for Val, you are using skills as the goal and skills has a narrow interpretation too often of workplace skills --

MS. WINTHROP: Yeah.

MR. KLEES: -- I am sure, you are using it more broadly than that. But the question of innovation that changes attitudes, personal development, moral development, the broader purposes of education. So, I guess, my question is, what are you not including in the term 'skills'? And shouldn't there be innovation for other parts of education? Thank you.

MS. WINTHROP: I am going to answer. Actually Steve, I am really glad you brought that up because one of the things that I have noticed is, particularly for the Americans and the US audience, the term 'skills' which seem to work much better overseas, is interpreted narrowly.

So, thank you for the question. What we really do mean, and this came out from some of the work that we have done in the past with colleagues in UNESCO on the learning metrics taskforce and looking at the broad areas and domains of competencies that the young people need to develop -- is that full, sort of, broad suite of competencies and capabilities and skills that young people need. So, I would think that it would probably include the broader vision that you are talking about, Steve. I don't know, Val?

MS. SMITH: I would like to add just a few things about that because I think as my colleagues and I reflect on what it means to prepare students for their lives as citizens, I think that is over and above preparing them for their career paths. I think it is also about -- I think it focuses on how one lives in a community, how one operates as a political subject in the world and takes responsibility for one, sort of, civic role. I think, sort of, all of these dimensions have to come into play.

I think, you know, it's complicated in an academic environment where we are so often measured by the salaries that our alumni make in the first job out, and that kind of

thing. And where, students and their families are really focused on, what will I do? How will I support myself? My family repay debt, so on, right?

But I think also, you know, it is not in fact the case that many of our faculty colleagues feel that they are equipped to support students and others through this -- through a broader, more, sort of, an expansive vision of what education means or the relationship between curricular and co-curricular experience. But I do feel that it's, sort of, a responsibility and I think this is where the innovation part for us come into play. It's time to figure out with whom we might consult, and how to learn together, take on the possible certain kind of humility to learn together what goals we need to be setting for the future generations. But I think part of it is how do people build a life within a community, not just build a career path?

MS. VEGAS: Great. Let me go back there with the lady with a blue shirt. Yes.

MS. SUCHETHA: Hi, my name is Suchetha and I am from India. I represent an organization called Dream A Dream. So, my question, it really -- I am wondering, you started by somewhere, Rebecca, you said that there are more children in school than ever before, and this is even true in India where with even such a large population, we have almost 97 percent of children enrolled in school. So then I wonder, why is there a resistance to change? Why are innovations on the margin? And I have some idea about India but I would love to hear your thoughts on it. What do you think is globally the reason that leapfrogging is on the margins and not become mainstream?

MS. WINTHROP: I think that this will be a question we should discuss throughout the day and I am sure you have your own experiences. But I think there is something with this idea of --must you access first and then quality and then relevance. I think this is dominant logic that is powerful. It makes a certain amount of sense too. I mean, kids aren't in school, get them in school. First, that is first and foremost.

But we did a lot of review of the innovations literature that largely sits frankly in the outside of education, often in the business community and one of the things they talk

about for innovations to really break through and succeed is having to, sort of, identify what the dominant logic is, and that mental models in some ways stronger barriers to transformation than legal models or your legislative environments or policy. And so I think that idea of mindset shift is actually really, really important. And something that, you know, why we put this work out there. We want everyone to -- if I could have one thing, that is for you guys to go back to your work and have the idea of leapfrogging in the back of your mind, and think about -- you'll work differently perhaps.

MS. VEGAS: Let's go back to the right. And the lady here. Keep switching -- the mike.

MS. BERVA: Hello, my name is (Organia Berva) and I come from an organization called Teach in Bulgaria, part of the global teacher network. Very excited to be here with you today and learning about Latin America, United States, and hopefully also a little bit about Asia and other parts of the world. I want to build on the question that was just asked. Leapfrogging, as we heard comes, 60 percent from non-profits. The other parts maybe come from some business and some policymakers. I want to understand what could be mechanisms to help, especially the public sector, which Rebecca rightly mentioned is the key holder of scaling those innovations? What can they learn from your research? And what are some aspects of their work that could change? Or what are some of the levers we could introduce in our collaboration with them so that these innovations are scaled more effectively? Thank you.

MS. SMITH: Do you want to --

MS. WINTHROP: No, I think -- and if you have any other comments. So, one of the things that I think that is helpful is for governments to think about how can you rapidly help marginalized kids get this breadth of skills, or Steve might be happy with breadth of, sort of, learning opportunities or sets of competencies. Often we think about, for the most marginalized kids, government policies is really just getting them the basics. And I think, anything that I have learnt over scanning all these innovations is that there is lots of creative

ways that you can -- if you have an out-of-school kid, they can have 21st century education. It might look different, it might not be totally within the same type of model that other kids are getting their education but they can have a mix of technology, a mix of creative teaching, a mix of people -- teachers who care about them, bring another set of expertise, it is possible.

And I don't think that we are doing any favors to say, you know, poor kids, first need to get in school and learn to read and write. That's sort of the floor. I think we are not doing them many favors. I think they will learn better and progress better if you try to be a little more ambitious. So, that might be my number one recommendation.

MS. VEGAS: I see someone who is in government who wants to pitch in. So, I would like to invite (Lian Bretner) to give your view of how governments can innovate.

MR. BRETNER: No, my question was -- we can discuss a lot about how governments should innovate and I think it's part of the day-to-day -- one of the differences is we talk a lot about innovation and I can say that in the public sector, innovation is only innovation if it's scalable. And I think some of the solutions we have seen and we have heard all over the world are very micro-innovations and they are not scalable on the public sector because you have 80 million, 100 million, 1,000 million, millions in your way, right. So, I wanted to -- if you can share what's your idea of innovation because -- your question leapfrog innovation is a very interesting but it has -- there is a lot of innovation without technology, there is a lot of technology with innovation, and there is a lot of technology that is back from the 19th century. So, my question is not about innovation but the other one is, in a system model that's on the second industrial revolution, the solutions cannot be a modification of that. Have to be something different in the minds. So that's open for discussion but I wanted to hear your opinions.

MS. WINTHROP: Well, everybody should go see Miguel's conversation at lunch time if they want to hear how Uruguay really -- the public sector did some transformation of education from government-led. So, you will have a lot to say about this equally as I, Miguel. But it's an interesting question. We debated this idea of are we going to scan the

globe for education innovations and really just look at those that have rigorous randomized control trials for effectiveness and/or a proven to be scalable on, sort of, across a large number of students. And we debated internally and at end of the day we decided, no we are not going to do that. We are going to define innovation like we said, you know, an idea or technology that breaks with current practice in a context if it's new, there or not necessarily new to the world because part of what we wanted to do was see what's on the horizon. What's coming down the pipe? What is happening that might be just micro at the moment but has the potential maybe in 10 years to really transform how we think about education. And you are not going to capture the innovations that are just, sort of, emerging and perhaps the most cutting-edge if you require some, you know, broad scalability or broad, sort of, very, very rigorous evaluation.

So, we have a full mix. I mean, some of the innovations in the catalogue reach a 150 million learners. So, really, really big. And some of them are tiny. They reach a 150 learners. So, we -- then that's part of the reason we did that. I do think that, again, part of the next steps and part of our challenge collectively as an education community is to try to think about what innovations are most promising for the public sector to take on. How could we sort that? How could we help policy makers make their own decisions and decide, you know, what are most relevant for them. So, that's part of what we are interested in exploring with this enabling environment.

MS. SMITH: And I just want to, I guess, maybe respond as well from the vantage point -- my vantage point is leader of a very small liberal arts college tucked away in the suburban Philadelphia area. I mean, we often ask ourselves about the question of scalability. I mean, we feel that we are in some ways, I mean, sort of, trying to shape lives, one life at a time. But part of the mission of the institution by inspiring our alumni to think about the impact they can have on the world is that -- I think we realize there is something profoundly optimistic in this model.

We feel that the individual lives we touch are inspired to try to become innovators in whatever sphere in which they find their life calling. And so that these individual lives actually have potential to have broader impact, that's one. And secondly, as we attract an increasingly global community of students, we are finding that our alumni are being able to have a broader impact across the globe. But, I think, institutions like Swarthmore and other smaller institutions like our own, we do recognize that they are some concerns about the scalability of this model and of its optimism.

MS. VEGAS: So, I see a lot of hands still and I am very sorry that our time has come up. I want to thank Val and Rebecca for their excellent remarks and now this conversation. We have a very full day ahead and as you will see from the agenda that hopefully you have picked up at the entrance, we have next a terrific panel on Unburdening Teachers.

As I mentioned earlier, there are headsets underneath your seats for simultaneous translation. The next session will feature our Spanish speakers. So, please, for those of you who don't understand and speak Spanish, you will need to have your headset and Channel 2, I believe, is for translation into English.

Following that next session we are going to move into lunch for four simultaneous discussions, diving into questions around Edtech. Please take a look at your packet for a short write-up on each of the sessions and make sure you select because they are on a first come first serve session.

Later in the day, we will hear from innovators themselves. This will be also a simultaneous session. You can find more details about it in your packet. We are excited to have innovation spotters here, those showcasing and highlighting innovations to better understand who innovations work on the ground. So, please, you know, save time for them and finally, we will close the day with a chance to network with each other and the showcase innovators over wine and cheese.

There will be quite a bit of moving around today from rooms, so please be sure to keep an eye on your belongings and take them with you anytime you change rooms. We also ask that you put your interpretation headsets back on your chairs when you leave any room. And now, I would like to welcome Jane Dimyan Ehrehnfeld to the stage. Jane is the Executive Director of the Center for Inspired Teaching and is going to do a short activity to get us moving before the next session. Jane, thank you.

MS. EHRENFELD: Good morning, everyone. Can you hear me? Before I start, Daniel Wagner, if you are here and you are watching, you have lost your wallet and it is at the front desk waiting for you. So, is that on? No.

So, my name is Jane. I am from Center for Inspired Teaching here in Washington, D.C. All of you saw there is a pretty shocking statistic up there earlier -- several shocking statistics but one of which was that while 69 percent of innovations out there in education involve playful learning, only 9 percent actually teach teachers how to make their classrooms playful spaces. So, at Center for Inspired Teaching, we are all about focusing on the teacher as the lever for change and teaching them to create classrooms that are authentically engaging and joyful and playful and fun for their students.

So, someone at Brookings, I won't say who, had the idea to have me come up here and help engage you in the kinds of activities that we do with teachers when we are working with them. And so, we are going to get our blood flowing. We are going to get our neurons firing a little bit. And hopefully, there will be a little bit of laughter too, because I think that's kind of a radical proposition in education that classrooms can be fun and happy and joyful places.

So, you can do this in any language, this activity. So, whatever language is most comfortable for you. All it requires is being able to count backwards from 10. Good. Those of you following along at home, please join in. So, I am going to ask everyone to stand up. You can put everything just on your seat. Okay. Right hands up. Okay. We are going to count backwards from 10 and shake our hands, right? 10, 9, 8, 7, 6, 5, 4, 3, 2, 1. 10, 9, 8, 7,

6, 5, 4, 3, 2, 1. Right foot. 10, 9, 8, 7, 6, 5, 4, 3, 2, 1. Left foot. 10, 9, 8, 7, 6, 5, 4, 3, 2, 1. Sorry ladies in high heels. 9, 8, 7, 6, 5, 4, 3, 2, 1. 9, 8, 7, 6, 5, 4, 3, 2, 1. 9, 8, 7, 6, 5, 4, 3, 2, 1. 9, 8, 7, 6, 5, 4, 3, 2, 1. 8, 7, 6, 5, 4, 3, 2, 1. 8, 7, 6, 5, 4, 3, 2, 1. 8, 7, 6, 5, 4, 3, 2, 1. 8, 7, 6, 5, 4, 3, 2, 1. 7, 6, 5, 4, 3, 2, 1. 7, 6, 5, 4, 3, 2, 1. 7, 6, 5, 4, 3, 2, 1. 7, 6, 5, 4, 3, 2, 1. 6, 5, 4, 3, 2, 1. 6, 5, 4, 3, 2, 1. 6, 5, 4, 3, 2, 1. 6, 5, 4, 3, 2, 1. 5, 4, 3, 2, 1. 5, 4, 3, 2, 1. 5, 4, 3, 2, 1. 5, 4, 3, 2, 1. 4, 3, 2, 1. 4, 3, 2, 1. 4, 3, 2, 1. 4, 3, 2, 1. 4, 3, 2, 1. 3, 2, 1. 3, 2, 1. 3, 2, 1. 2, 1. 2, 1. 2, 1. 2, 1. 1. 1. 1. 1. Thank you, okay.

Now we are going to get the lungs going a little bit. So, you are going to need a partner for this. If you there is three of you, that's absolutely find. So, what you are going to do, I am going to stand over here, so I can be on the microphone but also you can hear me. So, one of you is going to take your hands -- left hand over right. You are going to kind of flip around so your thumbs are facing down. So left hand over right, flip your hands, and lace your fingers. Pull them through. Okay, everybody, you got me. So, left hand over right, flip your hands around, laced fingers, and pull them through.

Great. Now, here's the key. Your partner cannot touch you. Very important. Partners, point at one of the fingers that your partner has laced. So, only one person should have their hands like this right now. Point at one of the fingers and ask your partner to move that finger. Don't touch. Don't touch. If you touch, you ruined it. Switch partners if you haven't yet. Switch partners. Give your partner a chance.

Okay. Come on back. Did anyone find that a little challenging? Yeah, okay. I am coming back to the mike. Sometimes something as simple as moving a finger can suddenly become really, really, really hard in the wrong context. And sometimes it's just as easy as just moving your fingers. So, just a little activity to get you thinking in a new direction as we move into our next panel. Thank you. I will back a little later for some more fun. Some of you might want to play in your coffee breaks around, so next time I come to the stage.

So, the next section focuses on unburdening teachers. As you heard before, one of the panelists will be speaking in Spanish, so please use your head pieces. Channel 2

is for English, Channel 10 is for Spanish. Colleagues in the overflow rooms are watching via webcast. You will hear it in English translated directly.

Will the panelists for the next session please come to the stage? Greg, Alison, Hadi, Manolo and David. Thank you.

MR. TOPPO: Any minute now. Here we go. So, just a reminder, we do have a Spanish speaker on the panel. So, if you set your ear piece to Channel 2, it will translate to English. Channel 10, which is one arrow up, to Spanish.

MR. CALLE: Sorry.

MR. TOPPO: This will be fun.

So, my name is Greg Toppo, I am Senior Editor, Inside Higher Ed. The topic of this panel is slightly different. We are, kind of, moving forward talking about unburdening teachers. Harnessing the power of community expertise and technology. We have really wonderful panel of real practitioners who are about to chat with us. By the way, I think I will be able to write in this panel now that my fingers are all, sort of --

You know, it occurs to me as Rebecca was giving her talk -- really wonderful, very exciting stuff. You know, it occurred to me that we are in a lot of ways leapfrogging already even though we don't know it in so many areas. And when I think about this thing in my pocket and in all of your pockets, I am sure you will have one of these -- you know, what I like to say is that about 10 years ago, we started giving these things, we started handing these things out to our kids. And so, this massive unprecedented scale and 10 years later, the result is we have universal telephone ownership among young people.

They are the first generation in which everyone has a phone. And they are also the first generation that hates to talk on the phone. I have two daughters; they are now in their twenties. They have grown up with cellphones. They would pretty much rather do anything than talk to you on the phone. And, you know, until recently we had a phone on our wall at home and, you know, when it rang, I don't know about you folks, when the phone rang in my house, nobody gets it.

And one of the reasons I think the cellphone is so powerful to young people, is because it does something we didn't even think it would do when we built it. Well, when I say we, I didn't build it but -- you know, it became in some ways, this sort of weird trust machine. What do I mean by that? You know, when we all grew up even the youngest among us -- our parents said things like don't talk to strangers, don't get in their cars, certainly don't visit their houses and go to sleep, don't date them, and for god's sake, don't marry them. And, you know, a generation later, we do all of these things pretty much without thinking about it, right?

We talk to strangers all day on Twitter. We get in their cars certainly with ride sharing. We sleep in their houses, AirBnb. We date them, right, Tinder, okay Cupid. And sometimes we even marry them. And, you know, it strikes me that if we can make a change that profound happen in everyone's lives, with something like this, it seems to me that figuring out who in the community can help teachers is kind of an easy lift. And I say that knowing that it's kind of a naïve assertion but I think I would like to explore it in that context.

So, we have really wonderful panel. Very diverse group of people. I am just going to introduce them from my left all the way down. They are going to tell us a little bit about what they do and I will take it from there. And when I say a little bit, I mean very little bit. Like, one or two minutes. So, that's the first challenge. So, Manolo is to my left, please.

MR. DIAZ: Thank you, Greg. Hi, everybody, my name is Manolo Diaz and I am the CEO and Co-Founder of Yogome. Thanks for the invitation. Happy to be here. Yogome started a learning content platform for kids 5 to 11 years old available in 6 different languages with content for eight different subjects from math, science to coding and sustainability. We actually recently added social emotional learning as well and we see over 6 million monthly active users from over 20 countries in our platform. Thank you.

MR. TOPPO: Very nice

MS. NAFTALIN: Very concise.

MR. TOPPO: You have to beat that, Alison. That was about 40 seconds.

MS. NAFTALIN: Challenge not accepted. Hi I am Alison Naftalin. I am the Founder and CEO of Lively Minds. We work in very rural and deprived, off the grid, very hard to reach villages in Ghana and Uganda where most parents have never been to school, schools are very poorly funded, very large class sizes. We aim to improve early child development in those settings.

Firstly and our primary focus is empowering mum. So, we train 40 women in each village and then the mothers are trained to run playgroups for the preschoolers in their community to give children a chance to learn through play. We also give parents ongoing parenting workshops. But also particularly where we work in Ghana, the playgroups all happen inside the school kindergarten and we use the program to also tackle some of the challenges that face the quality issues in kindergarten. In particular, large class sizes and lack of teacher expertise in how to teach through play.

So, each day a group of them trained mums come into the classroom and can teach the children in small groups using homemade toys and that helps teachers to teach because obviously they have extra hands, lots of teaching assistance and they are also given training on how to use these games.

MR. TOPPO: Okay

MR. CALLE: My name is David Calle. I have a YouTube channel called Unicoos with math, physics, chemistry and tech videos in Spanish. We have more than one million followers and it has been seen approximately 150 million times by 20 or 30 million students, mostly Spanish speaking. Half of them are in Spain, the other half are in Latin America. And this is for middle school, high school and college.

We launched a website called Unicoos.com and in addition to our free videos, there we have other things. Everything we do there is free. Our goal is to give equal opportunities to all. In addition to our videos, we have exercises with answers, theory, and we also have a Q&A forum where people can pose their questions online and we can answer

them. We have professors, teachers and students from all over the world and they are helping each other with their homework assignments and their assignments.

We are trying to grow by adding new subjects and adding other languages. We are starting to do this in Arabic for children who are refugees in other countries including Spain who might not speak Spanish and they are trying to learn Spanish or Italian or doing this little by little. It's tough because since it's free and we are not charging anybody for this, it's difficult to finance this project. But we love what we are doing and we try to help as many children as we can. We are trying to keep helping them achieve their dreams. That's our goal.

MR. TOPPO: Somebody a little high. You got a mike somewhere.

MR. CALLE: My ear is broken now.

MR. TOPPO: Oh, okay. There are two mikes. So, just in case you didn't think you would hear the words Brookings and YouTube star in the same sentence, you now have. Okay. Hadi.

MR. PARTOVI: Hi, my name is Hadi Partovi. I am the Founder and CEO of Code.org and I also started this movement called the Hour of Code. My goal in life and my belief is that every school should teach computer science.

One thing I was reflecting on, when Rebecca was talking earlier about how we have this issue about a skills gap but also a skills uncertainty and this question - what are the skills we will need in the future. My opinion is that we have a skills certainty, which is the computer science is going to be needed in the future, and then every career in every country, we are going to have more and more jobs that require digital skills of some sort and our schools aren't preparing them for this.

Code.org is helping schools and actually States and Governments add computer science to the curriculum. In the United States, we have helped 43 states out of 50 adopt policies to embrace computer science. We have also built the world's most popular platform for learning to code in schools. Roughly 10 percent of all the students in the world

have tried Code.org because our platform -- the early tutorials are available in over 50 languages.

In the United States, which has been our area of focus, almost half of schools use Code.org. In the fifth grade, which is our most popular year, two-thirds of all American students have an account on Code.org. So, as an example of how fast technology can be used to spread an innovation for something that didn't even exist five years ago. The fact that we have penetrated that level is an amazing testament to how technology can impact education.

With respect to this panel, I would say our work relies fundamentally on teachers, even though we provide a curriculum that spreads online. It spreads online from teachers to students. We have almost a million teachers teaching our curriculum in schools. Most of them never learned computer science when they were themselves in school but now they are teaching computer science using Code.org.

MR. TOPPO: And I want to get to that. That's actually the first question that I want to start with. By the way, in case it's not clear, I am going to deputize all four of you to talk to each other as well as to me. So, I would like to have -- make this as much of a conversation as possible. I would like to say we are going to have brunch without the Bloody Marys. Okay. Does Bloody Mary translate? Okay. Nothing could be easier.

So, actually I will start with you Hadi. Your remark about, sort of, teachers being the, I guess, the interface between the curriculum and the kids. First question I wanted to ask was, sort of, how you folks see yourselves as working within this idea of unburdening the teachers? Do you see -- I mean, you are relying on the teachers, do you see yourself unburdening them?

MR. PARTOVI: Absolutely.

MR. TOPPO: Let's talk about that.

MR. PARTOVI: You know, I think if you started from a blank slate and thought how technology can make education better. There is number of ways you basically

find ways for technology to reduce the work of the teacher. But that doesn't mean to eliminate the teacher. The simplest thing is grading homework. Teachers spend so much of their time grading homework and that's something that could be automated. In many cases, delivering a lecture can be done better with an engaging video, you can get the world's greatest experts to deliver a lecture. So, for us in our curriculum when we teach computer science, we have people like Bill Gates giving a lecture on how a computer works which is more interesting, I think, for most people than the majority of teachers giving that lecture. The homework grades itself while a good teacher plays a role.

MR. CALLE: Could you give my phone to these guys please?

MR. PARTOVI: Sure.

MR. TOPPO: All right, the work here is done.

MR. CALLE: I think that technology can help teachers a lot. I record videos but I am not saying that a video could ever replace a teacher. What teachers can contribute to their students is priceless. It has an incalculable value. The idea of videos is just to shake things up in the classroom a little bit. If we look at the time that teachers can make up, the time that teachers can have in the classroom because students have already seen videos outside of the classroom, it can be much more productive in a classroom. But teachers will be able to talk to their students more. Will be able to know their students more and they can do this because they will have much more time since they don't have to keep explaining the same equation again and again or the same scientific concept.

So, as I am saying, teachers can have more time in the classroom to get to know their students which I think is key. Many of our students want to have a wonderful career but we want them to be better people. We want them to engage in teamwork and be resistant to failure. And, I think, that those skills are very important as well. This generation has a lot of virtues but they have some defects as well. They are more impatient.

MR. TOPPO: Generation of children, not teachers.

MR. CALLE: No, no not teachers. And in the case of our teachers if they can use videos, if they can use any kind of online or digital platform and take advantage of that, they can make their classes much more fun and much more intense.

MR. TOPPO: Anybody want to --

MR. DIAZ: At the end, it's how can we empower teachers? We either contend with tools that can help them do their tasks on a more easy way. In our case, we started with a model only for parents for consumers. Selling to schools it's well known that -- it's not easy. It is not easy. The sell cycle is really difficult. It takes a lot of time. So, in our case, we decided to create a product for schools to start with teachers so they can use it for free. Since this school year -- well, last year our content is available for some beta testing.

We are actually doing a beta testing with some schools in Mexico and here in the US. And starting this new school year, the product will be available for free for those schools that want to use it. And that's important because we are generating this content now with a validation from a top university here in the US and for us the opportunity to get this content to more teachers where they can actually have the flexibility to use it as they can because that's important.

Sometimes these content platforms, they are like not flexible and they don't give the opportunity to the teacher to actually like optimize and use it as they prefer. They have to use it as it is and not to be flexible so they can, oh, I will use this content for this kid and this for other students, for example. So for us, it's important that they also have like these tools to personalize the learning experience for their students.

MS. NAFTALIN: And so, I guess as the non-tech practitioner on the panel --

MR. TOPPO: You know there are three engineers and you and me. We are outnumbered.

MS. NAFTALIN: So, I guess, I probably come at this from a slightly different take. I guess the teachers that we work with, there are a number of quite tricky challenges. So, one of the them is certainly that they an almost impossible task in that the average class

size that we work with is around 60 children to one kindergarten teacher. And there are no teaching resources and often, you know, in a very, very small cramped classroom. So, with the best will in the world, even if you had the very best trained teacher, it's going to be very really tough for them. So, that's one factor and that's certainly where we look at how we can unburdening them by crowding the classroom with community members to help with that work.

But on the other hand, there were also other challenges and other really important barriers, one of which is teacher capacity and the other one of which is teacher motivation.

MR. TOPPO: Just so we are clear, what's your definition of teacher capacity?

MS. NAFTALIN: Teacher capacity I'd say is the -- a lot of these kindergarten teachers are not trained in kindergarten teaching and often not trained in teaching at all. And so, that is an issue as a training need. And then on the other hand, there is also a motivation issue. There is incredibly high rates of teacher absenteeism. There is quite poor accountability. There is quite poor, sort of, governance of teaching. And what we found when we first started to introduce the program -- originally when we started implementing, we have had this wonderful idea that we come in, we train the mums and the teachers together and then they all get this excellent training and then the teachers would lead the mums and would be able to run these playgroups.

And actually didn't happen because then what essentially happens was the teachers saw this is as, ah, intervention. They saw this as an external thing that they had, sort of, nothing to do with and actually increased the absenteeism problem because then the teachers felt --

MR. TOPPO: So, it was a break.

MS. NAFTALIN: -- here are these, you know, seven - eight mums coming in. I can just sneak off and not teach. So, instead what we did was we said, okay, teachers we were going to train you but it's your responsibility to train 40 mums in the village. It's your responsibility to supervise them. It's your responsibility to provide the ongoing work. So, in

that sense, we are not unburdening them at all we are actually demanding that they make quite a big investment. But on the other hand, what we are not doing we are not bypassing them. We are making them the owners of the problem, we are empowering them.

And so, yes in the end, the outcome is that they do become unburdened because there is this complementary workforce, this volunteer workforce coming in and allowing them to give more quality teaching and allowing the mums to contribute. But on the other hand, that does not necessarily mean reduced work or sort of effort.

MR. TOPPO: It's a different kind of unburdening.

MS. NAFTALIN: It's a different kind of effort.

MR. TOPPO: Yeah. You know, Hadi, as you were talking earlier, it occurred to me that there are some people, maybe some teachers who might have the same attitude to what you are doing is what else and just say which is, you know, one more thing for me to do. How do you persuade people that that's not the case? Or maybe you don't have to and I am just not understanding your pitch going in.

MR. PARTOVI: Well, most of the teachers who use Code.org are really excited to have one more thing to do just because they have the same view that when you enter a school, it feels like going back into a time machine looking at the -- you know, it feels like you are back in the 1850s.

MR. TOPPO: So, they are saying bring it on.

MR. PARTOVI: Yeah. I think, teachers, by and large, know that the future changing and they wonder should they be preparing the kids for the same things that we have been teaching for the last 100 years. But really if they have intimidation within 10 minutes of having the kids engage with coding and computer science, that changes the mind for the teacher. Because they immediately see that the kids love it, they are enjoying it. And, you know, as a teacher, you don't always find one tool that everybody in the classroom is going to enjoy doing. Coding and computer science has very much become that. It engages the students, they quiet down, they do their work on the computer, makes the teaching job much

easier if the majority of the classroom is learning on their own and then you around to the students that need help.

MR. TOPPO: Is there any indication that it's replacing something else? That it's, kind of, crowding something else out? You know, there is only certain amount of time in a day.

MR. PARTOVI: Sure. In primary school, the way most of our teachers introduce coding and computer science is as part of a play hour.

MR. TOPPO: Okay.

MR. PARTOVI: So, you know, in primary school, you have to alternate between, you know, learn some math, learn some dance, you know, learn some English, learn some music. You know, just because the kids can't just do math and English or math and language all day every hour. And coding and computer science becomes one of the, sort of, more fun activities just because the kids enjoy it so much.

In secondary schools, students get to choose what classes they want to take, you know, you can choose do you want to take biology or chemistry or physics and computer science becomes one of those choices for students.

MR. TOPPO: Let's talk a little bit about, there was a really interesting point about it's not innovation if it's not scalable. I think Hadi, you have checked the scaling box in some way, right? What was your percentage of students who have given it a try?

MR. PARTOVI: At Code.org, it is 10 percent of the world's students, about a 150 million.

MR. TOPPO: You are the nuclear leapfrog.

MR. PARTOVI: Well.

MR. TOPPO: So, let's talk a little bit about scaling. David, you were talking about how, you know, YouTube is a worldwide platform. How do you scale something like what you are doing on YouTube without being, you know, Cardi B? Baby boomers there.

MR. CALLE: We do it with a lot of passion. That's what I was saying. I am a teacher in fact, I am an engineer but I teach classes for a living. I would call in all teachers around the world to record their lessons or to look for other videos online for their students to watch. It's very important for teachers to use videos. Not for the teacher, him or herself but rather for students to all end up at the same level.

In Spanish this happens and I am sure this takes place in Latin America as well because I hear from many students and teachers in Latin America, in middle school and high school, the biggest problem that they have is that half the class is learning at a much different pace than the other half the class. So, the teacher starts explaining something in the classroom and half the students are lost and they just tune out. They don't have a strong enough foundation to have that lesson and not all children learn at the same speed. That doesn't mean that they are more or less intelligent. There are people that learn very slowly and that doesn't mean that they are less intelligent.

In fact, some of the greatest scientists in the history of humanity were slow learners. These videos allow students to go home or be anywhere at any time with the internet and they can rewind the video and watch it again. With that format, children and teenagers can do something they are used to doing. They were born, practically, with YouTube and they are on YouTube all day. They spend their leisure time on YouTube and they can have math, physics, programming all of that on YouTube as well.

That's very important because these students can go at their own pace at home and they can reach a certain level. And that way the next day in class, the teacher can have all students pay attention to the lesson at the same time and that's very important for the teacher. Plus, it's more fun to watch a video at home than to do 50 division problems on a piece of paper. I think that it can help a lot and it is helping in fact.

MR. TOPPO: There is also an equality piece to this. That if I need to watch, you know, need a student, if I need to watch your video three times, that's nobody's business. It's between me and my laptop.

MR. CALLE: Exactly. Many of these students weren't doing well at all and we have seen incredible progress. I know that children with dyslexia, with ADHD, deaf children, people with all kinds of issues, use these videos. Deaf children can use them because they have subtitles. Recently, the mother of a blind child told me that he started watching my videos and since he started doing that, he has been doing math much better and he likes it much more. He can hear my voice at home. It's much easier to do this with a video. It's really cheap actually. All you have to do is have the interest and devote yourself to it.

When I started out, I thought there would only be 40 students and now we have much more. You are giving equal opportunities to all. I do it free. So, no matter how much money somebody has, they have the same chances. Not everybody can get a private tutor. I do it at home and anybody in a public or private space can do it. I would encourage all teachers to do this because I think that it can be a very important -- not just in math but in history, in English, any subject. Videos can be very important for use in all these subjects.

MR. TOPPO: I want to come back to the free word in a second. But let's talk a little bit more about equality. Do you folks in generally see your tools as tools of equality?

MR. PARTOVI: Absolutely. Totally.

MR. DIAZ: Yeah. Totally. I mean, in our case, when we started, we of course went with teachers to understand how we can make our content more engaging not only for private school students or public -- like for all the students. And the feedback was make something that is exciting and engaging for kids. In our case, at the Yogome starting, we had good guys and bad guys. Kids are the heroes who save the world with the power of their knowledge. So, they are fighting against evil queen, Nurancia, and this story engages kids.

I remember when we launched our first games having reviews from parents because we have these battles inside of our games. And parents were like, I am not sure if a game with math and battles is the best for my kid but I have never seen my kid so engaged with math. So, that is actually pretty, pretty exciting for me.

So, having those elements that, I mean, kids are used to. They are used to like seeing the most advanced movies, playing the latest console games. So, we can't, like, deny yourselves -- that we need to create content with quality. And at the end, this content will impact all kids. We need to make sure of that of course.

In our case, I mean, we were talking about like partnerships in the previous panel. In our case, through partnerships we are taking our content through all these organizations we are partnering with. Organizations that are donating tablets that includes our content for free. So, at the end that content can impact any kids in the world for sure.

MR. TOPPO: You know, anybody else want to tackle the equality question.

MR. PARTOVI: I want to say something about equality which is, you know, the reason I started Code.org is because computer science is an opportunity equalizer. Because the computer doesn't know who is using it. The computer doesn't know is it being used by a boy or girl, are they black or Hispanic or white. But the education opportunity in computer science has been very unequal. And we are headed into a world what's going to be more unequal unless countries do something about it.

Right now the United States, United Kingdom, Australia, South Korea, Japan, these countries have all basically big on rolling out computer science at a national level or the state level. Whereas if you look at Latin America, most of the countries haven't decided that this should be part of the curriculum. And, I think this is any industrial -- this is another round of an industrial revolution that we are going to see where the technology leaders are going to be in these countries that are basically adopting this in their education system.

MR. TOPPO: you know, just to follow up on that, I mean, you must get a lot of cynics that say, you know what, you are going to teach my kid some computer language in 2018 and in 2019, it will be obsolete. I know you have a reply to that --

MR. PARTOVI: That's a great question.

MR. TOPPO: -- but what's your reply.

MR. PARTOVI: So, in our curriculum at Code.org, we teach the things that have stuck around for 50 years.

MR. TOPPO: Has anything stuck around for 50 years?

MR. PARTOVI: Yeah. We teach the concepts rather than the individual programming language.

MR. TOPPO: Okay.

MR. PARTOVI: So, the programming language, you know, when I was growing up, you would learn Pascal, where today nobody uses Pascal. Whereas, the concepts of things like functions and variables, those have existed since, you know, they are mathematical functions that you can also use in code. The concepts of conditionals or logic, things like understanding how the internet works, the protocols of the internet. The internet has changed a lot in the last 50 years but the protocols are the exact same. So, we teach the things that are going to stand the test of time.

MR. TOPPO: And while we are talking about standing the test time, I just wanted to ask you if you could -- to give us the short version of what I think is this wonderful idea you have about teaching long division. Because I think it's really, in the context of skills that are useful moving forward. Could you just share that with us?

MR. PARTOVI: Yeah. Something that says that in education, there are so many debates about how we teach -- how can we teach better? And there is very little debate about what we teach? What should our children learn? Most of what we teach is the same thing we have been teaching for hundreds of years.

MR. TOPPO: And we are not really sure why.

MR. PARTOVI: Yeah just because why do we teach it, because we always taught it. And my favorite example of this is long multiplication and long division. Everybody in this room spent at least six months of your life learning how to multiply one long number by another long number to get an even longer number. None of us use that in our day to day lives. We all have computers and phones to do that. There was a time when every job

needed that. Whether you wanted to become an engineer, a financial analyst, a, you know, a scientist, if you wanted to work in insurance, you need to know how to do long division and long multiplication. In fact, the job title, if you were really good at it, you could be a computer. That was you job to become a computer.

MR. TOPPO: So, computers were people.

MR. PARTOVI: Right. But today, there is only one job in the world that requires knowing how to do long multiplication or long division, which is math teacher. That's the only job it prepares you for. Now that doesn't mean we shouldn't teach long division or long multiplication but do we need six months of repeating and getting good at this thing that you will never use again. You don't use it in calculus; you don't use it in algebra. You only use it in third and fourth and fifth grade and then you forget it because you never ever need it again. I think it would be much better to teach long division as an algorithm or teach multiplication as an algorithm and walk through writing the algorithm for how to do it but don't practice is it because the computer now does that for us.

MR. TOPPO: You know, I wanted to switch gears just a tiny bit in the time we have left. Talk a little bit about this pathway idea that Rebecca was mentioning. This idea that, you know, we have always had this concept of first we give access to school, then we improve the academic quality, and then we make it relevant to the real world. It strikes me that all of you have totally shattered that in some way. I want to pick on you Alison because it seems like you were the one who realized a little bit more than most on kids being in school in a certain way. I guess maybe Hadi too. Maybe I will pick on both of you. Do you see what you do working in another way maybe outside of school without having to rely on the institution?

MS. NAFTALIN: Yes, so we work both in Ghana and Uganda. In Ghana, we work in schools, in Uganda there is no state-provided kindergarten. And then the private school system that exists generally isn't in these remote villages. And so, the program works

in Uganda essentially by using community health workers who then train the mums, who then run the playgroups as a, sort of, this informal, informal afternoon club.

So, it works fine. It's slightly harder to scale but we are working through local government and through the health system route. Obviously then what it doesn't do is it doesn't tackle the quality -- the school quality issue but has other benefits in terms of the community.

So, yes, I definitely think being in schools isn't a prerequisite for the program and I would also say when we are talking about teachers, I think, it's really important to remember that teachers doesn't have to just include professional workforce. And what we are showing with the program is that parents, even illiterate parents who we work with are more than capable and in fact, are probably the best teachers.

And as was talked about earlier, children do spend the majority of their life at home rather than in school. And so, it, it's really important that we look at how can we unburden parents so that they have more time to teach as well as teachers.

MR. TOPPO: And just back to you briefly Hadi, the idea of Code.org totally outside of school. I imagine it exists in some way but --

MR. PARTOVI: Yeah. 40 percent of our students are outside of classrooms and schools but our personal focus is on the school because of the issue of equality. You know, every student goes to school and this is a subject that should be taught in schools to give everybody access. In fact the reason I am here is to help ministers of education from other countries, who haven't adopted computer science, to work with us to help how to make it part of the schools system.

MR. TOPPO: David, I wanted to ask you, kind of, push on your idea a little bit. You know, we have heard this morning the first couple of panels this idea of innovation. YouTube is kind of a traditional pedagogy. Watching a video even two or three times or, you know, building something around it, is very traditional. And that's been one of the criticisms

that, you know, the so called flipped classroom has gotten, right? Which is, what's the innovation? How do you respond to that?

MR. CALLE: Well, in my case, what I try to do is give different kinds of classes. It is true that you are talking about division and square roots. And I explain the same thing that many teachers explain in the classroom. However in all of the videos or almost all of them, I try to introduce concepts related to video games, super heroes, airplanes, buildings. I try to tie everything that we see in class to the real world and what the students actually love.

As Hadi was saying, we can't keep teaching math the same way that we did forty years ago when we didn't have the internet. We have to change the way that we do things and we have to show our students that science is not just letters and numbers on a piece of paper. We can't turn our students into calculators because that doesn't make sense in the current time. And we don't need to teach them to memorize things either because they can just look things up by clicking a mouse.

We need to teach them why they are doing things. So, if I am explaining something in a physics video like a pendulum, I will put Spiderman there. If there is a lever, I will do something with Thor. I can describe something with airplanes or a beautiful building that we have in Spain. I explain the same concepts as traditional teachers but by recording videos, you can be more creative. You can spend more time on the explanation and you can explain division without your students interrupting for example. And you can take that creativity into your videos.

That's what we try to do. We try to connect with our students more and try to give them STEM videos. We try to teach math and physics and science and that's all very important. But as he said, we have to change the way that we are explaining things because it simply doesn't make sense for our students to figure out square roots or do 50 multiplication problems. We have to teach them why that matters. Derivatives are wonderful as are integral numbers and that sort of thing. But we had to teach out students why that is important and how it can be applied in the real world.

If there were no math, there would be no video games. There won't be WhatsApp or Google. There won't be Code.org. Students have to be able to connect to what they are learning so that they can feel inspired to pay attention in science class, which is fascinating.

MR. TOPPO: Anyone want to react to that? That unassailable statement?

MR. CALLE: Do you understand me?

MR. TOPPO: You know, all of you to some extent have come -- obviously independently of one another but have come to see the power of play or playfulness in your work. And I wonder, has that been an easy sell for parents and teachers and systems or has it been difficult? I will just open up to anyone who wants to?

MS. NAFTALIN: Can I?

MR. TOPPO: Sure.

MS. NAFTALIN: So, we have worked quite hard on how we market the program to the community, to the parents. And I think there is an expectation that school is, you know, a very formal setting and you go in and our settings, you know, the teacher will recite from the blackboard. There is a this view of expected what a classroom looks like. But actually when you show people why an alternative method is more effective, they generally are really open to it.

So, I think it's really about communication and about showing parents and teachers why playful learning is going to be effective. So, I think, if you just tell someone, hey, you can learn through play and then you will get really great results, they probably wouldn't believe you but if you show them like, here is a game, what have you learnt? Then really quickly, I think, then parents and educators can very quickly buy in to the concept.

So, I think we just need to aware that it's not necessarily obvious to everyone why play is important but I tend to find that people are really open to it once they see the power of playful learning.

MR. CALLE: In my case, the parents love what we are doing. Some of them watch my video so that they can explain these things to their children. And some of them love it because they say that when they hear my voice coming out of the laptop in their child's room, they know that their kid is at least studying and not just playing around. And many parents say that's great, let them watch the videos since they know the Unicoos is there. They don't have to be so concerned about their children doing their homework so they can have more free time to do other things. So, they love it.

MR. PARTOVI: I believe for us, especially in the primary school, our curriculum feels like a game. The reason it is spreading so quickly in schools is it makes school more fun. You know, mostly students don't think of school as fun. They think of school as boring and, you know, homework. But when they do Code.org in schools, that's completely fun. In fact we regularly hear from teachers that the students don't want to go to recess because they want continue coding which they have never heard of for other things they do. And that's because coding doesn't automatically make you think it's fun but when you use Code.org, it has Star Wars or the Angry Birds or Minecraft and you are writing the code to control R2-D2 and you make your own R2-D2 game, that's fun.

And it's not -- you don't just play the game, you create the game and then you play the game and you put in on your phone and play the game and can take it home to show your mom. That's so much more exciting than what most of third grade or fourth grade involves. And yet at the same time, you are learning a whole lot of concepts. So, the combination of making it fun, making it play, but also actually having something that you learn from it is why it is spreading so quickly.

MR. DIAZ: We have a chance to do a partnership with the Yale University to do research around our content. So, before them actually deciding to work with us, they tried our games. And they were like, this is exactly what we are looking for. Not only the educational content but actually, how can you mix entertainment and educational content to give a more engaging experience to kids.

I remember attending one of the sessions where they were doing the research and kids, thanks to these battles and these characters, they were like just going through all the math content and all the different operations because for them, it was how can I get the next character, how can I win the next battle. They only way to actually achieve that is to go through the educational content. So, when they have like this elements of not only focusing on the educational content but actually having like a bigger reward for them, where they actually like engage with the story, the characters and everything. It changes everything. It is not education anymore, it is a more exciting experience.

MR. TOPPO: So, the irony is that when you are playing you work harder.

MR. DIAZ: Yeah.

MR. TOPPO: Right. And you work for longer.

MR. DIAZ: Yeah.

MR. TOPPO: By the way, David, I have a way for you to raise money. I think you need to do your voice-over maybe I don't know, maybe like people's answering machine, you know.

MR. DIAZ: Now it will be great. It would be great for my videos to be dubbed in other languages with voice-overs because it's really difficult to watch a math class with subtitles. So, if anybody here does voice overs let me know. That would be wonderful. But I don't want to be a competitor to Khan Academy or anything like that.

MR. TOPPO: I think that would be great. You can Khan Academy, head to head.

MR. DIAZ: Well, we are getting there. I am Khan Academy in the Spanish language. In Spanish, I am Khan Academy. And I really love the work the Khan Academy does. In fact, I was imitating Khan Academy when I started recording my videos. I looked at what Mr. Khan was doing and it really inspired me. I said that if he can help thousands of students all over the world, English speaking students, I will try to do the same thing in Spanish. So, he was a benchmark for me. So, I thank him.

MR. TOPPO: I think Sal Khan would say he is the Unicoos of English. You know, I would like to open it up for questions, little bit. Let's see if people have some thoughts they

like to share with the panel. I have three rules for panels and the Q&A. Tell us who you are, tell us, if you like to, where you are from, and the third and most important rule, please I beg of you make it a question. And short as possible too because we have a lot of people who want to get to the questions. I will give an award for the shortest questions. So, there is a mike here. Yeah. Is there only one mike? Just choose the first question. Up to you.

MR. VISHAL: Thank you for the insights. My name is Vishal, I am from Dream a Dream, India. The question I have is, I think, from the morning. The question we are sitting on is what is the purpose of education? And the perspective I am picking up here and I would like to just put challenge the panel on that is that we are still trying to teach old things in a new way.

MR. TOPPO: Did you say all things?

MR. VISHAL: Old.

MR. TOPPO: Old. Old, I am sorry.

MR. VISHAL: So we are still focusing on mathematics and languages and social sciences. We are trying to find new ways to teach them but not really asking the question of what is the purpose of education and what skills do kids need to leapfrog and be prepared for the future?

MR. TOPPO: I think I know who would tackle but I am going to open up to anybody. So, the idea is we are not pressing on the real question which is should we be teaching the things that we are teaching. Forget how we do it. The what question, right?

MR. PARTOVI: Yeah. Well, I think the purpose of education is to prepare students for their future life and in the 21st century, we should be rethinking what we are teaching them. And that doesn't mean we shouldn't teach math or reading and writing. We should for sure teach math and reading and writing. But there is many new skills that we never taught before that are as important or perhaps even more important. And the reason we advocate for computer sciences is because it's becoming increasingly foundational to every industry, to every field of science. But aside from computer science, financial literacy is something that is increasingly important yet not taught in the school system. I believe statistics is more

important than calculus and yet in most schools, more schools teach much more advanced math and statistics.

So, I highly encourage all education leaders to ask your question of what should we be teaching these students not just how. And what should be the new curriculum of the future?

MR. TOPPO: For other panels, is your 'what' changing? Have you discovered that you need to be teaching something different?

MS. NAFTALIN: I mean, for us we look at the sort of four main to mains of early childhood development. So, we are sort of looking at language development, socio-emotional skills, intellectual development. So, thinking skills, decision making, analytical skills, critical thinking and physical skills. So, we do that through outdoor play.

And so, I think, essentially what we are trying to do is use the teaching as a tool to aid childhood development. So, I guess, our content is not domain specific. It is very foundational life skills and I guess, sort of, all education really is geared towards that. Because no matter what you are teaching it's things like a lot of trial and error, resilience, social skills getting on with each other -- concentration, memory, all, all of these things are so crucial. And, I guess, sort of, there are multiple ways for children to get these things. But for us that's what is all about and I would imagine that the other guys would probably say similar hopefully.

MR. TOPPO: Okay if you don't agree. Other questions. Let's get one over on this side. Remember, who you are, where you are from, and make it a question.

MS. CICERONI: Great. Good morning. Thank you. My name is Gina Ciceroni and I head up the innovation work at Teach First which is based in the United Kingdom, part of the Teach For All network. My question is picking up on the topic of sustainability and scalability. And I think it's really interesting hearing about how your organizations have scaled. And one of the key things is about impact and not just reach. And so, I am really curious if you can share what you have done to date to evaluate your work. What you have learned in terms of narrowing the gap and what you still hope to achieve and where you have seen that some of the challenges are?

MR. TOPPO: Wow, that's -- on my count, that's 12 questions. Three times four. So, impact versus reach. Let's start with that.

MR. DIAZ: Well, in our case, I mean, thanks to this opportunity with Yale University, we did our research during two years. We just published the white paper, the findings last year. And the finding is that kids who use Yogome improved their math skills compared to those who don't use our math content. We focused for this study on first grade and math. Kids played two hours per week during four weeks and with that time playing our content, they actually improved their math skills. So, that's really important for us.

I mean, there is a lot of competition in our space -- the direct to consumer product. So, for us we want to add this level of validation not because we have super talented academic team in the company. The product is actually educational. We wanted to go and have the time to work with a university to actually go through all this research, sorry, to make sure that it's educational not only because we say but because there is some proof of that behind the product.

MR. TOPPO: Thanks.

MS. NAFTALIN: Thanks for the question. Yes, so we are in the process of working -- we are working with the Institute for Fiscal Studies in London who are conducting a randomized control trial at the moment. Baseline report about to be published so keep watching our website. But also what we are quite excited about is the randomized control trial is obviously is quite static based by the nature of the state, sort of relatively controlled environment to avoid contamination. And as we scale what we want to know is as we scale there is obviously a massive risk that you will lose quality in the scaling process.

So, what we are quite excited about is we are looking at, sort of, based on the RCTs in some of the key indicators about what assessments what instruments work well in that. We are looking at -- we are creating a, sort of, snapshot rapid evaluation that we are doing, sort of, as we scale so that we cannot only have the RCT but we can look at -- as we iterate, sort of, how we may move away from the results and what changes to the impacts. So, I think,

evaluation is absolutely critical. Obviously, no one wants to scale a program that doesn't work.

MR. TOPPO: Wouldn't be the first time.

MS. NAFTALIN: It wouldn't. And, I mean, actually having said that is also really valid to learn about what doesn't work and why. So, I think, yes, evaluations are very important.

MR. TOPPO: Thank you. David.

MR. CALLE: We have the advantage that we have a team of engineers and we have teachers from all over the world. These people have joined this project altruistically. We do have some income using YouTube, we make a little bit of money. It's not like it is in the US and Spain but we get a little bit of money or we get a small contribution from a company and we can use that money to grow. Right now, we are starting to talk to certain multinational corporations to see if they can sponsor the project. Because right now, our only goal is to hire teachers so that they can record videos in biology, statistics, computer science, other subjects. The idea is for us to grow and for us to help more students.

Meanwhile, we are doing it altruistically and we all have our day jobs. That's what we support our project with and we just work with our passion and it's scaling up on its own.

Right now, we are planning something. Our engineers are designing a tool to allow professors and teachers to use Unicoos in a specific way to see what students have seen videos and what students haven't. They could use Unicoos as a platform to do homework and the teachers would be able to oversee what their students are doing better. We are hoping that we can use that in schools. And if not, we will just keep struggling because we will just keep pushing forward to do what we do. We can still record videos and our teachers love to help other people and they love the idea. So, we keep moving forward.

MR. PARTOVI: -- ability and impact versus reach and evaluating. For sustainability, you know, we try to change the actual school system not just providing a technological tool and we have worked with 43 states to change the curriculum policy at the State level and with about 200 school districts to change curriculum at the level of the school district. So, all of the larger

school districts in the United States have worked with us. New York, Chicago, Los Angeles, et cetera.

From a standpoint of evaluation, there is two things we try to test. One is are the students learning computer science which they better be learning that because that's what we are teaching them. And in our high school classes and the advanced placement class, which is a college level course, 73 percent of our students pass the exam. And this is remember, their teacher never learned computer science. But that teacher using Code.org is enabling 73 percent of students to pass a college level advanced placement exam.

The other thing we have been evaluating is whether teaching coding and computer science helps in other subjects. And this might be the most interesting, which is we just work with a third-party researcher that found that in third, fourth and fifth grades, the students that used Code.org more performed better at their math and science and English and literature exams at the State level. And that, I think, is an interesting finding in general just because it helps engage students more in school and makes school more fun so they get better at everything.

MR. TOPPO: So, David, this is not your day job?

MR. CALLE: Yes. I am teacher in an academy and I use this as a service when I am not teaching to help students pass their exams. Like a consultant, I have a lot of work and I just manage to work a few hours a day on Unicoos and during my vacations and on weekends, I record more videos.

MR. TOPPO: Do you sleep sometimes?

MR. CALLE: On planes.

MR. TOPPO: Actually I want to -- can I get to more questions? I want to talk a little bit about this idea of things being free. Because it sounds like what most of you are doing, there is at least the intention of keeping it free for institutions or for families or teachers. But, you know, as we are all hearing pretty much all of you talk kind of in an under-serving pleasant way. This is expensive stuff. It costs a lot to produce, it costs a lot to make it good to, you

know, keep the fidelity to -- in Hadi's case to, you know, travel the -- not only the country but the world trying to make sure that, you know, school systems, sort of, work this into just how they operate.

You know, it's like free parking, right? Free parking isn't free, right? What you guys do is free but it's not really free. Can you offer some thoughts on, I guess, it's a different kind of sustainability, right? I had the same conversation with Luis von Ahn of Duolingo, right? You know, Duolingo is this language app that all of my kids' friends are using and it's free and he intends to keep it free. But he has got very clever and interesting ways of paying for it around the edges that never affect the users. I don't know, it's open to anybody. How do you keep what you are doing free without going broke? Maybe that's not even the right question.

MR. PARTOVI: All the material on Code.org is free. It's not fake free.

MR. TOPPO: Okay.

MR. PARTOVI: And in fact, it's so free most of our videos are licensed under creative comments, which means Unicoos could take the video and post it on their YouTube channel and just say it's our video. You can literally copy the content. All of the technology is open source. And in fact, in Russia, they don't want the students using Code.org so they made their own Russian version using our open source platform and just copied all the stuff. And we are okay with that. We are very willing to let education -- the investment we make in high quality content, we want to reach as many students as possible.

MR. TOPPO: So, is it just, you know, Silicon Valley investors opening their wallets for you?

MR. PARTOVI: There is a lot of either technology companies or founders of technology companies who themselves became very wealthy by -- because of the skills they learnt when they were young and just thought this is something that every student should have the opportunity to learn. And so, yes, so far we have been very lucky to have folks like Microsoft and Amazon and Facebook be such strong supporters of ours that we make this pledge of making it free.

MR. TOPPO: So, what about everybody else? Yes, David. I think next time you are on a plane and you see Hadi, don't fall asleep. Okay. You just follow Hadi wherever he is going. Anybody else want to talk about --?

MR. DIAZ: In our case, we are a for-profit company. With the first versions of our product, we found out that parents are willing to pay for subscription product like the one we have. And thanks to that, we managed to raise right now over 35 million in venture capital. But now with all these product that I was mentioning, our effort to have it accessible for free for schools is something that we are actually working on right now.

At the end, parents care about what their kids are using. So, we want to like get teachers to actually use the content inside of the classroom.

MR. TOPPO: So, you got a consumer --

MR. DIAZ: Consumer

MR. TOPPO: -- version that's paid and a school version that's free.

MR. DIAZ: Yes.

MR. TOPPO: Alison, you want to?

MS. NAFTALIN: Yes. So, at the moment we are grant funded and we are heavily dependent on grants but the aim long term is that we would like the governments of the countries that we work in to pay for the project and just incorporate it into the kindergarten budget. To keep obviously, we are working in poor countries and we realize therefore that the budget per child has to be extremely low. We are looking for, sort of, under 10 dollars per year per child. And the way that we do that is obviously all the games are made from local materials, the mothers work on a voluntary basis, the teachers do the teaching as part of their regular duties. It all is, sort of, integrated into the system. So, our sustainability plan is basically keep the program, sort of, operating within the systems that are already there and the extra inputs they have to just be, sort of, as pared back as possible.

MR. TOPPO: More questions. Over here in the back.

MR. FILIPE: Hi there. I am (Filipe G) from Brazil. My questions is to Manolo and Hadi. We teach English online and we are working with public schools right now. We have faced resistance from the teachers because we see students learning faster than them sometimes.

MR. TOPPO: On your platform?

MR. FILIPE: Through our platform and in Brazil, 97 percent of teachers don't speak English. The English teachers don't speak English. How do you guys deal with the resistance from the teachers? Because the teachers come to the Secretary of Education and say this program is challenging us. And then the Secretary of Education come to us and say, you know, it's hard, the students are learning but the teachers -- how do you deal with it?

MR. TOPPO: So, it's kind of a question about control, right? I mean, who is in control?

MR. PARTOVI: We are lucky. We have the opposite problem. Which is the teachers go to the Secretaries of Education and say you need to be teaching this because we love it so much. We have, I would say, the exact opposite of teacher resistance. But I think part of that is because in your situation, the teacher doesn't think that English should be taught with a computer. In our case, they assume if it's computer science the computer is going to -- there is going to be a computer involved and the teacher doesn't know coding or computer science themselves, so they are happy to learn along with their own students, to learn something they never learnt before.

There is though this challenge of some students go ahead of other students and what we encourage for the teachers is to find the students that are farther ahead and to bring them to the front of the class and have them help you do your job. And so, the student that is learning ahead of the other students can start developing leadership skills in, sort of, just finishing 10 lessons faster than everybody else.

MR. TOPPO: But this gentleman's question was kind of a political question in a way. Maybe you can answer the political piece of that which is how do you turn the tide --

MR. PARTOVI: We have the reverse political situation. He has the situation where the ministry wants this and the teachers are resisting it.

MR. TOPPO: Right.

MR. PARTOVI: We have the opposite which is this ground up movement of teachers --

MR. TOPPO: Sure.

MR. PARTOVI: -- where it's spreading amongst teachers and then we go to government leaders with the data saying, look, there is 10,000 teachers in your jurisdiction already doing this. Why don't we roll it out to every school?

MR. TOPPO: So, what would you push on if you were advising this gentleman?

MR. PARTOVI: Well, the resistance you described most of all is the students learning faster than the teachers. I would encourage to find a way to get that student to become a teacher, you know, to join the teacher at the front of the classroom because I think, the student who is learning the fastest can then develop leadership skills and make the job easier for the teacher rather than getting ahead of them and challenging the teacher.

MR. TOPPO: Did you ever --?

MR. DIAZ: Yeah. I mean at the end -- it also depends on the location, in our case, in Mexico, private schools are adopting coding classes. Now there is a big movement also in public schools but for now, we are dealing with teachers that don't want to like learn new things. This last two years there were like some serious updates on how teachers are actually evaluated or how teachers are selected to be given a lesson to be part of a school. So, that doesn't help, of course.

We actually started -- our first client some years ago was a private school. We tried to scale that. It wasn't easy. So, I mean, the reason why we sell to parents is actually because of that. Now we are going back into trying to get in to the schools but with all this approach of the product being free -- even with the product being free it's not easy. So, this concept of selling to schools is --

MS. NAFTALIN: Can I just add, which is -- I mean, it's not the same but it's sort of similar to the problem that we face where it's, sort of, the issue of potentially teachers seeing you as trying to bypass them rather than work through them. So, I would say that anything that you

can do to really empower the teachers and make them the owners of the solution, the more buy in obviously from the teachers that you have, the more likely the program is to succeed. So, anything that you can add on to market rigorously to the teachers to really get them to own the program and to be the one, sort of, steering it, I think would really help with that.

MR. TOPPO: Other questions. In the back. We are going to come to the front soon, I promise.

MS. KOMAL: Hi, my name is Komal. I am the CEO and Co-founder of Lab4you and I am from Chile. And my question is, now that we understand that the product has impact, in Latin America we face that many schools lack the infrastructure, basic internet. So, I would like to know, how has your conversation been with government officials or district leaders to improve that infrastructure? We might have computers or tablets in schools but internet is a problem. How has your conversation been with district leaders, for example, to improve that?

MR. TOPPO: Anybody?

MR. CALLE: In my case, people can download videos from YouTube. I am not sure what the situation is like in Latin America. I am not sure if there is a full coverage. I am not sure if they access to it in every school or in libraries. However, I have many viewers in Latin America and none of them has ever told me, well, I can't watch the videos because I don't have the internet. When I was young, I would go to the library and that's the only place that I could get information. So, today there are young people that don't have access to internet in their homes and they have the option of going to a café or a library to get online or a train station or something like that. That is an issue and it needs to be solved. I hope internet can reach everywhere in the world because until we achieve that, education will not be truly universal. That is a very important challenge but it is a political challenge, not one for us.

MR. DIAZ: Some years ago, we decided we didn't wanted to depend on government to really like sell or have our product more reach. As an example, this government, the current government in Mexico, gave these tablets, like Android tablets to -- I think it was like a one million students some years ago. The thing is the content was really

bad. They were missing a lot of content. Two years ago, I attended a meeting with the team involved in this tablet project. They don't even want to mention the project. Two years after they gave away these tablets, it is like prohibited to talk about the project. They are just waiting for these students that received this tablet in fifth grade to complete elementary school, so there is no like proof of this project being the --

MR. TOPPO: Existent.

MR. DIAZ: Yeah. I mean, when you -- the primary government is like a lot of things happening there that you really don't want to be a part of.

MR. TOPPO: Rebecca, what was the -- in the book, the program that was -- the tablets that were basically not connected. Can I ask you to come up and talk for 30 seconds about that? Because that might be an interesting way to, sort of, square the circle.

MS. WINTHROP: Yeah, the book opens with a story from an NGO called Pratham which many of us know that's based out of India, and their founders, Madhav Chavan and Rukmini Banerji did an experiment where they have for years, been developing educational content in Hindi and local languages and testing it and making sure it works.

And then they loaded a bunch of hardy tablets and basically, brought them to -- I don't know, their pilot was 400 rural villages, that was their initial pilot. And they said, two rules, one kids have to share the tablet, 10 kids to a tablet, so two groups of five and a parent has to charge the tablet at night. And they just saw what happened. And it was offline. These are kids that didn't have any internet.

And then they used every two months, every three months, they would send back a community worker who would get the data off of what the kids are -- what kids were doing with the tablet and on-load new content. And it was exceptional. I mean the first thing that the kids did is they hacked all the passwords to bypass the tablets and started doing their own content, making their own content. But it really, you know, it boosted academic scores but did so much more than that.

MR. TOPPO: I mean it strikes me that that's a possible --

MS. WINTHROP: Good example.

MR. TOPPO: -- to the question. I don't know. Does that help? We go back to you. Can you give that person the mike, please? Hang on, hang on.

MS. KOMAL: Can, maybe Hadi speak about the conversations he has had with the government officials?

MR. PARTOVI: Sure. You know when I have spoken to the Ministries of Education globally, but especially, in Latin America, the message I hear is there are very few places that have connectivity in every school. The exceptions in Latin America, I think, are certainly Uruguay with Plan Ceibal in Costa Rica, but there is many countries that are investing in increasing it. So, for example, Paraguay or Ecuador have announced plans to not only get computer service school but even one-to-one computing. Argentina is on its way towards getting there. So I would say, on the first front, we don't have one-to-one computing or even computers in every school but it is improving.

But the second thing I had say, for what we do for computer science, you don't need one-to-one computing. You need 20 to 30 computers for a thousand students, that's enough to teach a computer science class in the school. Many, many schools actually have that. So, for example, in a city like Magangué in Colombia, you don't have one-to-one computing but every single school has at least one computer lab that's connected and that works.

For us, because we want to reach every child, we are now investing in trying to figure out how to make our entire curriculum and all of our videos work offline disconnected as well. So for the schools that don't have that, we can give them something on a thumb drive that they can go from computer to computer to enable that. We are not ready to roll that out. We are just getting started thinking about it. But I think that is going to be the way to reach every child if you think about countries that don't have good internet access.

MR. TOPPO: Okay. Let's move up to the front here. Can we get this gentleman in the second row? Thanks so much for your great short question, by the way.

MR. READING: Hi, my name is Mark Reading from Atlassian Foundation. My question is primarily for Hadi. Hadi, I can't recall how many languages you mentioned earlier that Code.org content had been translated into but my recollection was that it was a very large number. And I guess for scaling purposes, often you will need to translate content into multi languages. My question to you is how have you gone about that? Have you created some sort of translation system, particularly when you have had content that presumably is evolving rather than being static? So any insights that you can share in relation to translation would certainly be welcome.

MR. PARTOVI: Sure. I want to make sure I don't overstate. We have 400 hours of curriculum and maybe 10 hours of it is very broadly translated. So our most popular one-hour tutorials are in over 50 languages and they are translated by volunteers. The volunteers translate these instantly. When we create the new one, they get translated. And I think it's actually more than 50 languages. There are languages like Kazakh in Kazakhstan, or Icelandic, or Catalan in, you know, Barcelona. There are groups that have translated just our one-hour tutorials. Our next 50 hours of curriculum is translated into about 15 or 20 languages, and then the rest is only in English.

So for us, one of our most important projects is to translate everything. And the way we do that is we use a system that enables crowd-sourcing of the translation. So anybody can come in and translate but then we work and identify regional partners in individual countries that have a real interest in doing it. And so for example, in Barcelona, there is this group that wants to see computer science taught in Catalan. So we are not relying on the volunteers. That group is actually doing the work. They just come in through the crowd-sourced system.

MR. TOPPO: Got you. We have time for maybe one more question. This gentleman in the middle here.

MR. MUSKIN: Thank you. I am Josh Muskin from Geneva Global. And I wanted to get back to the question about the title of the panel, Unburdening Teachers. And I

think everyone agreed that it's much less about unburdening them than giving them the burden that they are enthusiastic --

MR. TOPPO: Good point.

MR. MUSKIN: -- to carry and ridding them off the more mundane. But I am wondering about how do we get the teachers to do what we are talking about? How do we get the teachers to teach different content, to teach differently? Some of it is about giving them the -- crutches is not the right word -- but the tool of IT.

Someone asked the question earlier about the capacity of the teachers and I would like to get into what are we doing to give the teachers the capacity and the motivation to do this. But not just the capacity what I call intrinsic capacity, the tools that they have to manage, but what I call the extrinsic capacity giving them the conditions in which to be able to do things differently. Rebecca mentioned earlier recognition as one of the four topics. If we are asking teachers to teach the personal skills, but we are still testing them and doing long division as the gate that they have to pass through to be able to get to the next level. Then, we are really burdening the teachers in a very different way. So, just to get some insights on that.

MR. TOPPO: It's a big question. It's a really big one and I think it's an important one.

MR. TOPPO: So the idea is really -- can I paraphrase, do you mind? I mean how do we, sort of, motivate teachers to do something bigger?

MR. MUSKIN: To teach different content, different way.

MR. TOPPO: Yeah, different content, different way. Okay, that's a much better way. Different content -- how do we teach teachers to teach different content differently? In a way, I feel like we have been talking about this whole time but maybe, let’s maybe drill in a little closer.

MS. NAFTALIN: I mean, so for us, we have a very structured. It is a very behavior change based program. So, a lot of energy on engaging the teachers at the

beginning. Getting them to realize why what they are doing now isn't the best way. Why there is a good solution for them? Why that solution will make it easy for them? What the benefits of the solution will be? And we put a lot of resource into training them.

And then, a lot of ongoing support. And I think, ongoing support is often a thing that gets missed out but it's absolutely crucial. They need to be a part of the support network. They need that from the leadership of the system that they are affiliated to. They need them from their peers. In our case, they need it from the mothers who are bringing in the classroom, they need it from the students. So, they do need recognition.

What we absolutely try to avoid at all cost is by giving them a monetary incentive. They have to have the intrinsic motivation and it's our job, I would say is, as thought-leaders, as change makers, to tap them and connect them to that motivate them, to really give them the desire to change and then the support to do that. But I think, that's what -- how to make like that change happen and that's, sort of, where we focus most of our attention, I would say.

MR. TOPPO: You know, it strikes me, Rebecca mentioned at the very beginning this idea of where or what is education's Wikipedia moment. And as Hadi was talking about this simultaneous translation stuff, it occurred to me is that one of the amazing things of Wikipedia is -- it's free by the way -- but people created it for free with the exception of maybe couple of people on staff, and the people who are working on it are very excited about it. And maybe that's the question - how do you get people to work on a project like this, you know, no remuneration, no extra remuneration, big massive thing you can barely get your arms around, you might only have a tiny little piece of it that’s interesting to you, right? But that piece of it -- people are sort of, obsessive about it, right?

Well, we have about a minute and a half here, any insights into this like how to create those conditions that people really want to --

MR. PARTOVI: Well, I have an interesting experience because most educational schools are helping teachers do a better job of teaching the job they are supposed to do.

MR. TOPPO: Yeah.

MR. PARTOVI: You know, you are a math teacher, you have to teach math and you find the tool that works for you. We try to get teachers to teach something they are not supposed to do, you know, and to actually make time in their classroom to teach something that the school doesn't necessarily require or even want. And so, motivating the teachers is a big part of what we need to do. And at Code.org, I think of ourselves almost two things in one. One part is an online learning platform like a Khan Academy but the other part is a social movement to basically wake up teachers and sort of make them feel like they are kind of they are taking a little bit of more control over the education that their students are getting.

MR. TOPPO: I think maybe -- I mean, actually and that's an interesting way to -- we need to create a social movement.

MR. PARTOVI: Yeah. We regularly use the language of calling this a teacher-powered movement. Recognizing teachers is a big part of what we do. And, you know, when Rebecca was showing the slides or actually doing the raise of hands asking who thinks schools are innovative or cutting-edge, teachers feel the same way as well.

MR. TOPPO: Yeah.

MR. PARTOVI: Teachers, they are regular people and then they go to school and like, oh, nothing is changing.

MR. TOPPO: Sure.

MR. PARTOVI: And part of what has made Code.org successful is we tell these teachers you can be the change that you want and, you know, make them feel like this is their thing and that motivation is a big part of what helps them think about teaching different content with different tools.

MR. TOPPO: So, I wish we would talk a lot longer. We are pretty much at the end of our time. I want to thank these wonderful panelists and also I thank the great audience for your wonderful questions. So, please give everybody a round of applause.

Tiny bit of housekeeping. We are going to move into lunch. Take a look at the map that's in your packet for where the lunch lessons are going to be. The map is also on the screen behind me. Here is comes. While we are waiting for that, as Emiliana mentioned this morning, we will divide into four different rooms. This is very important. Get up here folks. We will divide into four different rooms during lunch for deep dive discussions. Lunch will be served in each room so we suggest that you move directly to the room that you want to be in. People are leaving already. See what's more important.

They will start promptly at 12:25 and conclude at 1:15 and if you do not want to participate in the lunch session, you can grab your lunch and come back in here. Last thing, the book 'Leapfrogging Inequality: Remaking education to help young people thrive' -- I am speaking over the classroom will be on sale. So, pick up your copy. Thank you.

(Recess)

MODERATOR: So if folks want to grab their food and take a seat that would be great. I think we have another good problem of an over-subscribed event. I will just say we do have space in two other events if people are interested. And there's also more food there.

So there's an event on (inaudible) on Innovating and Education from the Inside. And then there's also a Session on Introducing Computer Science and Coding in the School Curriculum. So if folks are on the fence and would like a seat and some food, there's certainly space in those two rooms. And if you walk out, you could be directed to either.

All right. Good afternoon everyone. We are going to get started. Welcome, welcome. My name is Jenny Perlman Robinson, I'm with the Center for Universal Education here at Brookings. And on behalf of Brookings and the Inter-American Development Bank, we want to welcome you to this Deep Dive Session on can education technology improve

individualized learning for all and help scale inclusive education.

The idea of these sessions right now are a few things. First is to have an opportunity to go a bit deeper in some issues that have either come up this morning, will be raised this afternoon, that we've all be thinking about. Secondly, to really have a chance to have a conversation. I apologize, I know that the layout of this room is not the most conducive to having a dialogue, but that really is the idea. That I know we'll have some really brief framing remarks from our esteemed panelists, but that it's truly an opportunity to have a conversation amongst ourselves.

And third, to eat. Nourishment is important, so feel free. You should be eating, opening wrappers, making noise, don't be shy about that.

So I think, you know, if we're having a conversation today about innovation and leap frogging, certainly technology plays some role. We might fall in different places along the debate, but certainly it is playing and can play a role, and particularly as was raised this morning in reaching marginalized kids potentially better, faster, and cheaper. So that's what we're going to be discussing here today.

I want to thank our distinguished panelists for joining us today. I'm just going to very briefly introduce them by name and not by biography, just because of limited time.

So first I have on my right Victoria Tinio. Vickie is the Executive Director with the Foundation for Information Technology Education and Development, also known by the acronym FIT-ED, in the Philippines.

To her right is Anthony Bloome. Tony is the Senior Education Technology Specialist with US Agency for National Development, USAID, here based in Washington, DC.

To his right we have Rachel Hinton. Rachel Hinton is the head of Education Research at the Department for International Development, based out of the UK.

And to her right is her colleague, Mandeep Samra, who is the lead for Ed-Tech and Innovation Hub, also with the Department for International Development in the UK.

So without further ado, I will turn it over to you, Mandeep, to provide some

framing remarks, and then we'll start the conversation.

MS. SAMRA: Thanks, Jenny. Can everybody hear me okay? Great. Well a big thank you first of all to Jenny, Rebecca, Alene, Adam, many of the others at Q and Brookings. You've done a fantastic job of putting together this event and we're really pleased that we could be here. So a big thank you there. And a big thank you to all of you for multi-tasking, eating your lunch, and joining us for this Deep Dive.
It's much appreciated.

And just to reiterate Jenny's remarks about it being as interactive as possible, we'll be having a few opening remarks of a few minutes each, and then really encourage you to put forward some questions, some stimulating debates, and any reflections that you have from the audience.

And thank you to the panel as well. A breadth of skills and expertise, so I think we're in store for a very lively discussion.

In terms of our key objective for this Deep Dive, we want to explore how education technology could improve individualized learning opportunities for all children. And the real emphasis is on the "all" bit. We want to really think about how we can reach the poorest, most marginalized children. So that could include children living in fragile, complex affected settings, girls, children with disabilities, and very importantly, it could include multiple form of disadvantaged. How all these characteristics could come together?

I know certainly from DFID's perspective we recognize Ed-Tech as a big source of potential innovation, particularly around individualized learning and that offering new platforms, new ways of teaching literacy in numerously to children who otherwise might not have that opportunity. But we also recognize there's a huge host of challenges and barriers and limitations that come with that. So we're not overly optimistic, and part of the debate today is very much to get to the bottom of what your reflections might be on this debate.

So without further ado I'd like to open up to my panel and get their top of mind reflections and some of the priorities from their respective organizations around individualized

learning for all. Starting with Vicki, perhaps.

MS. TINTO: Thank you, Mandeep. Good afternoon everyone.

When we were conceptualizing this Deep Dive and figuring out what the focus should be, we were using the term “individualized learning,” and the question came up, what do we mean by that, how are we using it, then are we using it in the same way.

And so I found this very useful article written by ISTE, the International Society for Technology and Education, that differentiates between three related, often used, interchangeably terms. Individualized learning, personalized learning, and differentiated learning. And Mandeep asked me to just very, very briefly -- is there anyone from ISTE here? No. Okay. I’m just going to do a very, very brief gloss on their definition. You may agree or disagree, hopefully not violently. And then we can just talk about that.

So differentiated learning happens, it’s an approach to learning, an instruction that involves usually classes and sort of looking at classes, groups of students. There’s a set curriculum or the overall overarching academic goals are set. Everybody has to finish something. The teacher doesn’t make individual lesson plans but has the flexibility to, in grouping the kids in a heterogeneous class, and then designing the instruction assessment, the types of materials, the trans levels and so on, to address the particular needs, preferences, goals, of the kids so that everybody, all of the different groups are able to get through what they need to get through.

Individualized learning typically is used really to focus on the pace of learning. So you have a set curriculum or set materials and the individual learner, or if there’s a teacher involved, an individual plan, work plan or lesson plan, that sort of paces the learning in a way that’s tailored to the learning style or preference of the student.

Personalized learning combines, it’s the whole thing. It combines both the flexibility in pace, but also the flexibility in terms of the instruction, the materials, the content, and even the possibility of the individual learning, designing the learning himself or herself, choosing what to learn, when, and how.

So the first point being is what when we say individualized learning in this session, what do we mean. And, Mandeep, I think you have a particular understanding of that in your context.

MS. SAMRA: Yes, so certainly from DFID we mostly talk about individualized learning under the definition that you talked about. But I think we're certainly guilty of often using adaptive learning, personalized learning, and certainly through the work of the Tec Hop that we're launching, that's one of the areas we want to really hone out a bit more and make sure that we're clear on our definition for that. Thank you.

MS. TINIO: In the places that we work with, which is mostly all developing countries through the Global South, but particularly Asia, what we've seen is really a focus on differentiated learning and differentiated instruction. And this makes sense because of all the various constraints we're familiar with that we find in developing countries, particularly the very, very large class sizes, from 40, 50, 60, 100, over 100 in one class. But also because of the dominant pedagogical approach, which is still very transmissionist.

And so if the focus of this session is really on equity, reaching as many, looking at the intervention that will give you the greatest learning gains for the greatest number of people. And so if we go through all of those three things, like individualized and personalized learning, if that's difficult, in and of itself, at scale it's even more difficult.

Differentiate instruction, which seems a little more manageable because you're looking at classes and groups, not as individuals. Our experiences, with or without technology, we're doing quite poorly in that regard, even just differentiating. Oh I shouldn't say "just," because it's very difficult. And the onus is on the teacher to be able to design the instruction by notes, group the kids, and design the instruction assessment and all of that. So it's difficult in and of itself, at scale it's even more difficult.

The work that we're doing with additional learning for development project as funded by Canada's IDRC and this new coalition we call the Deep TPD Scale Coalition for the group, focuses precisely on the teacher. Because we think that if we want to move forward in

terms of differentiated instruction, and even towards individualization, personalization, we might not be using technology directly with the kids, but we will be using -- we can use that to enable better TPD and more effective teacher professional development in order to reach the kids through the teachers.

MS. SAMRA: Thank you, Vickie, that's a great way of setting out some of the language and definitions. We'll welcome opinions on that when we open up for questions and discussion.

Next, Tony, would you like to give a bit of your perspective and what USAID is doing in this area?

MR. BLOOME: Thank you, Mandeep. And thank you to Brookings for hosting this event. I also appreciate that this room sitting up here looks a little bit like you're in an airline, right? And typically what happens after we eat lunch, it's either a movie or you go to sleep. So I want to say thank you for not expecting a movie, and hopefully not going to sleep.

So I want to pick up this point in regards to acceleration or sort of that scale. So USAID supports a bundle of activities, principally in three focus areas. Early grade reading, education in crisis and conflict, and for youth in the workforce. So a number of you may be familiar with that.

I support a project called "The All Children Reading Grand Challenge." How many of you are familiar with All Children Reading Grand Challenge? Not everyone. I will use a number of examples from that. It's a collaboration that we have with World Vision, the Australian government, a variety of other partners, including IDRC. It's specifically looking at technology for early grade reading.

So my comments, I actually want to focus on the lens of early grade reading. And I know we'll be talking about disabled or other populations in a moment.

So one of which, when I'm at a conference and people talk about 21st Century skills, my typical response is "Oh, you mean Early Great Reading?" And so that's where we spend a lot of our time, focused on technology for Early Great Reading. Now you could use

Early Great Reading to talk about stem or coding, but really the majority of client populations we're working with, it's a really important area. Fundamentals of Early Great Reading.

So I sort of distinguish it in terms of individualized learning from two perspectives. One of which is where further in the value chain can technology be used to help the teacher or the student in the classroom? And that may not be that you have technology in the classroom. So those are simply system-strengthening tools. If I can get textbooks to more kids more efficiently using technology, that's a form of use of technology.

We heard in the last session about using videos for teacher professional development. Paying teachers' salaries, using perhaps mobile payments. What are all the other forms of technology-strengthening happening earlier on in the system? These are all important parts of building that relationship that the teacher has in the classroom.

But it is separate then, like your low cost of intervention in the classroom. And maybe you have technology and then it's a question of which technology can I afford in a low resource setting? Maybe your best technology is going to be that you have a people projector. Because that's going to be the most powerful tool that you have to project lessons. What is that technology that you can afford in the classroom?

So through the All Children Reading Grand Challenge, our collaboration with the World Vision and the Australian government, we've funded 77 innovations in this space, looking at different technology for education interventions across the spectrum. Some of them are tracking and tracing. How do you make sure that your textbooks that you paid for actually get to the classroom? That's an appropriate use of technology.

Others are form of use of digital platforms. We have a collaboration with NORAD, a project called EduApp4Syria that's using Smart phones to deliver early grade reading instruction to children of Syrian refugees. And those Smart phone based apps are intended to be used in households. So in our low cost of intervention isn't necessarily the school, it's outside the school setting. I think there's scope for us to be able to approach it from both directions.

So in some respects, again, I feel that individualized learning could be again building that relationship of whether it's your teacher or whoever is playing that role as your community educator. Again, how can technology help them do a better job? Again, you may not necessarily have it in the classroom.

So for example teaching at the right level. This is one of those techniques that we're really intrigued by that JCO and a lot of others have utilized in a number of countries. So how do you teach teachers to teach at the right level? It may be that I'm using video to teach the teachers. But then in the classroom there's no technology whatsoever.

I also like the same idea for play based learning that we heard in the last session. How do we infuse a teacher with a sense of play based or pure education that could be play based? But again, it may be that you're using a video someplace in a teacher training college, and not necessarily in the classroom.

So again, individualized learning could be. I still want to bring the power of that opportunity. But if a child doesn't have a book or books to read, which I feel is a very intimate form of individualized learning if you don't have books. Then how do we use technology to help create that space that children have books? So many of our investments are in this area.

Including another one we have with the Norwegians called "The Global Digital Library," is trying to make a platform available that we have local language materials that can be downloaded or made available as print products in a variety of settings.

So I'm going to be happy to elaborate on other areas that we've invested in, including some of our learners with disabilities. But again, thank you for not falling asleep and appreciate any public service announcements we can make later in the session. Thank you.

MS. SAMRA: Thanks, Tony. We look forward to hearing more about some of those examples.

And last but not least, Rachel from DFID.

MS. HINTON: Thank you. And I'm going to start with an example that

actually builds on Tony's challenge that he gave us around the system and the system not functioning, and one of the biggest issues that I think for DFID we are facing. And we spent 964 million pounds, that was spent just in 2016. So we're putting a lot of investment into education systems and we really want to hear from you today about your ideas and your thoughts on, you know, how can we do this better, how can we make sure our investment is really being well used.

So how many of you have been to Kenya? Okay. A huge number. How many of you have been up to San Brubi right in the north of Kenya? Okay. A lot of people as well. Is there anyone here from Educational Development Trust? No. Okay.

Well I had the good fortune to go up and spend some time in the summer right in the north. It's a really poor area of Northern Kenya. And we have a big -- we have a project with the Girls' Education Challenge. Many of you might be involved in various programs. And EDT had one of their programs up there. And I stayed in Abomey, and I have some nice pictures, but we're not showing pictures. If you can imagine these wonderful, colorful communities, but mainly women left because although they're very humble and determined, a lot of the families, the men have migrated with their cattle to find their food for the cattle. The young people have migrated to the cities for work. The women, the young girls are going to try and find husbands. So you've got a few skewed and very poor population up there.

And this fantastic program EDT was doing was trying to bring technology into these communities and trying and do some of this different shades of learning, let's call it. And they were doing incredibly well. And it's one of the few programs that's really showing an outcome in terms of shifting literacy levels. I'm sorry, showing this demonstrates how they were doing it.

And then we went to head teacher's room and, you know, the usual courtesies and so on. And there in the corner, you can all imagine what I saw in the corner of that wonderful school with a very inspired teacher. A teacher with a very well trained tech experts were all the 60 beautiful tablets that had been provided by the government. Not last week, not

the month before, but four months earlier, with all the mobile phone, all the mobile charges for the electricity, you know, to generate the electricity they needed for them. All unused.

So I asked the IT trainer, lead trainer, and I said so. I said, you know, you're training the school and you're coming and you're inspiring them and they now use the technology on their laptops that we've provided to do this individualized learning in the classroom. So what about the tablets, who is using them? And they said "Oh, no, that's not an EDT project, that's a government project." And I said "But then you could help train on that." But the risks to go beyond what you're asked to do are too great, and no action is a better solution than action that might get you in trouble.

And we got a couple of these out, and everything is loaded on them. But it took -- they didn't even know how to turn the volume up on these little tablets. Because neither the IT tech trainer nor the head teacher nor the class teachers had actually used these.

So we've got huge system issues around how we go to scale, to even when, you know, that's not a situation just putting tech in a place where people don't know how to use it. That's the situation where there were people who knew how to use it or knew the benefits it could bring, but still they weren't empowered because of the enabling environment. So we've got a huge issue.

So when Mandeep asked us to say what are our three priorities, for me the three priorities, first to help identify what works. But what works for all children, in the most disadvantaged as well. And be a tech hub that Mandeep, I hope, will have a chance to tell you a bit more about, you know, is a 20 million investment over eight years. We're not doing this in a short time, to try and help us get there. And we really want to hear from all of you.

The second thing is this coordination that I know was talked about this morning between the innovators and government. And I think that we've got an opportunity to think about how we use existing aid architecture at a country level that's led by government, that has a lot of key donors at the table. But at the moment innovators don't seem to have access into that. And I think it's about this bridging between these two communities with

people who are often operating at a country level but then not getting the connection between them.

And thirdly, I would want to talk about and think about any evidence that we do generate having impacts. And I'd urge all of you to look on the website at some point for something called the Impact Initiative. This is something that is being led by Cambridge Patients and Ideas in Sussex. And it's an initiative out of our own National Research Councils. They talk about four kinds of impact that we want, that we don't just want the instrumental impact of changing policy and programs that we usually think of when we talk about impact. But we also want impact in terms of disconnectivity and the networking between innovators, private sector, public partnerships and so on, to create the demand, the right kind of demand from inside government. If we think of innovators doing the innovating and the government taking things to scale, the demand isn't always matching that supply. The supply is not always matching that demand. And the capacity building, they have a circle and then put it in four quadrants is the third, and then finally they talked about conceptual shifts. And I hope that this works, and I think it ought to lead to some conceptual shifts in how we work on this. Thank you.

MS. SAMRA: Thank you, Rachel. Thanks all. So just a very quick whistle stop tour of some of the themes that have already come out. We've talked about definitions, we've talked about imbedding technology into education systems and building the role of teaching and thinking about individualized learning and personalized learning are all differentiated learning. Building evidence and capability and Rachel's final thoughts around, you know, how do we bridge sectors, how do we build the evidence but make sure it's actually used and has impact.

So I'd like to open up to everyone in the room now. You can have comments, questions, and it's really an open floor. Please just give us your name and organization, that'd be really useful to know for you all. Thank you.

And maybe if we could take two or three questions that would be quite useful.

MR. LARA: Yes. Hello. My name is Alejandro Lara, and I'm founder of a non-profit called, which I'm very proud to say that, was a clever name. It's called Brainandyou.org. And believe it or not, that the name was available until recently.

Anyway, the point is I would like to learn from you, from the panel, why are we leaving behind brain research? Because, you know, for the sake of a race of technology and artificial intelligence, we're forgetting about investing more aggressively in brain technology, in progressing, what about the brain?

As you may know, year 2016 there were only, and for the past 150 years, scientists were able to understand on 87 ridges of the brain. And since then, beginning 2016, because of technology, they were able to identify 100 more ridges.

So the question is, you know, how can we aggressively actually pay more attention to brain youth development. That's what we do, using the latest new technologies to early intervention strategy. Thank you. I appreciate it.

MS. SAMRA: Thank you, Alejandro. Next question, please?

MS. ADAMS: Hi. I hate that half the room, no two-thirds of the room is behind me. Sorry.

My name is Kathryn Adams, and I'm co-founder and Executive Director of LEDA. We're based mainly in Haiti, but we work with adolescent girls doing programs, building resiliency and filling education gaps. But we also do training for education and emergencies, and effective trauma and learning. And so we are also in the Middle East now and then for that. Which I only state to give context to the question.

In my experience and interactions with groups like USAID and etcetera, there is a funding gap in putting together basic reading programs, accelerated learning, for adolescents. And because of the funding gap, there is a gap in resources available. And so I wonder what any of your work is doing to address those issues around that? And also beyond the basic skills of accelerated learning is the gap in any kind of accelerated secondary education. And without secondary education, these fragile contacts remain fragile, they don't

develop, they're always requiring outside brain and input because it's not there. Thank you.

MS. SAMRA: Thank you. These are great questions. Thank you, Kathryn. Would anyone else like to come in with a thought, common question, and then we can take another round? There's two people with their hands up, we can take both of those.

MR. EVANS: My name is Phil Evans, I work the International Baccalaureate that many people probably know about, we have a diploma, but we have actually primary years, middle years, the diploma, and a career ladders program from pre-K to 12th grade.

My question is, on the basis of a topic that's come up in a couple of sessions, and that's about pushing innovation in the classroom. One of the hardest things to do, I think, is to shift a growth mindset in the classroom when we have structures and systems that keep things in place. And you mentioned it just before. How do we disrupt a system when we're evaluating teachers on particular rubric and what not, and expecting them to prepare students for standardized assessments and things that are not necessarily capturing what we want kids to be doing in projects sense learning and what not?

In order for innovation to happen we're going to need to make some steps. What do you think some of the first steps might be, considering we hear this, you know, problem is always, you know, at the forefront of our thinking?

MS. SAMRA: Thanks, Phil, that's another great question. One more potentially, the gentleman over there.

MR. KALADI: Hello. My name is Abda Kaladi, I'm from the Queensland Foundation in Jordan.

And my question is actually about Rachel's point about connecting the innovators with the government. To give you some context, in Jordan there have been dozens of Ed-Tech pilots that have happened, you know, throughout the years. Probably none of them have gone to scale. And one of the things we're recently finding out is that even though the government is involved, there's still a gap between the pilots and decision making. And also within the government itself there's no process of learning from these pilots and figuring

out how to make it scale within the government.

And so my question is, what are your thoughts on that, and how can that capacity be built within the government?

MS. SAMRA: Thank you. That's a great set of questions, and lots of different themes. So perhaps we'll sort of take them turn by turn. I did see a link between the first and second questions, so Alejandro's question around great investment in brain technology and why they're not doing more of that particular thinking about early years as well. And I did see a connection with sort of personal, social, emotional resilience potentially, which led on very nicely to Kathryn's question around, you know, why are we not funding more on adolescence, particularly in some of the fragile conflict affected settings.

I'd like to be as democratic as possible, so I invite all of you to have a perspective on this. But potentially we'll start with Tony, given you mentioned fragile conflict affected settings as a key area that USAID is working in. But, Vicki, Rachel, do feel free to step in as well.

MR. BLOOME: Maybe in the interest of time I'll just address two of them, and then let other folks get in.

So, Alejandro, your point about the brain research. It's incredibly important. I'd like to think that the science underpinning a lot of the USAID investments is based upon research and science, especially when you talk about issues of early grade reading. And quite frankly, a lot of the countries where we're working in the elementary school level. Those kids are basically reading at a pre-K level, if not below. Right? So and your point also about in terms of adolescence, really practically speaking, for example reading innumeracy, where are you in reaching the learners where they are? Which gets to the issue of, I guess, individualized learning.

I would say that it's intriguing to think about in terms of then the use of technology, how do we sort of unbundle and make available some of that scientific research at the point of intervention that it's most valuable? Is it a Ministry of Education to back up sort of

a commitment through investments we're making? Is it teacher training colleges? It's really interesting to think about in the classroom, especially if you talk about disabled learners. And this is a really important part of our conversation as well.

So All Children Reading, we recently ran two competitions, they were in either have been awarded or reviewing. One related to blind, the other related to deaf learners. So in regards to assessing simply what type of learning disabilities you have in a classroom, this is a really important part of then being able to identify what interventions to support learners in those. And if you look at it in terms of universal design, you should be able to design your education programs or projects to adapt a variety of different learning capabilities, whatever that spectrum is, of learners.

So one of which is being able to assess who in your classroom or outside the classroom has disabilities. One of our projects in Ethiopia with RTI, we actually then found twice as many of the learners in the classroom had vision or hearing issues than had been previously noted. So we were able to use technology to capture those assessments.

And then we did invest in another tool as part of our project All Children Reading to actually then have tools you could use for early grade reading assessment for blind and deaf learners.

So I do want to say that this connects in some respects to the brain research. For example, in sign language the first language of that type of learner, somebody who may have issues, is signing, right? Not necessarily reading. So how do we support where they are in terms of other skill development?

Let me stop there just to see if there's other inputs.

MS. SAMRA: That's great. Thank you. Rachel Hinton, would you like to come in and add on that?

MS. HINTON: Yeah. I mean I heard the question a bit around why aren't we doing more of this? And I think it's a really interesting challenge to us. And talking from my recent experience of trying to get funded more work on early childhood development and

trying to bring in on medical research council with economic and social research councils, it's actually quite difficult to get people out of the silos of different sectorial specialism. And I think we need to do a lot more of it, and I think we need to be much, much better at it. And I think we need to be going into collaboration to bid for money in that way. And I see this also with adolescents, seeing education is about younger children so, you know, there's not an issue for adolescents.

One glimmer of hope for people is in the UK at the moment we've got something called a Global Challenges Research Fund, and it's a 2.4 billion pound part. I know for sure they're out at the moment tendering for hubs. I know for sure there are a couple of interesting ones that focus explicitly on adolescents. But also some really interesting into disciplinary bits and further trying to link these things up.

So one area we're really interested in is the sort of work that Sally Grantham-McGregor did in South America on stimulation and early stimulation linked to nutrition programs and so on. And it would be incredibly interesting if we understood what actually was happening in the brain. I mean they've showed long term impacts over a lifetime, because they're been studying this for many years, would be incredibly interesting to see what actually happened in the brain between those two covorts of those who didn't receive the additional stimulation but did receive nutrition and those that received neither. And we don't have that to kind of knowledge.

And can I answer the other question, or do you want me to just --

MS. SAMRA: Go for it, yeah.

MS. HINTON: So I was interested in Phil's challenge which I think is really interesting, how do you create a growth mindset in the classroom? And I think that some of the most interesting work I've seen was recently in India on a visit with Shraft Duvan and his team who lead the Star Work. And I think why I found that very inspiring was that they seemed to be working very hard with head teachers to generate a culture of trust to allow innovation and failure as well as success. But they are building the intrinsic motivation of

teachers. And, you know, it is incredibly powerful.

But again very interesting when we did some -- they actually had robust research done and they showed that it worked very well in terms of learning, you know, raising learning outcomes in Delhi, but it didn't have the impact they were expecting in UP, and again, that's about this wider enabling environment where you don't have that sense of trust and you don't have a safe space to go outside, just the traditional push for targets, then you don't get that innovation. But I just wrote a blog on that particular challenge on the DFID website.

And on the Dehli's question, the thing I really, really interesting challenge around, you know, how do we take pilots to scale. And again, one of the most interesting examples I think is the Data Analytics Unit in Changi, where JPAL have actually worked really hard with people inside government for them to be demanding evidence. And so it's created a very different kind of dynamic around assessing what really works and whether it's value for money. And I think we can come later to the issues of value for money because I think one of the challenges is not recognizing the financial constraints governments are under. And if you're only saying this works and that works but they don't know at what cost, it's really not very useful. I think there's a really example will come to, at least we might share from KAMFED's work, which is really impressive.

MS. SAMRA: Thanks, Rachel. And, Vicki, I thought potentially you might have some interesting insights around this question around pushing the grade mindset. And I guess connected to that, thinking about how we close this gap between what's happening with great innovators on the ground and pilots, and those in positions of decision making power, policy making.

MS. TINIO: Thank you. To both Tony's and Rachel's point, I think what we've encountered in our work in the Global South with digital learning for development and now with TBD share coalition is this challenge of making sure that whatever research we produce is based on our work on the ground translates to effective policy to transform a good practice. And that's just the challenge overall whether you're using technology or not.

But what we've seen is really -- and our strategy for reaching all of the different sorts of marginalized, all size sorts of groups, marginalized or not. Is really the importance of focusing on the teacher? Because especially in the last mile it's difficult to sort of target individual learners. But if you can reach the teacher, and as Tony said, you can teach the teacher with whatever it is. They don't need to use the technology in the classroom but they can facilitate the learning, they can enable the learning.

So with this TBDX Care coalition and to the first question, TPDX scale is sort of, our interest there is looking at the intersection between the very rich evidence based in effective teacher professional development. So that's a very mature field. We know what works, a decent principle, we have seen it applied in a diversity of contacts, so we know what not to do. We might not know exactly what to do in very specific, but we know what not to do.

And then of course all of the knowledge that we have of different Global South contacts and how to deepen those. And then interestingly, the very new and emerging research and development areas in Ed-Tech, learning at scale and learning analytics.

So but these are two new emerging fields that have evolved at the start, and are evolving, being defined in the North. And they are looking at, for example, learning at scale to use our technology mediated large scale learning environments that, whether remote or face to face, that involved few teachers. Teaches many hundreds, thousands of learners. The most well-known of these forms would be the MOOC, the Massive Open Online Course. There's a lot of research on that and it's very problematic, especially in the Global South. But it also includes intelligent tutoring systems, all of the algorithm based models, new forms, learning games, professional learning communities and so on.

So this is all very exciting but you need to have a certain level of sophistication in terms of computing, in terms of your understanding of the learning sciences, of the neurological sciences, and all of these things. So our interest in sort of taking that, whatever the cutting edge or bleeding edge knowledge is, and how that's sort of forming understanding of what can be done in the area of educational technology, to do things at scale

and sort of marrying that with what we know about effective TPD. And then also what will work and what won't work in the Global South.

So initially it's sort of our -- we're working in the Philippines, we'll be working in Columbia and in Bangladesh. We're looking for other sites all across the Global South. Initially what we're seeing is that for example a MOOC, in and of itself, the way that it's run, is not going to work. There is a blend that you're looking at that combines self-pacer, individualized learning, collaborative learning, and sort of the supportive community that you can build online or off line at the COP sort of professional learning communities. And we're looking at all of sort of different variations of these models across the context. So whether it's informal learning or formal learning, or non-formal learning, pre-service or in service, you need to find the right blend.

Which means also, to Tony's point, including the blend of technology. You can be using part of it is radio based instruction, there's DVD based instruction. Part of it is a smart system. Right? And part of it, a bit of it is online, a lot of it is off line, mobile, carrier pigeons, I don't know.

But the whole point is that you use what will work in the context where it needs to work to achieve the greatest learning gains for the greatest number of people.

MS. SAMRA: Thank you. That's really helpful, thank you, Vickie. I'd like to open up for some final questions and comments. I think this will be the last round, given time.

MR. WAGNER: My name is Dan Wagner, University of Pennsylvania. I run the ICT and Development Program there.

It's been fascinating. I have so many questions. But I'm going to limit to one big sort of elephant in the room kind of question. I think all of the speakers touched on it, and it links back to the last session as well and maybe relates specifically to the value for money question that Rachel pointed out.

Teachers. Over the last I would say -- I've been doing this work for about 25 years. And my sense is the research that I've done suggested that most of our resources in

ICT and Development have gone toward teacher training, teacher involvement, scaling using teachers, governments know how to deal with teachers. In fact that's where most of their money goes in ministries of education.

But as we heard the last session and a little bit this session, we talked about differentiated learning, personalized learning, which implies that technology can reach kids directly. And I'm sort of wondering if any of the panelists would like to imagine where we'll be five years from now with respect to the role of teachers versus reaching users directly.

MS. SAMRA: Thanks, Dan. A very thought provoking question. The lady on the left.

MS. MULLOF BOOSE: Hi. I'm Katie Mullof Boose with Oxfair International. And I have a question, sort of what I thought he was about to ask, which is sort of another elephant in the room around teachers.

Which is about the difficult tradeoffs and questions that I think a lot of people must be asking about funding. And often innovations and technology in the classroom are a solution to, you know, when teaching practices in the classroom are not effective. But what about in contexts such as the woman who spoke on the last panel referenced the kindergarten classroom with 60 children to a teacher. How are donors like TD-FED and USAID grappling with this challenge of the financing tradeoffs between some of these basic inputs, people to get enough teachers for example, in classrooms to then be able to build on that with effective classroom practices and support for those teachers but without that minimum investment level. How do you know when a technology intervention is appropriate in a very low income country?

MS. SAMRA: Thank you. Maybe one more. Lots of hands went up. It's tricky. Okay. Well we're around for the rest of the afternoon. I think I saw that lady towards the back put her hand up first. So apologies to the others if you don't around to you. I think so, yeah, I think she was first.

MS. WOODWORTH: Hi. I'm Ann Woodworth with Planet Aid, and we work with a network of local NGOs, mostly in Sub-Saharan Africa. I thought the elephant in the

room was going to be pre-service training for teachers, and the lack of funding, and how can you scale up most cost effectively without any major donors funding pre-service teacher training.

MS. SAMRA: That's great. Three big elephant in the room questions. Which is a sign of us all getting quite engaged with the conversations. That was a good thing. I think I'm going to stick to one person per question on this because of time.

So Dan's big question, raising value for money, how can we imagine a future, I think he said five years from now. Tony, would you like to tell us a little bit about your thoughts on that?

MR. BLOOME: Okay. So not like having big questions at the end of a session for us to, you know, comment on. But this workshop still goes on, and I hope that with the expertise that's in this room, that we'll figure out ways that we can continue to dialogue. As I often think about, we could easily have just been the people asking the questions of the folks in the room how much expertise that there is. So.

So, Dan, I loved the question. And you know the theme of last year's Moments for Education Symposium, some of you may have attended, was looking backwards from the year 2020, what kind of decisions that you made in terms of -- I really like your point. I don't think it has to be an either/or, you know, quite frankly. I think there will be inputs that we're using for systems strengthening that will support the traditional formal education process. And that ultimately in the short term and medium term is going to be re-scale is. You have to work with Ministries of Education at least, USAID does.

But it doesn't preclude looking at other innovative approaches to reach directly to the kids or the supporting community environment. So parents at household level, community educators or those that could be trained as community educators. How do you reach the out-of-school youth? So I think there's a variety of ways that you could use technology to reach those learners.

So for example if we don't have enough content for kids, how do we embundle

the creativity in a community to create local content? So one of the projects we have in Zambia, the oral stories were being collected by parents and then basically being disseminated by mobile phone and being read at the household level. So we thought wow, that's a great resource to tap into the parents' expertise.

Crowd sourcing for example. The Global Digital Library is an example of a platform that I've mentioned we've invested in with NORAD, as well as EduApp4Syria. Both platforms are open source, we'd love to have more content added to those platforms. EduApp4Syria I think has been translated into 30 different languages so far. So how do we get other people engaged?

And then while it's not in my stream, I think the question about technology. I always approach it, I tell people technology goes from puppetry to satellite. Right? What's your most effective accessible form of technology that you have access to? And I know you singled out carrier pigeons, and I think there are other smoke signals as well. So there's a variety of different types of platforms that we could use. It really is a question of what's accessible and cost effective. Although if a technology can be shown to be effective for learning outcomes, I would still say then it's a great opportunity for public/private sector investment. Lower the cost of that technology.

What we don't have a lot of is evidence in improvements in learning outcomes. So as a donor, before I make the investment in that technology platform I want to show that it made tangible improvements in learning outcomes. Thank you.

MS. SAMRA: Fantastic. Thanks, Tony. We've got about four minutes left. So I'm going to ask Rachel and Vickie to maybe spend just a minute, a minute and a half. And I have the perfect questions for each of you. So which I thought the question around tradeoffs and funding, it would be great if you could talk to that. And finally, Vickie on the training for teachers, pre-service training.

MS. HINTON: Thank you. Well I think obviously governments are needing and wanting all the time to help on the priorities. And I would say that the key thing is that

we're generating more evidence on this. I mean Lon Pritchard, who runs our big research on improving systems of education, the RISE Program, on the website there's some really interesting debates and discussions about the fact that it's not just more input. And I think certainly from my experience living in Ghana and working with the education system there, was the pre-service training was suddenly not a good investment because it was four to five years of very theatrical training. Many of those teachers never saw a lesson plan, never saw an assessment in the time that they were there, and then they were put in classrooms having to delivery. They were learning about, you know, piajua and so on and so forth.

So, you know, I think there's a lot of issues around value for money. And I think that we need more research. I mean the Comfort Program I alluded to earlier has just a really interesting paper out quoting Rose and Ricardo Sebexas, who looked up that initiative of girls' education. They said for every hundred dollars invested, there was a 1.7 times additional impact on learning. And if you then included equity, it was up to two. I hope I got those figures right, Lucy. But I mean you've got Lucy like here in the room to talk to about that.

But that's the sort of information governments need. You know, if I take this route I'm going to get double my impact for the same hundred dollars invested. And we need to get better at it, we need to be more rigorous. The building evidence in Education Global Group that is a coalition of the Bank and USAID and so on, one of the new guidance products we're working on at the moment is how to assess value for money and how to capture costs when we're doing programs and research. So I think that's a well overdue bit of guidance that I hope's useful for everyone.

MS. SAMRA: Thanks very much, Rachel. Vickie, over to you, and a minute if that's okay. Thank you.

MS. TINIO: To the question about pre-service education and how it relates to sort of continue its importance in continuous teacher professional development. It's very important because we know that a lot of the challenges that we experience in service is due to poor pre-service education. Evidence is already, there's lots of evidence on what needs

essential conditions for effective sort of technology integration in education in schools, in universities, I teacher ed. The big challenge is actually making sure that those conditions are there. Including the condition of teacher competency standards, to certification, the accreditation, all of the infrastructure, the actual running continuing teacher professional development programs.

And so when we look at technology and how we can use technology to support, it's not just instruction as has been the point. It's all the whole system needs to be working. And then that itself can be supported in many ways by technology.

I think for all the funders, for practitioner, for teachers themselves, and for researchers, it's sort of working in lock steps, sort of making sure that piece by piece you put in the standards, the accreditation, the training, the support, the formative assessments. All of these things need to serve somehow sort of coordinate so that then they lock in and everything is there for the system to work.

At DID we've set ourselves a goal that by 2030 we would have, you know, the SDG goes to 2030, I mean how far are we getting, we need to coordinate between innovators, researchers, practitioners, funders, and so on.

MS. SAMRA: Thank you. Suddenly we've reached the end of the session. I think we could have carried on for a fair few extra hours. And a big thank you to all of you. And a very quick plug from me, from DFID. You all have heard Rachel mentioned our new education technology research and innovation hub. We are looking for members to join our advisory and steering group, and very much as Tony said, recognizes a lot of expertise in the room. So if anyone is interested in being a part of that and helping us with things like agenda and social inclusion strategy that we'll be building in the next couple of months, please do get in touch. I think there is a one pager that will be distributed at one point.

And my final kind of top three take away, being used as focus, putting student teachers at the heart of all of our thinking about this. Being evidence based, so that came up quite a bit, thinking back impact value for money. And making sure that we come out with our

theories and work at cross sectors. That was another big take away from this session.

Thank you everyone, and enjoy the rest of the afternoon.

MODERATOR: Thanks, Mandeep, and thanks Jenny.

(Recess)

MS. VEGAS: Hi, everybody. In case you weren't here this morning, I am Emiliana Vegas, I lead the Education Division at the Inter-American Development Bank, and it's my pleasure to introduce this session on the Education Workforce Initiative: Harnessing new approaches for education workforce design and implementation.

I'm going to introduce our panelists, our moderator and panelists and then hand it over to our moderator. So, Amy Bellinger will be moderating. She's the project lead for the Education Workforce Initiative of the Education Commission. Amy is an international education consultant working in the areas of innovations and education and program organization strategy, design, and evaluation. Recent clients include DFID, the Education Commission, Results for Development, and the Human Development Innovation Fund. Amy is an advisor to STIR Education, and, prior to working independently, Amy was head of the international education at Ark, where she developed and implemented Ark's first international education strategy, including the launch of its first education program in Africa and new education programs in India. Amy's previous career was a management consultant for Deloitte, IBM, and PWC. She has her BA honors degree in geography with European study from Exeter University in the UK.

Thank you, Amy for joining us.

Next we have our first panelist, Ju-Ho Lee, who is the Chair of the Workforce Initiative of the Education Commissioner. And he is also the Former Minister of Education in South Korea. Professor Ju-Ho Lee served as Minister of Education, Science, and Technology of the Republic of South Korea between 2010 and 2013. Before joining the Ministry as Vice Minister in 2009 he was Senior Secretary to the President for Education, Science, and Culture. He has been noted for his education reform endeavors and active lawmaking. As a member

of the National Assembly his policy entrepreneurship began when he worked as a research fellow in the Korean Development Institute, KDI, and, as a professor of KDI public policy and management. He received his BA and MA degrees from Soul National University, and his Ph.D. in economics from Cornell University in 1990. After his nine year service in the Korean Parliament and government, h returned to academia in 2013 as a professor at the KDI School of Public Policy and Management. He is also working as the international community as Commissioner of the International Committee on Financing for Global Educational Opportunities. I'm honored to have you here.

And, finally, last but not least, Liesbet. Dr. Liesbet Steer is Director of the Education Commission. In this role she led the report The Learning Generation: Investing in Education for a Changing World. Currently, she is overseeing the implementation of the Commission's recommendations, including the design of the international financed facility for education, the introduction of reform and results based approaches in pioneer countries, and a new education workforce initiative, and the development of global accountability measures. She has more than 20 years of experience in international development research and policy.

And just to be kind of brief I'm going to skip some of it Liesbet. (Laughter) Liesbet has written widely on development, finance, and on education and presented in a wide range of fora and advisory panels. She was educated at the Universities of Antwerp and East Anglia, and the London School of Economics. She holds a Master's of Science in quantitative economics and a Ph.D. in development economics.

Welcome to all three of you, and I'll hand it over to Amy.

MS. BELLINGER: Thank you very much, Emiliana, for the introduction. And thank you for giving us the opportunity today to explain what we're hoping to do with the Education Workforce Initiative. We are fairly at the beginning of this journey, so we wanted to use this opportunity really to get your input to helping us frame this work and shape some of the research questions that we're going to try and answer during one of our deliverables.

So what we're going to do in this session is to start with Ju-Ho. As Chair he is just going to give a high level overview of his vision for what we're trying to do. Then, Liesbet and I will explain our objectives and how we're going about it. And then most of the time will be spent on discussion in your tables. We've been asked this session to focus on the role of education technology and how we both think about how the workforce can be designed differently and also the role of technology in strengthening the workforce. And we'll explain a bit more detail.

But I'll start by handing over to Ju-Ho.

MR. LEE: Thank you, Amy. The Education Commission predicted that 825 million children, roughly half of today's young generation, will reach altitude without skills they need to thrive in work and life. This narrative has been already heard in this seminar quite often and I think this is really important, the prediction, because it tells about a very serious crisis, what you call a learning crisis. So how can we overcome this learning crisis?

I think everyone in this room may agree that they key is the change in teachers. As a minister in education in Korea I have tried to make a change in many areas, except for a radical change in teachers. (Laughter) It's really hard. You know that also it's very long-term, it requires a long-term commitment because it takes time to bear fruit. So politically it's not easy, it's really difficult. But now everyone probably in this room feels that it's high time to make a change in teachers now.

So we have to rethink and redefine teachers. There is one important I think breakthrough to redefining teachers, redefining the education workforce, it's education technology. You know that recent years have seen education technology accelerating remarkably. The adaptable learning with artificial intelligence and big data and immersion learning, virtual reality, augmented reality, and clarification, and, also social learning with a digital platform. All those marvelous changes in education technologies are now ready for teachers to use them to provide personalized learning opportunities for every child, including

the vulnerable and the disadvantaged. So now we have huge opportunities given by educational technologies, but these opportunities are not used by teachers.

So there are I think two major areas that we really have to focus on. The first area is radical changes in curriculum and pedagogies in teacher colleges. We really have to make teachers be able to embrace and harness technologies. And the second area is we have to open up classrooms to invite experts, technicians, professionals, associated with technologies, educational technologies, so that they can reduce the burden of teachers.

These are really important, but it's not really easy. And at the national level it's really hard to make a change. But what about the international level? Maybe it's really time for international communities to focus on this issue. So if we can embrace and harness technologies, the teaching job can be really different, totally different, fairly attractive to younger generation. For example, for those who are interested in computer science, brain science, games, social platforms, can be invited to the classroom to become teachers, to innovate, to collaborate, to share with the peers and students. So we can really think about these changes right now.

So based on these enormous opportunities given by education technology, I think it doesn't make any sense for the international community to resist the Education Workforce based on all the models. We really have to encourage developing countries to design and strengthen their education workforce based on a totally different approach, new models, embracing and harnessing education technologies.

So this is my brief remark and I ask Liesbet to go further.

MS. STEER: Good afternoon. Thank you so much for joining this session, and thank you so much, Professor Lee, for introducing the Commission's initiative, which is an initiative we hope all of you can contribute to, so eloquently.

So I will say briefly what the initiative is about, but maybe also step back one minute and tell you a little bit about the Education Commission for those of you why may not have come across it -- I hope you have. But the Commission was established in 2015 and

consists of global leaders from public and private sector people who have been in office or are currently in office, people who lead major international organizations or major corporations. And that group of people, there were about 25 of them, some wonderful people who've done some amazing things in their lives, came together to think about what's next with education. And, in particular, the question around investment was placed before them, how are we going to finance education.

But as we were pondering over that question, and as they were sitting together, really struggling with it, it became immediately clear that when you want to talk about more investment you have to talk about how we are using that investment. And so quite a large part of the report was dedicated to better spending, not only more but also better spending. And so the Commission's report included a number of recommendations in that area.

And since the release of the report, as Emiliana said, called The Learning Generation, the Commission has been working on the implementation of the recommendations, and they chose to focus on four areas. One is finance and the volume of finance. The second one is the Education Workforce initiative, thinking about the human resources for education delivery. The third one has to do with results and how one can make a system perform better and what are the kinds of processes that could be used at country level to improve delivery and performance. And the fourth is around data and how we could use our projection model, which was developed for the Commission, and put it into the public domain to give access to the data that was generated.

So what is the Education Workforce Initiative? You have a set of slides there that I will walk through, but the Education Workforce Initiative came out of one of the recommendations -- there were 12 of them. One of them was to strengthen and diversify the education workforce. And so the initiative is really trying to look at the possible ways of doing that, harnessing obviously innovation, and thinking in a new way what this workforce could

look like and how it could be implemented, because, as Ju-Ho said, at the country level this is politically a very difficult issue.

So we would like to set a vision with this initiative of a workforce for the 21-22nd century that is likely going to look quite different from the workforce that maybe we see today. And why are we so interested in this now? First of all, when we go back to the projections of the Education Commission, we immediately saw that the expansion that is required under the Sustained Development Goal is virtually unachievable if we're not thinking differently. So in some countries we will need to deploy half of all tertiary graduates to just meet the need for teachers. Overall, in low and lower-middle income countries, we need an increase of 25 percent. In low income countries the number of teachers needs to nearly double. And then we haven't even talking about improving the current set of teachers and their schools. So we have a massive challenge out there to upscale and create this workforce.

The second thing is, of course, what was mentioned before, is we are in a different world. We realize that the kinds of skills that are needed are very different, the tools at our disposal are very different and also offer many opportunities thinking about technology and the different ways of bringing knowledge to children. The other finding in the Commission was also that often teachers are performing so many tasks that actually the amount of time they can spend really on teaching is very small. So, again, addressing that issue is an important reason for why we are looking at this now.

So as we set out to try and think about it, it was actually a bit difficult to be honest, because there's not a lot of evidence or literature out there that has looked at education as a workforce. Interestingly, if you look at health, for example, the World Health Organization defined a whole number of roles within health and tracks those roles on a consistent basis. In education it's much more difficult. We find some data on teachers with some difficulty maybe on some school leaders, but that's kind of as far as it goes. We don't really have a very good picture of the various roles that are being taken up.

And so health is a bit of an inspiration for us because one of the first things that struck us is that in health people don't tend to talk about the doctors workforce, even though we always talk about the teachers workforce or the nurses workforce, we talk about the health workforce, we talk about doctors and nurses and lab assistants and all these people who deliver health services. Now, education is obviously different, but it's interesting that we haven't really spent a lot of time as a community to talk about the team that's required. And so in health, when we made the comparison in terms of the support staff that are available to support a doctor, it seems that there is more support in the health sector than there is in education. Again, it's a different sector, but it kind of points us in a direction that maybe asks us to think a little more deeply.

So we can turn to the objectives. What are we going to do, Amy? (Laughter)

MS. BELLINGER: Thanks, Liesbet. So I guess as a Commission our role isn't one that's going to be here for the next 20 years. We have a very short, finite period of time in which to try and do something differently. So I guess our first objective is trying to just catalyze some new thinking in this area and encourage people, whoever you are, whether you're practitioners, policy makers, innovators, to think more about the education workforce as a whole, and more strategically, about how do you design it differently, how do you expand it, and how do you strengthen it.

We're doing this in two ways. The first way is around trying to find as many examples of where different approaches have been made and whether there's any evidence or impact to support them, and to try some new approaches. And we're going to put together an Education Workforce report which tries to I guess collate the existing thinking and put some new thinking together. We're also going to work with three countries to try and apply this thinking in real situations. So we wanted to look at specific education workforce challenges and support those countries to think through how might those challenges be addressed in potentially different ways.

So the three countries that we're looking to work with are Ghana, Sierra Leone, and Viet Nam. And as part of all of this we want to encourage a lot more cross geographical learning, but all cross sectoral learning based on the experience looking at the health workforce, but also civil service reform more broadly, and other sectors, to see if that encourages us to think about this differently.

So, in terms of our priority areas, so it's really thinking about how do you design the workforce so that it enables students to learn what they need and encourages more inclusive and equitable learning, how do we explore the changing roles, not only of teachers but of school leaders and of the role potentially of the district, which when we've looked at literature, we've really found that this kind of middle tier has been quite neglected and that the role of leadership also could be strengthened. And then how do we look at potential new roles, whether they're learning support assistants, master teachers, specialist teachers. They don't just have to be pedagogical roles, they could also be the role of business or finance. How do you include different skills that might be able to add value to a school or a district setting, both within and across schools?

And then, finally, if you've designed the workforce you want, how do you implement it. SO how do you recruit that workforce, prepare them, support them, develop them, provide careers paths, and how do you tackle the difficult challenges around the political economy, the financing, the cost effectiveness, in order to implement this.

So in terms of our structure, we're led by a small secretariat in the Education Commission. We have a High Level Steering Group to guide us, of which Ju-Ho is the Chair. We invited Susan Hopgood, the President of Education International and Global Federal of Teachers Unions, to be Vice Chair because we decided at the outset that unless we worked with teachers unions we were just going to come to many stumbling blocks along the way. And she has been brilliant and really open. And then another of our Commissioners, Theo Sowa, is Vice Chair. And then we have a group of about 20 people from different backgrounds, different geographies, different disciplines, to help us think through this

challenge. We also have a much broader advisory group, and I'd invited any of you that would be interested in kind of hearing how this progresses to join that foundations, practitioners, just to give us input as we develop our deliverables, from lots of different perspectives.

The first deliverable, as I said, is the education workforce report. So we're currently looking for research institutions to partner with on that, to think about different elements to this. And then at country level we're going to be working with country level partners to work with governments on how to embed this in a particular local context.

So the deliverables I've talked about, the education workforce a bit. Just to talk a little bit about some of the new approaches to this. So we really wanted to think, how do you think about designing a workforce at district level or school level which doesn't just mean that you bolt on load of roles, which is obviously going to increase costs and not be very sustainable. And so we'd like to try using what we're calling an organization design approach, where you start with the education outcomes you want to achieve for a particular context and then you look without the kind of predefined, preconceptions of how schools or things have been structured, but what are the skills that you need to deliver those education outcomes, and therefore, what are the roles that you might be able to construct to do that. And then the second fairly new approach, it depends on the context you wanted to look at, is how do we help governments think strategically across the education workforce. So at the moment there is a focus on teachers, but if you look at an education sector plan it doesn't often have like a more strategic long-term view of the education workforce as a whole. So how can you help governments look at the supply and demand for different roles using a more labor market approach to help provide a tool for them to be able to use?

So just in terms of where we are, we had our first High Level Steering Group meeting in March and we're just, as I said, putting together the team for the Education Workforce report. We have until December 2019 to do the report and support countries, so it is a very short window. Just I guess to note, that there are lots of organizations working in the space around teachers, and so we are integrating very close, like the International Task Force

on Teachers, the Early Childhood Workforce Initiative, the Global Partnership of Education, they're all part of our High Level Steering Group or advisory group and invited to comment at every point along the way. But just to emphasize, with what we think we're doing differently, is trying this more of an organization design approach, also looking at the role of district, of leaders within the system, not just teachers, really being explicitly looking across sectors to what we can learn, and focusing on the how, like how can reform in this area be implemented. And we're trying to get a balance -- and it's easy to say it's at the beginning -- you can judge us at the if we've done it -- between providing some kind of more radical thinking, but being very practical when we're working on the ground with countries. And I think someone said before, you've got to build on the systems that are already in place.

So with that I will ask you whether there are any questions you have on what we're doing and then we can go into more discussion and get your thoughts on some of the things that we can into account. But any questions to start with or comments? I think you need to use the microphone because it's being recorded.

SPEAKER: Thank you. My name is (inaudible). I'm originally from Sri Lanka and I'm a social entrepreneur working in education in Sri Lanka. I wanted to find out a little bit more details about what's your criteria or how do you approach countries to implement some of the recommendations, and how do you go about uniting those partners?

Thank you.

MS. BELLINGER: Thank you. Shall we take a couple and then respond, perhaps?

SPEAKER: Hi. I do have specific information about Latin America, how bad the problem there and getting all the needed teaching positions that there should be. My impression without the data is that as a region we have more a problem of preparing the teacher force that's already there, like improving their capabilities and all that, rather than getting to cover the teaching positions. But I don't know if that is the case.

MR. KNIGHT: My name is Jim Knight from London, where one of my responsibilities is to run one of our largest teacher training institutions, which we do as a blend on line and face to face. And I'm interested in whether or not you are looking at what attracts people into the profession in the first place. We have a catastrophic collapse in England in the attractiveness of the profession. I don't think we're along. I think there's a lot of competition for other social purpose driven occupations for graduates. How are we going to square that off?

MS. BELLINGER: Shall we take those three to start with? I'll pick up countries, but then I'll invite Liesbet or Ju-Ho to answer the other questions.

So on the countries, we started actually by looking at the Education Commission's footprint and, as Liesbet mentioned, one of the Education Commission's initiatives is focused on results, the pioneer country initiative. And that visited 14 countries in Africa to look at which ones were ready to embrace some of the Commission's recommendations. So we started with those countries, particularly for Africa. And it has emerged that there are some which are I guess in a political situation that are more able to embrace education workforce issues, so Ghana and Sierra Leon. Sierra Leon has just set up a teaching service commission and it's got a new government. So it's actually at a brilliant opportunity where it can actually effect change. And in Ghana, the minister there seems equally focused on change. And they've also done some initial work on teacher reform, which can then be built in, particularly around some of the other roles. In Viet Nam there is a specific opportunity, which I think I might let Ju-Ho explain in a bit more detail, but in Viet Nam we wanted to do something that is more related to teacher training, because that's the part of the sector I think that needs more support in terms of the education workforce. But I'll let Ju-Ho explain that.

MR. LEE: So, first, about the Latin American, I think the word leapfrog is not really familiar with Latin American country people, but it's really familiar in Korea, because Korea is the best example of leapfrogging in this area, this revolution era. You remember

probably some smart phones, their ages, TV displays, all these digital technologies, Korea was really doing great. And Korea actually leveraged the third industrial revolution to leapfrog. So Korea became advanced country by leveraging the third industrial revolution technologies. So, for Latin American countries, I think first industrial revolution is a big opportunity for you to leapfrog.

And so that's why I'm really talking about changing education by embracing and harnessing first industrial revolution technologies. Artificial intelligence, big data, social media platforms should be intangibly used in your education so that you can leapfrog your teachers, because teachers -- if you want to strengthen your education workforce, following all the models, it takes maybe 100 years, right. But if you radically embrace new technologies, harness these technologies, maybe you can leapfrog.

MS. BELLINGER: Thanks, Ju-Ho.

MR. LEE: And about the teachers losing -- I mean the UK and even many advanced countries, they are losing best teachers and they are not successful in attracting the best for teaching jobs mainly because the distance between what teachers are doing and what the young generations are (inaudible) for are really widening. So this is also the area that shows how we have to really radically change our workforce to embrace technology actually. So if, as I already said, when you become teachers and actively engaged in utilizing technologies and providing teachers to innovate, collaborate, and share those new technologies, why are you not attracting the best talents. So that is my answer.

MS. BELLINGER: Thank you. We'd like to spend the next 20 minutes getting your input, if possible. So Liesbet, do you want to pose the first question?

MS. STEER: So we have to deep dive into the role of ethic in the design and strengthening of the education workforce. And, first, to step back a little bit, sort of wrapping the discussion here, or trying to summarize it, I think what we're really after is to try and really hone or enable teachers to focus on their professional capabilities more fully, and then also

think at the same time about specialists roles that could be going and coincide or go in parallel with these sort of highly specific and specialized roles that some of the teachers could have.

So, keeping that in mind, going back to the discussion that Amy was setting out, is so what does this team of people look like where the roles will be better defined, where there will not be -- actually your question about sort of why are teachers -- is sort of the reputation of teachers declining in some cases, my view on this is -- and we haven't done research on this -- but I think it has to do with the dilution of the role, the fact that, especially in developing countries, teachers are doing all sorts of things. They're sitting at voting booths, they're teaching some of the time, they're probably cleaning up. So the role has become so diffused that -- and what are we actually paying for. So I think if we can be much more specific and clear about the definition of the roles and the kinds of professional path that's required to get to that, the training needed, and then the road towards certain roles, I think we'll be in a better place.

So both the definition of roles and then we how we actually build the pipeline of people who would perform those roles are two very important things.

So now comes the question, what about technology? How is that going to interface with this whole vision? Is technology going to help perform some administrative functions, is it really on the learning side, is it in innovation, is it in sharing? There are so many ways to look at it, and that is something we're still trying to wrap our heads around. So the first question is really, in terms of the discussion here, is how we could use current and future technology to enable the design of this new education workforce and where do you think the biggest opportunities lie, or the biggest interface will be in the coming years.

MS. BELLINGER: Great. And we probably only have five minutes discuss and it would be great to just get a few examples in your feedback. But if you discuss at your tables then we'll get you to feedback some thoughts afterwards.

Thank you.

(Discussion off the record)

MS. BELLINGER: Sorry that I have to cut your discussions short. Sorry, I'm going to have to stop your discussions since we've got such a short time. Do you mind just drawing it to a close? Right, so can I have a volunteer to share some of your thoughts just from that discussion? I'll just ask for a couple of people. Who would like to share their thoughts from that discussion? No volunteers? I'll pick on people. Joshua?

MR. MUSKIN: Just to break the silence. Josh Muskin, Geneva Global. So we were intrigued by the question, but we thought that we need to go back a step lower, to what someone else had raised earlier about the ecosystem. And if we're looking at the functions of the teacher today only within the context of how we perceive education delivery and the structure of education delivery, then we're going to get stuck where we are right now. And so looking at the ecosystem, both redefining what we want students to be learning as well as how we want them to be learning it, and then what the role of society can take in delivering those skills to the kids, or helping the kids cultivate those skills, whether they be academic, whether they be application, or personal skills, then come back and say, okay, here's what we need done, which of these functions do we want to attribute to or assign to the teacher and for which do we want to recruit other sorts of education functions. And then come in and say, okay, for which of each of these can IT serve as useful tool.

MS. BELLINGER: Thank you, Josh.

SPEAKER: Hi, Sevgenia from Teach For Bulgaria. We have been speaking here with my colleague from TES and -- what was your name again, sir?

SPEAKER: Jim.

SPEAKER: Jim. So initially we started talking about the fact that it's useful to really find the role of teacher and then create additional roles, all centered on the child, such as the caregiver, the subject related expert, the teacher who is with the child on a daily basis and understands their individual needs. But to me, I would love to see teachers who feel empowered to be continuously innovating their practice and adopting their approach to be truly helpful to every child's individual development so that we are building these globally minded

agents of change for our global society, which then means that if we narrowly define their roles from the outset, how do we created empowered leaders for these kids?

So I wonder if it is less about defining specific roles and more about selecting the right individuals who would -- and supporting them in a way that they continuously develop their skills, they practice an innovative powered mindset, and they feel supported to adapt their role to achieve the end result we're aiming for students.

MS. BELLINGER: Thank you very much. One more comment and then we'd like to pose you another question for the last five minutes.

SPEAKER: Yes, our table, we had a very good discussion. Brief, too brief, I think. We recognize the power of technology, of course, and that's very important. Use it for accountability for teachers and also included in communication between the administrators and the head master and the teachers, et cetera, and of course the minister of education. But we also talked about that the technology is not in itself the solution. We have to go deeper into creating the quality in teacher training, because if you look at the areas that are most needed in terms of quality education, the children in the rural areas. And the teacher training system at this point in time, at least in Sub Saharan Africa and Asia where we are training thousands of teachers, they're not set up to prepare the young generation for going in and actually tackling the task of training in a rural area, without electricity, without sometimes a school. And so sometimes the teachers' attendance is also a major attendance in the school because they are ill prepared.

MS. BELLINGER: Thank you. That actually leads just to the second question we want to pose. Sorry, I know we've got very, very little time. But it's thinking about in that situation, where you've got a large rural community -- and I think that's why the example this morning on Amazonas in Brazil is very interesting -- is there a role for technology in as low tech a way that might be needed to play in reaching those children and those teachers which traditionally would have been expected to come to a city for several days, you know, in training

sessions. And that's where we wondered if you do have any examples of where technology has been used to professionally develop teachers at scale.

Another example is the use of Skype to coach teachers. I think that's happening in Brazil as well. And, obviously, you do need electricity and an internet connection, but what really low tech solutions are there out there that could enable that to happen?

So just last two minutes discussion -- or, actually, if you just want to feedback response to that? Sorry, we're running out of time.

MR. LEE: About the ecosystem approach you mentioned, I think it's really important when we try to redefine educational workforce because the education sector alone cannot make this kind of radical change. So the education sector and private companies and also government all should be able to work together. But it's basically through a bottom up change. So bottom up change should also be combined with top down strategies. So I think we really have to utilize all the resources to make this kind of big change, from the government to private sector to education, and even the social sectors.

SPEAKER: So I think you're perfectly right, that we need to look at the ecosystem cross sectorally, but I'm also focused on the ecosystem within the education system alone. We train teachers to do many things that we do not permit them to do. We train them to do continuous assessment, which implies feedback and remediation, but if I stop my class to spend two extra days on a lesson because they're not getting it and my inspector shows up, I get sanction. And student centered, if I'm training my students to be good 21st century citizens and send them off to the exam where they're going to be tested on being able to do quadratic equations, I am disserving my students. I am educating them maybe for life, but they're going to get blocked because they're not going to be able to go further. So that's what I was referring to earlier this morning, the difference between entrance in capacity and, creating the conditions, the enabling conditions for teachers to do what we're training them to

do and desire them to do, and which are going to motivate them much more if we give them the space to do that.

Thank you.

MS. BELLINGER: Thank you. So we've got about three minutes for questions or comments on whether there is a role, and what the role is, for digital technology at scale.

SPEAKER: I'll just share what we're doing in England and what we're looking to do in one or two other places around the world at the moment. So there we train teachers in places that universities can't reach because they're far flung and students don't want to come into cities. They largely learn on line. We have no problem recruiting then pathway tutors who are normally ex school leaders who are retired, who are happy to travel to those individuals and give them some mentoring and some observation. But most of their study is done on line with other learners, and so collaborative social setting. And what we've been particularly successful at is taking people who have a Bachelor's, who are working as unqualified teachers, often as teaching assistants, and in quite hard to reach communities, and then assessing them against the teaching standard as they currently are, and then designing bespoke packages of content, because it's all on line so it's very easy to do that, so that we can then qualify them, upping their quality as a result.

MS. BELLINGER: Thank you. I'd love to hear more about that. Thank you.

SPEAKER: Hi, my name is Josh. I work with Bridge International Academies; we're a social enterprise operating schools in five countries in the developing world. And just to speak to your question, we have been able to successfully deploy various technologies for training teachers, for providing curriculum to teachers, and for monitoring and support of schools. I think one of the core ways in which we've learned to do that is by thinking through the technologies that can work in the context that we're working, some of which are among the most rural locations in Sub Saharan Africa. And we've really had to think carefully about how

we create technologies that are off line first, or mobile first, or use as little bandwidth as possible.

I think when we think about technology and we think about the devices in all of our pockets, these are not necessarily devices that are either affordable or even function in some of the context where we work, and really, any of the context where we work. And so it takes a certain level of design to think about what is necessary where we are working. And that design does not mean reducing the technological constraints, or kind of dumbing down the technology. It's actually just as complicated to think about how do you compress files so they don't use a lot of data, so they will travel along 2G networks rather than 4G networks. I think that might be some of the thinking that might help us think about using technology in some of the most rural places in the world.

MS. BELLINGER: Thank you very much. Last comment.

MS. BIBI: Hi, this is Deema from INJAZ Jordan. Just a quick note, because I feel we're always focused on existing teachers more than preparing the teachers who will join. And it's much, much harder and becomes a mission impossible because, like a country in Jordan, for example, one-third of the population are students and the teachers is a big number of the population and it's very -- it's not an easy task to re-prepare them and technology, et cetera. So the role of the higher education -- because teachers will end up teaching the way they were taught throughout their education, specifically higher education, universities, colleagues. And the role of the higher education, I often see, is neglected in preparing teachers. And I think that is a main focus area.

Thank you.

MS. BELLINGER: Thank you very much. We completely agree.

So we've got wrap up here. Just to say that on the back of your presentation you've got my email address, and if you have other examples, questions, comments, please do contact us. Like I said, we're at the beginning, so you can help shape this.

Thank you. (Applause)

MS. VEGAS: Thank you very much to all of you for staying here and especially to our panelists for a wonderful discussion.

The next session is starting in about five to ten minutes in the main room. So please head yourself and we'll have some of the same panelists discussing similar issues.

Thank you.

MS. SMITH: We're going to start the session. Welcome everybody to this Deep Dive session on National EdTech. Miguel is going to share with us the Uruguay experience using tech to inform pedagogy. It's difficult actually to introduce someone like Miguel Brechner. He is the President, Plan Ceibal. He is not just an authority in Uruguay, but he's also an authority in Latin America. He was the origins of the creation of the innovation agency in Uruguay, which is today, like reference for the whole Latin America. He's going to be sharing with us his experience; how you can actually transform medication from the inside out and the -- just the emotional border. He's going to be talking for about 15 minutes and then we're going to have the opportunity -- you're actually going to have the opportunity to exchange ideas with him; ask him all the questions you have and at about 1:15, we're going to have to leave the room and go back to what we were before.

We're going to be a little bit strict about the time because the organization is actually a little bit tight, so I want to just give the room for Miguel. Thank you.

MR. BRECHNER: Good afternoon everybody. Thanks for having me here. It's a pleasure. I want to share some thoughts with you and then, the richest probably will be the discussion, but even today when we saw what happened in the first presentation, and they turned the panel, a lot of the things that happening are a complicated -- are very complicated because we are -- everybody's talking that we are in the Fourth Industrial Revolution and we need to shape policy for the Fourth Industrial Revolution in education. And I have the feeling that -- I mean, we're still living in the Second Industrial Revolution in education.

It's a much production design, the institutional design of the system. I make a joke every time when we talk about the inspectors, right, the inspector was the people re-

inspecting the factory. Inspecting schools is something just a term. It's very difficult. So, we need to take a different approach, right. Evidently, to change from the Second Industrial Revolution to the Fourth Industrial Revolution, it's like driving a car at the full speed and then change the wheels while driving. And it has a lot to do with how we do these things. The other thing that's very important is that the 21st Century skills were defined in 1990, 27 years ago. And the changes of the last 10 years were incredibly in any (inaudible) should think of it. I mean, my origin, I'm from the technical background. My first computer show was in 1978. Just half of you were never born by that time. (Laughs)

Most of the companies that were at that show don't exist. The only ones that exist, probably stayed today are Apple and maybe IBM, right, but those companies were not in the 1978 Computer Conference. So, and I came to education through Plan Ceibal. I presented a project to the president. He approved it and we started it, but we need a way to understand if we want to go from the industrial model to the 21st century model, we have to go out from everybody does the same to a more liberal thing, for a liberal-cratic way to a more teacher-oriented, principal-oriented design, right. So, we need to personalize the design, but we also need to personalize the education. We can -- we have to provide.

The other important thing is that technology's important, but it's not a silver bullet. Technology is just a tool. And that is something difficult and I'll be a little non-politically correct. The big problem with technology is that the technology vendors push very much their solutions even though that has nothing to do with (inaudible), right. So, the important thing is for you to buy. My one of the big examples, I always use was the white boards in Mexico. They spend billions of dollars, but they didn't one minute of time to the teachers to prepare their lessons or whatever they were going to do with those white boards.

So, we took a different approach. Our first approach that started in 2007 was to give one laptop to every child in school. That had nothing to do with education. It had to do with equality and equity, right. All children are the same, so we thought that all children should have the same right to access technology. So, our mission at the beginning was to give

laptops to children and to give internet to the schools.

We knew that, that would influence later on in how the schools -- in how the students will want to do things; it will impact in technology; it will impact in learning. From 2007 to 2009, we deployed laptops. In 2011, we already had nine grades with computers and internet in schools. The first thing was very accomplished. I only normally pass only one slide to see how was the inequality in Uruguay in 2007 and what it is today and the poorest (inaudible) of population in 2007, one in every -- one out of nine students -- sorry, one out of 10 students had laptops -- access to laptops while the rich, nine out of 10. Today, there's no (inaudible), no difference. And let me make a point. Senators are not technology. Senators are devices for consumer use. For the time being, I'm not going to say that will not change, but today, Senators are consumer devices that are very good for certain interactions like reading; like participating in certain things. But it's not technology. You don't program a robot on a cellular. You don't do complicated things and you cannot have a live video conference with 15 of your maids through the cellular.

In 2011, we -- after a long discussion, we realized that technology was not enough, so we had to build platforms on top of technology to see how can we support the educational system through what we're doing. Just also, I have a brief reference. We are a public institution run under private law. We depend -- the Board has four members. My boss is the president. There's one board member from the Vice Minister of Education. One board member, the person in charge of the formal education and one person in the Board that he's the one that manages the money of the government -- of the public sector. And we are all publicly funded.

So, by 2011, we started to look for new things to do to support education. Then, our tasks began, I'll say, okay, we are 21st Century skills are not good enough, so we went in what Michael Fulon calls the success; creativity, critical analysis, citizenship -- all the things that you all know that are related to what do we expect the person to be, right. The skills, the competences, those are very long argument of how much you need of the

fulamentas (?) and how much do you need of the -- these critical skills to be -- to think about the future and to sew where we're going to start in the future.

With that in mind, we decided we have a vision that we need to support the system and we need to see how technology on one side can do things that unless you use technology, you cannot do. On how the technology can do things to accelerate pedagogy. For example, we purchased the books for the educational system and the reading books and we put them in the laptops and in the tablets. That doesn't improve the reading. That doesn't improve anything unless you have a reading support; unless parents read with their children or grandparents read, but one thing that was very important is that majority of low-income people didn't have access to books. So, we gave that with books. The other very important program we did, was English. We do not have enough English teachers. So, out of 125,000 students, we're doing fourth, fifth and sixth grade. Only 30,000 had access to English because we didn't have enough teachers. Then you have two choices or you look for teachers and you wait 10, 15 years until you get teachers or you invent something. So, we invented to have the teachers outside the classroom via video conference. Very high quality video conference just to let you know, all the schools in Uruguay that are urban have video conference, right. High speed video conference, so the teachers started to teach from outside the classroom, having in the classroom the English teacher.

Now, that method we started with a thousand in 2012, 25,000 in 2013, 50,000, so you can grow. We don't have enough teachers, so our teachers are from Argentina; our teachers are from Uruguay. Some of our teachers are from Columbia and the majority of the teachers are from the Philippines. But that solved us one big problem. Now, we have 93, 94 percent of the children learning English and we have external exams and they learn very well. It's one day life and two days online. We don't believe in online only. We believe the more we can do is (inaudible).

The same thing we are doing with computation are thinking now. We started last year with 90 groups of primary school, fifth and sixth grade doing competition. I thinking

we're going to jump to 500 groups. That scale, you can -- there's no way to start preparing the teachers to do competition, I think because that will take us ages and we don't have enough people. The industry of Uruguay exporter per capita of sulfur in Latin America. So, we all are -- all our people are engaged in doing other things. So, we are look -- we look for teachers overseas as well in Argentina. We found from (inaudible) that's a very prestigious computer science foundation and they're going to teach for all the 500 groups.

Again, we are using the technology, but important things that we're doing English and the important thing is that we're computational thinking. In mass, we took a different approach. We purchased math (inaudible) for the last hundred thousand activities. Adaptive, so, no matter where you are, you can do more things that are more difficult, simpler with a big thing that gives the teachers wherever every student is standing, so it's a very adaptive platform that helps to personalize education, like, personalized math. We don't make anything mandatory. Everything in our platform is voluntary. Fifty percent of the students are learning math helping -- using the platform and we have a study that was published last year where it shows how much it increased their knowledge of mathematics. The students that are suing the platform against the ones that are not using the platform. And the most interesting is that the low-income people are doing much better than the high-income. Obviously, they have different support. These things are getting support for the people.

We have also bid a lot of things related to stem a computer programming like, robotics. Yesterday, our team -- Uruguayan team won the first prize in innovation in research, the Lego League in California. But if you want to reinforce -- that everybody was talking today about how do we motivate; how -- no, we have a problem. We want people to do collaborative thinking, problem solving, citizenship and at the same time, we ask the teachers to test on what's the capital of Albania. This is a contradiction, so we took a different way. We formed a -- there are seven countries that are working together with Michael Fulon on what it's called new pedagogies for deep learning where our approach is to work from top-bottom to up on these skills. And we work on problem-solving and I'll give you one example just to make it

simple. One of the schools had to find a way to kill a bacteria in the soil. So, they started mathematics. They started physics. They started chemistry and realized that the only way to do it was to put -- how do you say, calcium? MS. SMITH: Chalk.

MR. BRECHNER: To put lime on the soil. After they solved the problem, they build a robot that will do that. It was an automated car that -- so, the programming of the road was a combination of solving a problem that was theirs. The same yesterday, the guys that won the prize in California meant was how to collect water, put it in tanks and then use it for the farming of the school. Those are the sort of things that teachers get very motivated because the students get motivated because they're solving problems that are theirs, not that are from other people, right. So, this thing that we're doing, the new pedagogies for deep learning is a slow way, but a firm way to change education.

We started with a hundred schools, now we are with 420 schools. That is approximately 25 percent of the schools. Because we believe that if we could go top-down and say, this is the new curriculum, there's going to be a discussion with the unions; with everyone, well, if the teachers demand it, then it's going to be easier to change the rules.

Now, we've implemented a sort of subversive way of doing it. Every school that presents a project gets approved. Right, but we don't change the rules. But you have to be innovative. It's more innovation on the design than sometimes -- well, because on what needs to be done. The teachers are very enthusiastic on doing things and there's no way that the authorities will make a general rule today of what's the new rule for the 21st Century skills. Because we have millions of problems that are 21st Century skills. How do you measure collaborative work? How do you measure critical thinking? How do you measure citizenship? What are the tests for that? We are very well accustomed to do standardized tests, particularly in this country, right. But no one is happy with the result and then nobody wants to do the other things because everyone is scared that the normal results are going to be different. Yes, things are going to be different if we want to change. I mean, if you want to be innovative, you have to see what's the end. For us, the end is the success, the work that

motivates students. Don't forget that anyone that's getting today to primary school will leave school by 2030. And if the world has changed in the last 10 years, wait to see for those that are going to be in 2030, how that's going to be.

So, we need to go into the Fourth Industrial Revolution with a mindset that is not from the Second Industrial Revolution. Let's not waste time trying to reform the old system. Let's try to build a new one while we are working on the old one.

Just a couple of reflections though because I'm one minute late already. We think ourselves as an agency for innovation and pedagogy and technology. My proposal is that every country has to have a specialized agency for this. You cannot have inside a system that has 60,000 or six million people work in the innovation. No one has been able to build innovation from the inside.

Second, if you want to use technology, technology has to be transparent. Technology has to adapt to pedagogy, not the other way around. The teachers don't need teacher training to do what's up or to do Twitter, right. It was so easy that everyone learned, so we cannot think that teachers are second class citizens that they need training. They need to have good tools. What you could say is we need to build capacity building in pedagogy; we need to build capacity building in what didactics of this, how it happens and other things. That's a different discussion that makes millions of courses of how to switch on computer; how to do this; how to do that, right. It's incredible that we are still there, right. I mean, today in the presentation, there was a discussion. The education against telecommunications. Another industry there, two totally different. This is people. People need to be motivated, right. You cannot -- with this, you can change anything because it's a different type of business. With people, you need to motivate. To make things easier for them. If you make life easier, people use technology. If not, ask the people, right. We have a program to give tablets to retired people so that they become digital and we deliver already 170,000 tablets to old people and they use it. So, when things are easy, people use it.

Last, but not least, learning based -- project based learning; applying

knowledge and skills of real-life problems must be the fundamental of how you grow the future system, right. New pedagogies is the path to go in the sense that everything is new and unless we do that, we will keep our -- how do you say it? The people that leave college; that don't finish are the people that are motivating, growing and growing. And there's no point in building three million parallel things to do what the school should do. And schools are responsibility of the government. The private sector is very important, but public education is a responsibility for everyone in the government. Thank you.

MS. SMITH: Thank you, Miguel. (Applause) So, questions, comments for Miguel. Yes?

SPEAKER: Thank you, Miguel. Can you speak a little bit more about the sign approach and the implementation because it's funny that you're a government agency, as our founders (inaudible) correctly, and yet, the way that you're pushing for pedagogical change and the future of learning, let's put it. It's from -- it's a bottom-up approach. So, can you speak a little bit about how, you know, you get the 90 schools that you mentioned become 500 and what are the incentives that you are providing them to adapt whatever it is that you're -- I mean, because it is the central idea that it's been pushed down, but it's down, you know, expanding and scaling up. So, I'd be interested to learn more about it.

MR. BRECHNER: When we started -- the first thing, this is a presidential project, okay. But we don't have re-election. You can come back after five years, but there's no re-election. So, it's a good way not to have political discussion of this because it's a presidential project. We decided that it has to be outside the system because the system is not prepared for deployment of these things. I mean, you cannot ask a normal system to deploy laptops to every child in education because it's not part of their usual business, right. We have to deploy 300,000 laptops in less than two years. It's not the -- and put internet in schools. So, you need a totally different approach.

We are an organization that failure is part of our everyday life. I mean, one day, 50,000 laptops stopped working at the same time. A bug in the software, right. Imagine -

- we didn't -- I don't know how many of you are specialists, but we decided not to give the root of the laptops to anyone because of other issues that had to do with technology. We solved that problem. Now, we invented that design that we have a board, as I told you with authorities and then we have a bigger board, a consulting board that the person in charge of primary school is there; the person in charge of secondary school is there; the person in charge of the teaching school is there; and, the person in charge of the whole system is there. So, whatever we decide it has to be implemented. So, when we say, we're an agency of innovation. So, why don't we do a computational thinking? So, what does it mean? We discuss -- we have people from the educational authorities working in our office and so, then, once it starts working, it's an interesting thing because sometimes, it becomes parent asking for more; sometimes it is teachers asking, or sometimes, we have some teachers that they don't want to be in class where they teach English. So, we cannot use the system because you cannot teach a video conference unless you have a teacher in class that helps. So, there, they're not learning English or we have to find a regular teacher to go to teach them. So, it's always dialectical thing. We present innovation; we discuss with them; we put them there; if they want and then, let's see what the teachers say. Mathematics, we have 50 percent of the classes taking it, so we have another 50 percent that are not using it. But we are not worried. That's another thing. We are not measuring everyday what we are doing. I mean, when people ask me what's the impact of some of these things, I say, "What's the impact of technology?" I say, "What's the impact of water in school? What's impact of electricity in school?" I mean, we cannot be under 21st Century and discuss if we are going to have devices or not in school, right. There are many flavors of devices, but people say, "Bring your own device." People don't understand anything on what it means to administer your own device because if you believe in equity, you need to make it simple.

Now -- so it's a bottom-up in the sense that we want teachers to push, but it's not anybody that say what she wants with this new pedagogic for deep learning, we have mentors, tutors, classes. For the ones that -- once you decide you belong, here are the rules

for belonging. You can do whatever you want, but you have to do this; you have to do that; you have to have teacher leadership classes. I mean, we have a program in Uruguay that you can become a principal without being a leader. The educational system are promoted because --

MS. SMITH: Seniority.

MR. BRECHNER: -- seniority and not because of leadership in Uruguay. So -- but we don't mind making mistakes. We are -- I don't know how many of you know about the lean method of management. We are lean method of management, right. We make mistakes, we correct them. I mean --

SPEAKER: Miguel, could you elaborate a bit more on an idea that you just mentioned briefly, but I know that you have deeper thoughts on that at least. Why do you think that you need an external agency to bring innovation to the education system?

MR. BRECHNER: Basically, if you start innovation, it's very, very difficult to have innovation from the inside in large corporations or large organizations, right because it's very difficult to move. You need to be -- first you -- if you are an innovation agency, there's no problem of failure, but if you are on a system that has a lot of rules, failure is something against you. You're not innovating -- your organization, I mean, you look at the start ups. They make many mistakes, right. So, there's very few companies that have really innovated while being big. And there's very few organizations and also, it's very difficult to think out of the box inside a big organization, right. And here, there are very few examples of people that have innovated in education while dealing with all the problems of education. For us, it's fantastic, we started from scratch. Our average age is 34. It's a woman-oriented organization, right. Seventy percent of managers are women, 57 percent of the people that work. Half of our staff is technical and half of our staff is from the educational world. So, you can make a lot of -- there's no legacy, right. And I don't see how you can be bold in some of decisions if you are in the system. We are starting a new thing now and I say, if it fails, we close it. What's the problem?

SPEAKER: Miguel, this is a question about you because you've been able to transcend periods of different politicians in your country, so if I want to breakdown your --

MR. BRECHNER: Same party.

SPEAKER: Yeah, same party, but its more about you. You're a great leader, so I would love if you can breakdown what is your brain and in your heart. If you want to find twins like you or clones like you in other countries, what are the characteristics of a person that is able to keep engage everyone; to keep the follicles don't close the agency because Latin America is -- it tends to be that way.

MR. BRECHNER: Thank you. I'll tell you, it's a -- I mean, when we started, I brought to my team, one guy. I offer him to come and he told me, he was the general -- he used to be the general manager of Johnson & Johnson for all Latin America. So, I ask him, "Miguel, do you want to come?" And he said to me, "No, this is crazy. You're building a telephone company," he told me, right. We said -- I said, "No, no. We're going to do it." I said, "Here are my conditions. I work only Monday to Thursday and I only work a half a day and I don't travel." And I decided, "Yes. Come in," and you know him and he's an incredible guy. So, you have to -- I mean, my kids -- they are not so kids, like your age, some of them, tell me that I retired 15 years ago. I went out from a private business to this and in Uruguay, we're very clear. Just know that you're in both sides. I may have my other things -- my other business I do outside Uruguay, but in general, I cannot do anything with technology. I work in for almost 25 years in the technology sector -- in the computer area and telecommunications. Once I got into government, there was no way to be on both sides.

So, my suggestion is you have to find someone that has been in the private sector; that knows how to do things because people say, "Oh, it's incredible what you did." I've done big projects, I mean, if a telephone company would have deployed the laptops, no one would have been surprised. It's normal. Why are you surprised that the government does it? My suggestion is, as in any job, you have to find the person that can lead it. A group of people that it's very important to have been in both worlds, at least in real life programs solving

(inaudible) of the private sector, right. But it's important to have someone from the private sector being on both sides. So, it's a way like retiring and doing this. I'm very happy -- great because it made me 20 years younger, right. I mean -- but I don't want to run politics, so I don't want to run for anything. That's something I decided the first day because I do other things like, running, marathons and other things that are -- you cannot do everything, right, so you have to select what you want to do.

MS. SMITH: Yes --

SPEAKER: Hi, thank you very much for all your -- for all your sharing. I had a question because I'm curious about your budget for student or your budget (crosstalk) --

MR. BRECHNER: Oh, I didn't tell you that. The budget for year -- the budget per student per year is a hundred dollars per year. That includes the laptop. We changed the laptop or tablet every three years. That includes maintenance; that includes the software; that includes the telco; that includes internet; that includes the platform. To give you an idea out of the hundred dollars a year, $40 is what we spend in the hardware in the laptop; around $12 is what we spend in service. It's a headache. You can't imagine the problems of having 700,000 kids with devices, right. I mean, they break; you have to change; you have to fix and whatever you find, there's always something you know how it breaks. One of our big mistakes was to put a lot of emphasis that (inaudible) that a laptop was from the kid. So, the family and the teachers disengage a little bit in the sense that it's his -- instead of it's the family, we take care. But our budget is a hundred dollars per year and we've kept that all the time. And that's 5 percent of what the student cost in Uruguay. So, that's another important thing. When the budget is discussed in Parliament, no one goes after our 5 percent. And that also makes it very different and I think we are reasonably efficient in this running and that makes it very difficult for countries that are spending $300 per student a year, like in Africa to being in a program like this.

MS. SMITH: There is --

SPEAKER: Thank you very much. I have a question regarding your

coordination with the Ministry of Education and whether you see any change or any impact from your program into the machine that works and whether there's any sort of positive change and how that (crosstalk) --

MR. BRECHNER: At the beginning, it was us and them. Today, it's we -- I mean, we cannot have 430 schools working in this program for new pedagogies unless we work with them. I mean, the ones that are changing, I mean, our goal is to be transparent, so that people in the educational system use us for that they need and push what is needed, but today, many of the things we do is done in very -- in full coordination with the authorities. I mean, a math platform, you can have it. And if they use it or don't use it, but books, you need the collaboration of who selects the books. We don't select the books. They select the books. We don't select many of the things. They do it and we implement for them.

For example, in primary school, we're getting into an important program for reading and math. They're doing the curriculum, we are doing the games involved and the game part and the computer part for those things. It's impossible to work, but once you start building the confidence of the two organizations, you offload the back of the former system about thinking on technology. That's something they don't -- it's not part of the DNA and at the same time, they accept that we have specialized people in pedagogy, so that we make a sense on what we're doing in conjunction on the pedagogy of that side.

SPEAKER: Thank you. I'd like you to talk a little bit more about the relationship between our project and teachers. We just had a session on unburdening teachers and I didn't see any unburdening there. I mean, basically, all these projects add to what teachers are doing as we've been doing for 20 years or longer. I don't know the situation in Uruguay, but in many countries, teachers' pay is relatively low compared to others. They're not treated as professionals. Parents don't want their children to become teachers. Teachers don't want their children to become teachers and that atmosphere, how does your relationship work with teachers and with teacher unions as well?

MR. BRECHNER: Let me say something. I go back to the 19th century

design, right. It's so bad, the design that teachers see themselves as workers -- as work so in a factory. They don't see themselves as professional. The society does not recognize them either, so let's, right -- so, the only profession in the world that you have to get paid to be kept up-to-date is the teacher profession. You don't expect a doctor being paid extra by the -- by his employer or an engineer being paid extra to do more studies that everyone has to do. SO, there's a big problem of the design. That's why I say it's a bureaucratic or authoritarian system and that -- on the other hand, the society in Latin America, Uruguay, also doesn't recognize the teacher. If you ask someone, "What do you want to be a teacher or an engineer?" The parent would say, "Be an engineer." Right, my son lives in Singapore, right and he says, "In Uruguay, everyone wants to be (inaudible). In Singapore, everyone wants to be an engineer," and that's cultural difference that's very important. Now, there is a big issue there. Now, the problem of the unburdening that was discussed that I wanted to intervene, but then I said, "Miguel, shut up." (Laughs) is that the whole discussion was top-down, right. Now, you have a class and you decide, "Okay, you three get together, decide how you teach physics, mathematics and chemistry through a project, but we are not saying, do that and apart from that, you have to do this and you have to this; and you have to do that," and we are -- and you decide how this student will pass your three subjects. You unburden the traditional things and you burden a new thing that's more motivating, right. When we -- that's a typical case. It must -- when you have a hundred thousand activities or exercises from third grade to ninth grade, you unburden the correction of what's his problem because the platform will tell you what's the problem? What's he doing right? What's he doing wrong?

Now, one thing that was clear and it's clear in our society that unless you have a special program for low-income and the critical areas students, we won't get what we want, but that is something that it's a compromise in this society to see who are going to be the people that want to go there and do the hard work because it's much easier to do the work on the rich area of the population than on the low-income or poor area. But to unburden, you have to find tools that are very simple. Rules that are very simple. You cannot -- no one can

put more -- I mean, the system cannot accept any more pressure on the teachers. They're not recognized and they're badly paid. In Uruguay, when we -- our party to government in 2005, a maid used to earn more money than a teacher. So, how do you expect to have the best people teaching? Today, it's a little better. I mean, it has increased in economic terms, around 70 percent of constant money, right, but still an engineer earns twice or three times that, but it will take time, but at the same time, you need to discuss very strongly with the unions, because it's not for all. You have to start building a system that if you work here, you do this; you do that; you get this payment; and if you're work in a better area, you get less payment because at least I think that we have to solve the lower income gap between the goods and the critical population to have a more educated society. But the burden, unless it's top-down, it's bottom-up (inaudible). If burden is to-down, it's very difficult to decrease the burden.

MS. SMITH: Yes.

SPEAKER: Yeah, the gentleman here inspired me to ask another question regarding teachers. So, you mentioned that technology has to adopt for in pedagogy and you spoke about the teachers not needing PD and the importance of capacity building in pedagogy. So, I somehow -- very little -- in some way, I disagree because I've seen teachers in Latin America, especially in Mexico where I work, that -- where teachers couldn't download an app in their phones because they did not know how to. So, the tool or the device does not mean digital literacy and how have you managed that in Plan Ceibal?

MR. BRECHNER: I don't know -- if a teacher cannot download something, it's a problem of the software because that teacher is using what's up. That teaching is using Twitter; that teacher is using Facebook. So, if he cannot download the app or install the app, it's a problem of the app because imagine in Mexico that I had some friends or imagine capacity building on what's up? Imagine the population -- things, I mean, now, capacity building has to be on the pedagogy of the tool. That, I agree with you. And that has to be discussed what's the good things and the bad things and if we focus on what's the good and

the bad things of the application we are using, they're taking -- provided it's easy to use, then you move forward, but we spend a lot of time on teaching how to use a computer. I mean, I don't know how many places in Latin America are still using the office (inaudible) as being taught in school. Well, you don't that, right and we don't -- we didn't need that 20 years ago or 30 years and we don't need it now.

So, we have to be very -- imagine a doctor, right and a teacher. A doctor has to do an echo on your and he takes this and tests the echo. He didn't do a training. He did a training on how to read the echo; how to move the echo, but he doesn't know how to start; how to download; how to backup, nothing. The same has to be transpired and the same way has to be transpired for the teacher. Who cares about backing up the information? How to install a printer, imagine if teachers may not know how to put a printer, but it has to be simple. In the last 10 years or 15 years, things have moved more to the finger than to a board for trying -- right. So, things are easier. People are using more technology. I don't know if we settled our difference, but we can (laughs) --

SPEAKER: I've seen many things that --

SPEAKER: I had a question about as an innovative agency, I'm sure there's times where you've tried to -- I guess I'd love to hear from you an anecdote of like, where if you tried to push or suggest something to the government, or you've had some pushback because the system can't handle where you've tried, so here's how you navigate that tension where you're proposing new things that perhaps you think this is going to be helpful, but the government tells you, "We're not there yet." So, how do you handle that tension?

MR. BRECHNER: We discuss a lot what to propose. We haven't had -- because the system is part of our advisory board, we don't go into one of the things that agency gives you is not to drive at full speed against a wall, right. I mean, and the -- what I've learned in politics is to decide what words to you want to fight. If you fight all the words at the same time, it's very -- it's the normal way to make you lose, right. Once the books in, the guy that (inaudible) wrote, I don't know, 2000 years ago, right, it's written there, right. So, we are

very careful there.

Very few times, I needed -- I used the support of the president to push something. Very few, I've been there since 2007, 11 years and I can tell you perhaps two times, but I have a saying that says, "You have to be tough without losing tenderness." It's not mine, it's from Che Guevara, right, so (laughs) -- I can do (Speaking Spanish).

MS. SMITH: He sit on the left. He's (crosstalk)

MR. BRECHNER: No, but I'm very honest. I mean, I'm very honest and -- for we live in a difficult time today, but still, people that have thought things in the past are very important. And we have that -- I mean, there are times you back down and if things don't work, there are times -- what we like sometimes happens, if we start something and another group of people do the same from the inside, so we support them. I mean, we are the tough discussions on the issues that become very political, opens for (inaudible), how do you say, open source, right. We are the largest open source community probably in Uruguay. Everyone uses open source, but we have to deploy laptops to blind people and I'm talking to you eight years ago. And there was one person solution and one Microsoft solution and the blind people wanted to Microsoft solution, so who am I to decide because we're open source that we're going to give them -- and I had a problem with the Stallman. I know all their open source. Well, we are very pragmatic, right. We're agnostics. We want -- we are not -- we're a political institution in the sense that it was created by the government, but we are not the Minister of Education. We don't do our own operating system. It's someone else that has to do. We need to go into the children and make the children better, right. So, if the solution is open source, much better. We love that, but if it's not an open source solution, we're not going to discuss and wait three years for open source, right. I mean, at one point, my people -- young people, open source, it's like -- I don't know. So, they selected an open source platform. I said, "You want it, use it." I -- a year and a half later, they said, "Enough." Right, but we cannot lose the, what is our goal. Our goal is to prove the equality of education to children and particularly, to the low-income areas in the country. Oh, yeah, you have the

microphone, then lady.

SPEAKER: So, we have a system that was designed for a different era. We have tests that were designed for a different era. Now, we have that new pedagogies in practice, so you're changing, you know, pedagogy --

MR. BRECHNER: We're building up new rubrics.

SPEAKER: Well, yeah, what are you doing with tests because if tests are still measuring in the capital of Albania and yet, you're telling teachers, you know, you should go, the three of you discuss this project between chemistry and so forth, like, how are those teachers going to feel comfortable if at the end of the day, they don't accept it? Thanks.

MR. BRECHNER: Again, we want things to change, so we need to give space for change. We have regular tests like PISA and we have regular test like (inaudible) from UNESCO and we do that, right. And we use a lot of that information. We are also a formative test from third grade to ninth grade to help the teachers, right. So, there is -- it's a test that we do it twice a year and immediately, they know the results and immediately, they know how their kids are doing. What are the problems; what they're not understanding; et cetera. So, we do test. The only thing is, we're not fanatics of tests, right, because at the end of the day, if you are -- how do you say, if you are -- not because you passed the test that means that you know and all of us know that, but we still apply the tests, right.

Now, on the other side, what we are trying to build is a new rubrics. We are doing that with people -- we are even countries working together that part of the U.S., Ontario in Canada, Australia and New Zealand, Holland, Finland and Uruguay through -- with a work with microphone and we share. And we improvise and we experiment, but we're in the middle of an experiment, but unless you start -- I mean, you start doing it, it will never change. It's very interesting to see the evolution, for example, of collaborative work that has happened in Uruguay. How they -- the school defines itself; how the teachers define themselves; how they define what they're doing; and, how that works. It's like building a new thing. The only thing is that -- again, I'm very non-politically-oriented. What -- we cannot take PISA as the only way of

measuring. PISA is one example of important things and we have to prove PISA, but if PISA is measuring creative thinking and you're not working on creative thinking, what are we going to (inaudible). First, the first two years to have the result. Take the position, we say, "No, this is not right. We'll wait another three years, fight." So, we have six years already we're wasting. And then we start working for creative, no, it's too much, right, so the testing has -- the U.S., in particular, is much, much more extreme on testing than Finland. Finland has a totally different approach, right and we are in the middle. And we have to feel -- everyone has to feel comfortable of what they're measuring, right. I don't envy if you are very hard on standardized tests to go to an open system, right, but again, I go back to 18th century, right. You take this, the inspector looks, this measures one. Okay, now, if this would be art, you would analyze it different, right. So, that's a question -- at the end of the day, we have to understand what type of system we want. The bureaucratic 18th, 19th system or a liberal 21st century system.

MS. SMITH: Okay, we have time for one more question, I think -- three more minutes.

SPEAKER: Good afternoon. Thank you so much. I'm very much interested in these relationship with the teachers and families. You had to allow education plan for teachers from the inception until this day and we all know that the Ceibal Plan is very successful. So, I'm more interested to know about if you face any resistance from teachers and in families and if you didn't, where are the main elements that made the plan successful if I were to replicate this? You know, the countries in Latin America.

MR. BRECHNER: With the families, it was incredible that everyone had his own device, made the change. In some places, we had more computers than beds. Right, now, when you think everyone means everyone -- when people ask me what's the biggest challenge of Ceibal, I say, "Scale." Everyone, blind, deaf, paraplegic, whatever, huh. With families, it was part of our support because when the teachers complained against the announcement of Plan Ceibal because it violated the autonomy of educational systems, the

president said, "This is not any violation. We are giving everyone his right." Today, what -- whoever wins the next election next year, Plan Ceibal will stay because it's a right in the Uruguay society to have a laptop. So, that gave a lot of support from society today. Still today when you make a poll on what's the most important thing that happened in the last 15 years, Plan Ceibal comes out first, second or third, right, it depends in what people say, right? So, it's very -- the families are very much supported. There is also an issue of following some people, particularly for single parents, communities, the thought that I -- their son can leap from going to a new world, it's amazing. The guy -- last year, our students from a very small place in -- not in Montevideo, outside the capital, warn the price and I would say the five guys that participated, one was the son of the maid; the other one was the son of some other -- house (inaudible); one was accounting; one was a dropout who came back to do the project. So, that's the mixture of society you want in the public education. So, the resistance of teachers is zero. There is a resist in (inaudible) family. In teachers, at the beginning, we had a resistance, what are we going to do? They're going to -- it took time for teachers to understand that the only transaction with students that doesn't cost anything or with us parents, with our children is to ask them for a favors of computers. You ask your son what to do and he will help you. You ask anything else and charge you. In computers, kids solve -- I mean, you have a problem with your (inaudible) with your computer, kids help you and they don't expect anything in return. If you ask -- go to the grocery and bring this, they will ask, can I do this? Can I buy from you this? So, we had -- at the beginning, that then, we understood. We still have some resistance on the very left wing teachers. See, this is a (inaudible) plot from the imperialist (laughs), but it's part of a democratic society. In the rest, I think I would say, we have a big majority of teachers that express that this is fantastic and unless that big majority that use it. So, I say, we have one-third of teachers doing incredible things. One-third doing standards and one-third doing nothing. And that's part of the normal things when you introduce new technologies, right, but we are very happy that we have two-thirds. We have to work on the other third.

MS. SMITH: Thank you so very much, Miguel and everybody for a very vivid exchange on conversation. Adam is reminding us that time ran out, so I'm sure everybody's taking -- many takeaways. I actually wanted to share my takeaways with all of you, but I don't have time, so --

MR. BRECHNER: No, no, no. You have three minutes, that's --

MS. SMITH: No, I don't have three minutes. We are past two minutes.

MR. BRECHNER: You have five minutes to do down.

MR. SMITH: We're past two minutes.

MR. BRECHNER: Two minutes, share with me. Come on now.

MS. SMITH: To give me one, okay. So, the first one is about as far as build a team that thinks out of the box. Number two, is technology needs to adopt to pedagogy and not the other way around. And number four (sic), and that one I love, is failure is part of the day-to-day life. So with that, I wish you a great afternoon. Thank you for joining us.

(Applause)

MODERATOR: So I'm going to interrupt the conversations for one second. So sorry.

So thank you all of us for being here. You already heard Hadi's presentation, so I don't need to introduce you again. So lucky me.

But the idea for this lunch is to be as informal as you want it to be. And ask the questions you want. There's no specific dynamic here but, so you can lead the dynamic as you wish. Either talking to someone specific or shooting questions or whatever you think. It's going to be worth the time for us being here.

So the table is yours, Hadi.

MR. PARTOVI: Sure. Well, I want to spend most of the time talking about how we do what we do, rather than why we do what we do. I hope the previous conversation to the extent I spoke about that, I gave a good enough sense about why I teach computer science.

But the one thing I want to say about the why, which most people don't think about, most people think we should teach computer science because there's jobs in computer science and that these jobs are very high-paying and it's hard to find people with the skills. That's not the main reason to teach it. The main reason to teach it is because every field is getting impacted by technology. So future doctors should know computer science. Future lawyers, future farmers, future architects, in any field, learning at least a foundational idea of what's an algorithm, how does the Internet work? These are the types of things all of us when we went to school learned what is photosynthesis or how does the digestive system work. You take it for granted that everybody knows those things, but most people don't know anything about sort of the technology that's all around their lives. And that's the reason that should be part of the curriculum.

I'm happy to answer any kind of questions, with the most interesting ones around how we've managed to get, at least in the United States, such a dramatic change in the education system and what could we do to replicate that in other countries.

Do you want to -- as somebody who is doing this in Venezuela, do you want to share what you were saying you were doing?

MR. SANCHEZ: Okay, good.

My name is Armando Sanchez. I run -- I cofounded a nonprofit called Academy. Our objective is to make computer science education universal at primary and secondary schools in developing countries. And we have been using code so far extremely successful.

To give an idea, we ran a pilot last year in Venezuela. The client is the largest educational NGO in Latin America, Fair Legria, one and a half million students in 21 countries. And when we ran the pilot, they said, well, this is the first time that we have -- that you mentioned that kids don't want to go to the breaks. They want to remain in the computer lab working and they wait for the next section, try to help them, the other section. They just don't want to leave there.

They were extremely impressed. And on top of that, because we worked their programming, we did it on purpose because we also want to develop collaborative learning companies. Collaborative problem solving. All that stuff. And this is actually what impressed Fair Legria the most, the fact that kids, usually they're individualistic, aggressive, or timid, et cetera, shy. They became like tutors in language, in math, because they do -- in programming, they are navigators, which is a sort of tutor, very often. They switch roles.

So the impact was very big, up to the point that they requested us to expand outside of Venezuela. So now we are helped by the bank. We are expanding into Ecuador. Fair Legria as well in Ecuador.

But one thing that I wanted to point to the table is something that Alison mentioned in the last session, which is teacher capacity. Teacher capacity in our developing countries, especially in the segment that we work, which is disadvantaged schools, which are most of them, is not extremely strong. And in computer leaders, even less.

So what we had to do was to translate code into a muke. And that muke, to make it so easy to follow. I mean, we don't have outline sessions. Everything is online, and we transformed the outline sessions according to online videos, et cetera, and interacting sessions.

And we made it so easy. Then, university students can become coaches of that project. And then the teachers can focus. And what David was mentioning in the last session, which is they're focused more on social emotional learning. They're focused more in the development of collaborative learning competencies, (inaudible) learning competencies, all that part of the soft skills part. Whereas, the muke allows you to relieve the teachers on that burden, and we leave the door open for whoever wants to become a coach in computer science. They can also take our training like university students and become a teacher that is also a coach in computer science.

So the question is, in order to fill this capacity gap, we use code because code was the easiest alternative to make it a muke. But it would be great, Hadi, that we really have

mukes already, off the shelf mukes.

MR. PARTOVI: For the teachers you mean?

MR. SANCHEZ: For implementation for the students. Students are supposed to take these mukes in their computer labs, and the teachers, it's much easier for them. Instead of teaching computer science, they facilitate the mukes. And in that way, you can expand much more the reach because then you make it easier for everybody. Instead of just giving the tools to the teacher, okay, do it, which is something that can work maybe very well in the U.S., but in our countries it's more difficult. So that's why we think really that mukes should be a good alternative for this.

And also, mukes have the advantage that they sort of enforce a new paradigm of education, which is the teacher is not the center, the source of knowledge, and I am part knowledge to the students, but I am a coach. I'm a facilitator. If there is a muke, it's impossible to teach a muke because it's there. So you are forced to facilitate that. Facilitate autonomous learning. And in the muke I would do. We put them in pairs, in groups. Then you also have collaborative learning going on there. And then the teacher is reporting that, which is what 21st century students do.

So that is why my wish on my wish list for Christmas, you know, for Santa, would be to have all these wonderful tools. But in a muke format.

MR. PARTOVI: Well, one thing we're doing in the United States from a teacher capacity standpoint, is in the U.S., the U.S. has an actual teacher shortage, but every country has a shortage of computer science teachers. Nobody -- no country has a large population of teachers who themselves learned computer science because most people, if they learned computer science, they went into the field of software. You can earn a lot more money doing that.

But what we do is we have established training programs similar to what you said to get university students, but for actual teachers to attend professional development to learn how to teach computer science. And it's roughly two days -- one or two days of training

for elementary or primary school teachers, and 10 days of training for a later grade, you know, secondary school teacher. But after 10 days of training, that's not enough for a teacher to become a software engineer. It's not enough for them to leave their job and get a higher salary, but it is enough for them to be able to teach computer science using the code or platform, and these teachers, they love the training.

Usually, at least in the United States, teachers do not want to attend professional development. It's kind of viewed as, I already know how to teach math. Don't teach me again how to do my job. But if they're a math teacher that is taking professional development to learn computer science, a biology teacher or a history teacher, they, themselves, enjoy that workshop because they feel like they're learning something new and they're bringing something new to their students.

And this teacher training is by far the most important agent of change in the school systems. You know, we spread naturally from teacher to teacher if the teacher wants to do it, but if the teacher is intimidated, that workshop is what enables them to do it.

Can I get a quick sense, how many people here are from outside the U.S.?

A majority.

How many people are from a ministry or sort of a government role where they are?

Two. Okay.

And are the rest NGOs? Is that the right assumption?

All right. You had a question?

SPEAKER: Yeah. Is the -- how did you narrow something as big as computer science into a 10-day retraining course just enough to let these teachers then become teachers themselves?

MR. PARTOVI: That's a great question.

Our training isn't to teach you how to become a computer science teacher. It's enough to teach you how to teach Code.org's curriculum. And the curriculum itself does a

lot of the work. And the reason is our curriculum does two things, which there's a lot of research basis around. One is that it's a blended curriculum. But the second is it uses inquiry-based learning. The blended part means the lectures are done, you know, via video and things like that so the computer does the lecturing. The teacher doesn't need to be the expert because we have these videos of the experts. And the inquiry-based learning means instead of being sort of -- basically, the teacher does more to ask a question and work out the answer with the students, and so the teacher just needs to know how to use these lesson plans that are designed for nonexperts. So it's already actually well understood in the research that inquiry-based learning works better than lecture-based learning. But it works extra good when the teacher is an expert. It's kind of the only way to do it.

SPEAKER: I had a follow-up question. Like, coding versus computer science. I feel like people understand coding already pretty well, but like how and where do you see your curriculum going when it comes to computer science and sort of the ethics and security and machine learning, like these kinds of fields that are not only like here are the instructions, or should they even be taught?

MR. PARTOVI: Will you introduce yourself?

MS. DOW: Lin Dow. I write children's books about technology.

MR. PARTOVI: And she's going to be speaking later.

MS. DOW: Later. Yeah.

MR. PARTOVI: Yeah, it's funny, because our name, Code.org, we chose that name just because it's short and easy and catchy, but what we teach is much broader than coding. And it's funny because people regularly ask me, does everybody need to learn how to code? And I say, no, but everybody needs to learn computer science. And they get confused. They're like, well, your hat says code.

SPEAKER: Your hats, your socks, your --

MR. PARTOVI: Yeah.

SPEAKER: How do you explain what computer science is?

MR. PARTOVI: Yeah, so our curriculum, which I think of as computer science, teaches things like how does the Internet work? What is a cookie? What is the DNS server? You know, you see these error messages on your computer. You don't know what they are. What is SSL? What is HTTP? You know, why do you have to type that every single time? Or things like cybersecurity, what's a computer virus? You know, and people know that it's like bad but how is it bad? How does it actually work and how do you protect yourself from a computer virus? Or things like big data and data analysis, how is that impacting things? How does the Internet work? And also, the digital citizenship and sort of the ethical implications of how technology is impacting things and its impact on things like privacy and on security and so on. We try to teach all those things as part of the curriculum. So, for example, our high school course, maybe 40 percent of it is coding, 60 percent of it is those things. And that always surprises people because of our name being Code.org.

But a lot of those things are just as interesting to learn and very valuable. You know, coding is great if you want to become a coder. Understanding how the Internet works is relevant for every single field because we're all using it all the time.

SPEAKER: I would argue -- my name is (inaudible). I'm from the Bahamas. And I would argue that perhaps the 60 percent which is not coding, the thing that would be most interesting to those people, I'm sure your name might throw people off. It's throwing me off because I was wondering why, you know, it would be something like most students would want to know or do.

But I wanted to ask a more practical question around how much time does it actually take to implement your curriculum? How many hours a week or how many --

MR. PARTOVI: You mean students' time?

SPEAKER: Yes. Like when it's being taught. How much time out of the -- how many hours a day would you need, or 25 hours a week or whatever?

MR. PARTOVI: So our course is starting in primary school. They're about 10 to 15 hours each grade. So in first grade, 10 to 15 hours. Second grade, 10 to 15 hours.

Which is -- that gets expectedly spread out like one or two hours a week for a short period of time. It's relatively easy to fit that in.

For grades six through eight, there's a year-long course that's four hours a week for an entire year. And for high school, there's also a year-long course that's, again, four or five hours a week for an entire year.

The middle school course is the one where some schools teach it as only one-half year or they try to reduce it, but our general hope is that computer science gets integrated through grades one through eight so that every student gets the basic exposure. And then the high school course is an optional course for the students who want to choose that. And the year-long optional course, just like a chemistry class, not every student takes chemistry, but as long as it's available in the school for the students to take it, we think that's where it belongs. And then grades K through eight, we believe it should be integrated for every student.

SPEAKER: But do you think there's -- there's certain things that everybody needs to know, like the ethics of the algorithm, for example. You're aware of that. And there are certain things that we don't want to go in that direction you want to know. It's like, everyone -- when I was starting, my father used to tell me, you should know a little bit of law or a little bit of accountability, and this is like the same but there's a certain -- the value or the ethics behind it, everybody should know that; right?

MR. PARTOVI: Well, almost all of our curriculum teaches things we consider to be foundational and not vocational. All of our curriculum we've created from that standpoint of what are the things that would be good for everybody. And we do teach coding, but we teach it mostly using dragging and dropping blocks. So you're not learning the syntax of, you know, people talk about coding as learning a language, and we actually don't do that. You don't learn, you know, python or a particular C++. You just learn to drag the commands and how to fit them relative to each other. And by doing that there's less time spent finding errors and, oh, you should have put a semicolon there and you forgot the semicolon. And where you learn more is the logic of how. A lot of what goes onto coding is just learning basic logic and

problem-solving skills, extraction, how to break down a big problem down into smaller problems and, you know, using functions or variables to define what's going to be one part of the problem and how to then pass that information to another part. Those are all really thinking skills. You learn them and exercise them when you're coding, but they're applicable, if you want to become a lawyer, it's exactly applicable.

One thing that's fascinating, if your dad was saying it's good to learn a little bit of law is, you know, in America, there's a test that anybody who wants to become a lawyer becomes, which is the LSAT. And the LSAT has all these puzzles on it that are logic questions. You know, like Mary has three of such and such and Bob has only two, and together they have this much. And how much -- it's like a question like that. And it turns out those questions -- computer science teachers use those questions in computer science class because basically, the logic puzzles that lawyers do are so similar to the sort of problem-solving that people use for coding as well.

SPEAKER: Can you tell me a little bit more about the implementation of the platform? And do you see it as something that let's say a government would go in and find out the way to go about it? Or is it attached to some sort of technical assistance? I mean, how do you see the implementation (inaudible)?

MR. PARTOVI: Sure. I'll describe what's been happening in the United States because I don't know if there's one answer for every country globally. But we've seen a combined -- and we've kind of helped drive the simultaneous bottom-up and top-down approach. What happens in a bottom-up way is individual teachers are saying I want this for my students; I'm just going to do it. And that doesn't have a formal part of the school day or, you know, they just kind of get the classroom together. It's not a regular schedule, but they start experimenting and instantly realizing the students enjoy it, building excitement, building support. And that's really important because things that come from just the top-down in education usually get rejected. The teachers don't want to do something that, oh, the government wants us to do one more thing. But when they choose to do this they build that

excitement and then they're actually supportive when the government wants to do it in a top-down fashion.

The top-down things that we've help happen at the government level have been education standards, just defining what are the learning objectives of what should be taught in every school or what should be learned. Usually, at least in the United States, the government doesn't say which curriculum provider, which course should be used, and we try not to make (inaudible) the required thing for a given state. But then the large school districts which are at the city level, we'll work with them to establish any programs and then the individual school district will choose to roll out (inaudible) school by school. And that school district will decide how many hours each grade should be assigned and how many teachers should go through the training and so on. And we work on who's going to pay for the training program, which is another big question.

SPEAKER: Okay. And the training program is given by whom? You guys, yourselves or --

MR. PARTOVI: So in the U.S., we've established 60 different nonprofit partners that do the training, and we've trained about 700 expert facilitators. So the expertise is by people that we've trained. And they're training about 25,000 teachers a year to become computer science teachers. That's it. It's a very high-scale program in terms of changing the education workforce in the United States.

SPEAKER: Do they speak Spanish?

MR. PARTOVI: Actually, many of our facilitators do speak Spanish. So part of what I've been interested in is can we build a critical massive Latin American countries that want to -- that would enable us to do sort of a train the trainer sessions somewhere in Latin America to then establish experts in lots of countries that can then replicate it this way. I'm also personally learning Spanish just for that purpose.

SPEAKER: I have two questions. First, how do you evaluate the success of the platform? And second, my own experience with innovation (inaudible) the novelty effect is

really big. Like, kids can get engaged, real engaged with this new thing in the first few months, but then the new thing becomes just an old and boring thing that is taught by -- things that are taught by schools. So how do you -- have you observed this decreasing engagement? And also, how do you maintain them engaged?

MR. PARTOVI: So your first question was about evaluation. We're, first of all, slightly different in that most education programs are changing how we teach and measuring the same outcome. You know, because I was saying earlier about we're trying to change the "what we teach." So most programs, basically, they do their thing and then they tested the kids learn math better than the other way of teaching math. Whereas, we're comparing ourselves to just not teaching any computer science at all. Do you know what I mean? So when you have zero computer science versus Code.org, just the fact that it's even being offered is automatically a step forward. Do you know what I mean? It's not -- it's not like bad math versus better math. It's like no math at all versus math class actually exists in the school.

SPEAKER: But for example, student engagement and other dimensions because -- this is an important question when you're dealing with --

MR. PARTOVI: Of course.

SPEAKER: -- multiple (inaudible).

SPEAKER: Or like have you seen more enrollment in computer science majors.

MR. PARTOVI: Oh, absolutely. Yeah, I was just going to start addressing the baseline is we're not trying to get from good computer science to better. It's going from just zero to it exists. So the bar is low for improvement where the class is not even being offered.

In terms of student engagement, every measure we see is just incredible of, you know, students saying they don't want to go to their next class. Teachers telling us that they tell students, you know, you can't do the coding until you finish math. You know, they hold it out as the thing until they see it motivates students to do the other stuff. Or students

not wanting to go to recess, to the playground, because they want to stay coding. That's in the younger grades. But even in the high school class, at the end of the class we ask students how much do you like computer science? How much do you like this class? And then we also like ask, how much do you like school? And they like computer science more than they like school. Basically, 65 percent of students say they like school and about 80 percent say they like computer science at the end of our class.

In terms of just keeping engagement, if it's a year-long class that's just part of the school system, it's not like it's an online thing they do on the side, like Khan Academy. They're doing it in the classrooms. The engagement is driven by the teacher teaching the materials. But it's also because the students are making things. You know, computer science is interesting because it is simultaneously analytical and creative, and some kids, their brain works like a math brain and they just want to solve an equation, but other kids want to paint and draw and create. And this is a field that brings both of those things together. So the ability to create an app as part of school, that just itself, just the creativity makes kids happier than them rising, you know, it's something for a classroom.

In terms of whether they want to continue learning, from our high school class, 70 percent of students say they want to study computer science after they graduate, which is really fantastic number. Basically care about driving up computer science.

SPEAKER: As opposed to what?

MR. PARTOVI: We just ask, are you interested in -- do you want to study computer science when you graduate high school? And 70 percent say yes.

SPEAKER: Hadi, if I can jump on that. I'll introduce myself. My name is Suki Kay and I run the international program at Code.org. And to your point, I think we also try to engage previously underrepresented communities in the computer science classes that are offered, especially in the U.S. So we offer sessions for school counselors and principals on strategies (inaudible) students, like girls, for example. Underrepresented minorities in the U.S., the black students and Latino students don't have as much access to computer science

classes, but we try to work with school counselors and teachers and administrators to make sure those students are getting there as well. And in our high school level classes, we've seen enrollment for the AP exam from girls, and black, and Latino students just really, really grow much faster than the rate of other AP exams, and white male students in the AP exams, as well, which is something really exciting for us to see.

MR. PARTOVI: We didn't talk very much about diversity, but the most feel good thing about our results has been the diversity of the students on Code.org. We have almost 30 million students who have accounts on Code.org. And at a time when the tech industry is 80 percent white men, or white and Asian -- white and brown or Asian men, the Code.org student base is 70 percent girls or underrepresented minorities. So the white and Asian men are only 30 percent of our students. And that's because it's integrated into the school system so it's much more representative of the actual population.

SPEAKER: Can you talk about those strategies for, like how do you get --

MR. PARTOVI: How do we get diversity?

SPEAKER: Yeah, get a girl to be interested in coding.

MR. PARTOVI: There are so many different things. There's no one strategy that was sort of a silver bullet. One thing, which is kind of an obvious one, is role models. And not just -- so we've done things like having Shakira talk about coding or having Ashton Kutcher, you know, an actor, or Steph Curry, or Maymar. You know, whether it's Latin American, African American, just celebrities of any sort talking about this, Barack Obama, just making you think, you know, people that you wouldn't expect. But then inside the curriculum, many times there's a video of -- I mentioned Bill Gates teaching how a computer works, but we always pair up -- all the famous people are white men, you know, whether it's Bill Gates, or Mark Zuckerberg, or so on, but we always pair them up with somebody who is younger, who basically reflects diversity of either gender or race. So you can see Bill Gates with somebody who works on the Xbox team at Microsoft who is an African-American woman and she's not famous like Bill Gates, but she pairs up with him to do the instruction. And so the students see

a role model that's different.

The other thing we do for diversity that's different is we don't start our class jumping into coding, because if you start with coding, the kids who are learning it at home are already experts and then the ones who weren't learning it think, oh, this isn't for me. This is best for those kids. And it'll typically be that the boys are already ahead, and then the girls thing this wasn't for me. So we start with something like how does the Internet work, which none of them know, and that sets them on an equal footing, and then the ones who are new to all of it realize I'm just as good as the boys. And then when you introduce the coding, they can sort of compete.

SPEAKER: I have a question. What was the turning point in the U.S. for you to insert yourself in the public system? It seems like you went both grassroots and top-down to get to the number that you have. The curriculum, the model seems amazing, but as you think about other countries, whether you're thinking going, you know, top-down or both ways? Like, you need a little bit of (inaudible) to then get the public schools to pay attention to you?

MR. PARTOVI: We need both. The Hour of Code as a movement has been the best thing that's happened in this field. And I don't want to pat myself on the back too much about it, but it's been the best idea I've ever had in my life and it's grown so much bigger than I could have imagined. And the result -- the Hour of Code is just this idea that teachers should just teach one hour of computer science, and it doesn't matter if the school is doing it. Just do it in your classroom. And that's been done in every single classroom. You know, our counter for how many times the Hour of Code has been done is now around I think 650 million times, which is just an insane number of times for people to have tried coding. And getting to engagement, many times it's just the same student doing the same thing over and over again because they enjoyed it and it didn't wear off and they wanted to do it again. But that has created a lot of bottom-up interest, and we've also done pretests and posttests to show that one hour is enough to get everybody excited. After one hour, both the student level of interest and the teacher level of interest goes up, both their attitude and their self-efficacy, which is in

many cases more important, especially among high school girls. Within the first hour you see a 20 percent increase in both of those things. And that creates the bottom-up interest.

For us, I would probably say it different in the United States. Probably a very memorable turning point was the two times President Obama got involved. One time he hosted students at the White House to do the Hour of Code, and he actually wore this hat himself and wrote some code. And then the second time is he made a declaration that computer science is no longer an optional skill; it's a basic skill. Just like reading, writing, and arithmetic. And when the President of the United States says that, all the teachers, especially with the last president, all the teachers paid a lot of attention.

SPEAKER: And the public school system, how did you get your first break there?

MR. PARTOVI: I'm actually amazed how quickly America's public schools embrace this. Because when I started, everybody said don't try to change public schools. It's a disaster. You're just going to go home sad. And I just thought, you know, in 50 years, the public schools have to change, so somebody is going to need to do it. You know, why not start now? And I thought this would be like decades and decades of work. In our first four months, when Code.org was 10 people, we got 30 school districts to say we want to roll this out, including multiple of the larger school districts, like Chicago, which is the third largest school district, or Broward County, which is the sixth largest school district, all saying we'll partner with you to do this. And I don't think they realized we were only 10 people at the time. So right now we need to raise funding and hire people to do this work.

But I think the reason for that was, I think teachers -- this resonates with educators. Educators recognize that their system is teaching the skills of the past, and they see that in the sort of disengagement of the students. So I don't think students are disengaged with school because learning isn't fun. It's because of what they're learning seems irrelevant, so.

SPEAKER: I'm going to try to get understood in English. I will try my best

with that.

Actually, I started coding when I was 12 because a teacher -- I really don't know how does he get it because he didn't know how to program or something like that. But actually, he guide me to coding. Right? This was really useful when he tried to help me to figure out a way for applying the coding. I finally created a company (inaudible) for teachers, but it was because the teacher guides me how to do the coding.

So where is the way -- the question is, what is a way for engaging the students not for coding but for making something really important with coding or getting some inspiration from the coding? I really think not being a more boring area for learning in schools, but being really relevant for students, what is the way?

MR. PARTOVI: The most important way to engage is to make it creative and project based. So all of our courses have a bit of learning the skills and then a bit of creative project where you decide what you want to make. And this is also key to getting -- engaging diverse students. Because traditionally, when I learned computer science, it was very math heavy. So, you know, an example of a coding exercise would be to write the code to calculate the Fibonacci sequence of numbers. Linda's laughing because I'm sure she probably did that, too, at some point.

LINDA: Square roots of prime numbers or something like that.

MR. PARTOVI: And like, that's not fun. You know, nobody goes home thinking, God, I hope I could calculate the Fibonacci numbers. You know. But instead, so our courses, they ask you to design a product. You know, start with what do you want it to do, why, what's the impact that it's going to be. You know, is it going to be a game or do you want to change the world or is there a world problem you want to solve? Putting you through a design mindset, a creative mindset. And then, okay, well, which part of that can you actually build in a two-week class or modular period? But that project mentality and creative mentality creates that engagement because I think humans are naturally creative. And if you choose the project you want to build, then you have your own motivation to finish it.

SPEAKER: I think that maybe when we're talking about capacity of the teachers, maybe the capacity is not the coding capacity. It's the capacity for giving the context for creating that can of projects. I think that could be the role of the teacher, actually.

SPEAKER: Another part of our program, in our teacher professional development sessions for elementary, all the way through high school, many of the sessions actually focus on pedagogical strategies and not so much the coding content. It's about teaching the teacher how to say I don't know when a teacher asks a question or when a student asks a question they don't know the answer to, that's okay. And you try to give teachers that learner mentality that they can model for their students in the classroom.

And then also, we work with, you know, fabulous partners around the world that take our content and our learning, the curriculum that we offer, and also have really interesting communications. In Mexico, we know that (inaudible) will meet together to have a competition this summer that encourages students to design a social innovation, an innovation using coding skills that they can compete with. Like, early solving a problem that can impact your society, and so there are a lot of applications coming from our partners around the world (inaudible).

SPEAKER: Sorry. I have another question.

What are the challenges to go offline?

MR. PARTOVI: What are the what?

SPEAKER: What are the challenges to go offline? Is it just a matter of like putting a lot of time to make --

MR. PARTOVI: You mean, why is it hard for us?

SPEAKER: Yeah. I mean, in the cases, because you're saying that you have to --

MR. PARTOVI: Yeah. All of our curriculum currently is web based. So, you know, the videos, they're streamed over the Internet. The actual coding platform, most people may not realize this, but Code.org isn't just lessons. The actual coding is done inside the

webpage. The reason we made it all web based is so that not, you know, not all schools have the permission to install software on their computers, and if you install software it'll be like, oh, it works on this version of windows but not that version unless you have administrator privileges. You know, all those headaches are something that teachers don't want to deal with debugging that. And so making it web based has made it super easy. But that also means you need Internet access. For us to make it work offline, we need to figure out, at minimum, how to get all the contents effectively on a thumb drive and have it so from page to page it connects to teach other.

SPEAKER: And is this something like, do you do updates to the platform very often? That would be a challenge.

MR. PARTOVI: Yes. Well, yeah, we update the platform I think two or three times a week. So it's continuously improving. If we made an offline version, we'd probably do like a once a year, here it is, it's done. Because keeping that up to date all the time is going to be a challenge in and of itself. And also, if we did offline, we'd want to do offline in many languages because our number one request for offline support comes from other countries.

SPEAKER: So I -- this question is for you and Linda. Like, you went through a more like traditional learning process to get familiar and to master computer science. So do you think like oversimplifying a subject like that could backfire in some sense?

MR. PARTOVI: That's a great question. I certainly didn't learn computer science the way we're teaching it because the drag and drop programming didn't exist. But for me, the measure of our success come from our high school course, which is a college level course. With 73 percent of students passing the advanced placement, I feel good that we're not missing the mark from oversimplifying. And the oversimplified stuff is being taught in second grade and third grade, which is younger than I was when I started learning. And what it really does is it just makes students very comfortable with the high level concepts.

I don't know if Linda wants to say anything about that.

SPEAKER: Can I maybe like ask a follow-up question again?

The standards, and like the rigorousness of the different standards and frameworks in different countries, like where do you see the most maybe progressive work when it comes to setting these frameworks that don't exist right now for like elementary school aged kids and we're just inventing them, like who is leading the discussion and where should governments or like countries that are thinking about how to do this look to -- like, is it the U.S., or is it the U.K., or Singapore?

MR. PARTOVI: That's a great question. First of all, I personally am like torn because those things need to happen. The only way things happen in education is if there's standards and frameworks. And on the other hand, it takes all the fun. It certainly makes like, oh, it's schoolwork. And it makes things suddenly have less creativity.

But there's two examples I'd point to. The historically best example is Estonia. Estonia, basically, is a 30-year-old, kind of brand new company that created itself after the fall of the Soviet Union, and they teach computer science every single year starting from third grade. That's probably the country that is the most advanced in teaching computer science, and I think it's had wondrous effects for their overall economy. I don't think most countries can copy that, but if you want to be really advanced, that's who to look at.

But to take a more, kind of middle-of-the-road approach, the framework, the K-12 computer science framework established in the United States I think is really good to look at because we brought together about almost 200 stakeholders from education, from higher ed university, from the various tech companies and industry, to talk through what are the learning objectives at different grade levels and what's the appropriate amount of things to learn, not just about coding but about networking and cybersecurity and data analysis and algorithms. And the product of that is a really well thought out framework that can be applied as well.

MS. SOMBORG: My name is Win Somborg. I'm from Jamaica. Through all of this I've heard no mention of cost. Could you tell us, is it a free online program? Do you pay for it? What's your cost?

MR. PARTOVI: Sure. Well, our online stuff is all completely free. As long as you have the Internet access, all of it is free. All of it is open source. All of it is licensed under Creative Commons. And we're very lucky to have the generous philanthropic support to make to free. When schools want to roll it out, the teacher training is something that they need to pay for. And in the United States, we're also currently paying for the teacher training, so that's also free for schools. So part of why we spread so quickly in schools is we, basically, all of it that has been given away for schools. And we're now starting to shift things and say now the school needs to start paying a little bit of those costs or we're trying to see can we shift the cost of the teacher training either to the school or to the government.

MS. SOMBORG: Well, for teacher training, I see teacher training, will it be an annual cost? What does it cost? What does it cost to pay for it?

MR. PARTOVI: So the U.S. cost wouldn't apply to Jamaica, but the way you should think about it is for a primary school teacher, one or two days of training one time, and for a secondary school teacher, about 10 days of training one time. So what that amounts to in the United States dollars ends up being about $200 for a primary school teacher, and about $2,000 for a secondary school teacher. I don't know if that would translate. You can basically -- the number of days is the thing to use to translate to different countries.

SPEAKER: Your group, actually, four people at this table are working on the project for preschool programming in Costa Rica. The government has asked us to develop an approach to teach within the math curriculum because they don't have programming in the preschool-kindergarten curriculum. But within the math lessons, to then teach programming. What would be your recommendations for ways to work with kids that young? Because there are several terms referred to, like early programming, yes, second and third grade, and this is like a few years before that.

MR. PARTOVI: And is this preschool, pre-kindergarten? Or is it kindergarten?

SPEAKER: It's going to be preschool and kindergarten, pre-K.

MR. PARTOVI: So it's ages four, five, and six?

SPEAKER: Yeah.

MR. PARTOVI: So the only part of that question I don't know how to answer is the math part of it. In other words, are they hoping that the kids do programming and learn math, or are they just trying to say programming inside math class?

SPEAKER: No, they see it as part of the math curriculum.

MR. PARTOVI: Yeah. Well, we have courses for pre-readers that you can just literally reuse or, you know, pick and choose parts of them. And there's other companies and organizations that have also made pre-reader content for teaching programming. And I say pre-reader because you literally don't even need to know how to read. You know, the instructions are spoken and then you drag and drop arrows. You know, for example, to make the Star Wars one, you want to make droid move around. And instead of telling them the move command, you just drag and drop the arrows that say which direction he's going to move to get to his goal. But you make a program consisting of the arrows. And then you can have a repeat block. So if he wants to move four times in one direction, you put a repeat block and you put the arrow inside that and you put the number four, which tells him to go four steps that way. And there's millions of kids who can't read who are doing this.

LINDA: I just want to add two things. Part of our elementary school curriculum also consists of like storybooks and (inaudible) and unplugged activities which I think we haven't really mentioned yet, which are completely offline activities that, you know, we encourage students to move around to learn the concepts of programming. And so we have a number of activities that can support that, as well as I would encourage you to read about what Singapore is doing with their pre-K curriculum because they have a very active community of preschools that are learning, you know, the premier science concepts of coding. They're working with physical computing devices and many have respects because they want to get kids away from the screen. Not 100 percent of their time should be on the screen, especially at pre-reader levels. And so there's a lot of activities going on in Singapore that I

think would be interesting to you, as well as our pre-reader curriculum can support a lot of (inaudible).

MR. PARTOVI: Yeah. Unplugged activities are really worth talking about a little bit because people assume that if you're learning computer science, all of it is on the computer. Our curriculum, I would say roughly half of it, is not in front of the computer. It's exercises that a teacher can have the classroom do.

You're lifting your eyes.

SPEAKER: No, the program I mentioned, there's no computer involved. Lots of it is completely unplugged and then we have kind of a robot with a smartphone reader and then they program with cards, kind of what you're describing. Yeah, just teaching the concept of programming.

SPEAKER: (Inaudible) question that we had because the idea is within the math or pre-math, or they call it mathematical skills is really foundational, but if the idea is to develop their interest in coding later on, and so the question I have is (inaudible) have you seen this, especially like for girls, that they lose, you know, this fear and this very young because they see, and actually, you're programming. This is basically programming on their own. Very early on they start learning the skills I think at this age is, the interest is the losing fear is getting contact very early on and then getting to more formal. Is that your experience?

MR. PARTOVI: Yeah. In our primary school courses, the girls are about 47 percent of the student population. It's almost 50/50, which is fantastic. I think it's because we started young and because the way we teach it is more creative and more fun and less boring.

LINDA: We've seen a study that says girls start to feel more fearful about learning computer science around age 12. And so as much as you can, making sure that students have exposure before age 12 and develop their self-efficacy, the confidence to say, oh, I can do that, too, I think is very important.

And one thing I love, you know, we have our sequenced K-12 curriculum, but we also have several, sort of open-ended programming environments. And, you know,

students can learn how to draw and make colorful designs on one of our programming environments, or they can learn how to tell a story. They can learn how to -- they can use the drag-and-drop programming to create their own storybook or their game if they wanted. And so we find that those environments are sometimes more relatable for girls than they are for boy students who are more interested in like the games where you can compete and things like that. And so we have a number of resources I would say to try to keep that interest from a very young age all the way through high school.

SPEAKER: Sorry. Their programming is also extremely good for them. They love the program. It's very sociable, and code is specifically set up for (inaudible) programming. You can track how the (inaudible). They love it. The girls are the ones that have like the most (inaudible).

SPEAKER: I have a question for you. (Inaudible) Venezuela, what has been the experience? I mean, you said it was two days and one time, and I was wondering about follow up, if it's needed, if it's not. I guess, I know with teachers there's, I mean, first they have to unlearn certain things and I guess in this case they don't have to learn because it's completely new. So maybe that follow up is not as much needed as in other cases. So I wonder, has been the experience in that sense?

MR. PARTOVI: What we've done is our follow up is basically on an online forum where teachers support other teachers and we're also active on the forums as well so they submit their questions online if they need help. And we also, in our U.S. work, we have a partner organization that if a teacher wants it, their school can pay for a volunteer to come to their classroom to support them alongside their work. That's mainly for the middle and high school, for the older grades for the year-long course, so if they get stuck, you know, there's somebody they can look to for help.

SPEAKER: So I'm going to shift gears just a little bit. Theoretically, you're collecting a lot of data about how students interface with your platform. And it sounds like you also have a discussion board with teachers where you can also see. Have you learned

anything or do you have any additional insight on how people learn or how teachers grapple with the new content in terms of their social experience with it?

MR. PARTOVI: Sure. The first thing I'd say, because as soon as you ask about data, especially during (inaudible) your VMGDPR rules is we are very aggressive when it comes to privacy. So we generally have this point of view that we want to be safer than the law requires on issues of privacy because in my experience, a lot of tech companies, wherever the law is, they want to be as close to the line as possible and we want to be as far away from the line as possible. I just mention that especially since we're in conversations with school districts, agents of the governments that we want to make sure that we are an organization they can trust with that kind of thing. And we don't store student identities, so the data we get, we have teacher email addresses but we don't get the students' identity, so that is one of the number one ways we keep things secure. So I can go to sleep never worrying that somebody is going to steal student email addresses because we don't even have them. But we get a lot of data and there's a lot of interesting research we can find from that. We do some of that ourselves and we are also partnering with university researchers to do studies.

As examples of things that I found really interesting, we recently found that -- this is a little unexpected, but the students working under older teachers performed better than students working under younger teachers. And people all expected the opposite. And the reason is because the older teachers have more years of teaching experience. So the teacher, age and teacher experience were very correlated and that was a strong predictor of student success, which is completely unexpected in computer science. Everybody just assumes, oh, younger teachers will be more technical and will do a better job, but it turns out the ones that have greater teaching experience are succeeding better.

The other thing that was an interesting finding from our data was that the race of a teacher, if the teacher themselves was from an underrepresented minority group, they managed to attract and retain a more diverse student population, both on gender and on race.

SPEAKER: And just to follow up. Is there any way of identifying extremely

good coders and maybe like scholarships? I know you don't have the student data, but it seems like --

MR. PARTOVI: I'm sure there would be. We haven't started looking at it yet. That's a question on my mind because at some point, when it comes to running a nonprofit, there's money to be made in identifying the very, very best coders. And I'm sure we're sitting on a lot of data that could help us do that. We haven't looked at it yet. When we find them, we would only know their teacher's identity, so we would need to find some way of helping that teacher connect them to some future opportunity.

Any other questions?

SPEAKER: Any plans for (inaudible)?

MR. PARTOVI: Well, all of our stuff works on any web browser but we don't have apps. It's just a webpage. But when we think about offline support, one of the ways to deliver offline support is an app that you download it once and it just lives on your tablet. What we haven't done is we need to do a bit of research, which maybe Brookings or IDD could help us with just to understand what would be the computer systems that are most commonly used in schools that don't have Internet access. Would it be tablets or should it be old Windows machines? You know. Probably the latter. Yeah.

MODERATOR: If anyone else has another question, we will be wrapping up in a few minutes, so please feel free maybe two last questions.

SPEAKER: How about like adult learning? Like, or like even outside of school, ways to give credit to learning coding for people that are not in the public system?

MR. PARTOVI: So we focus only on K-12. And we thought about should we expand beyond that? And so we said, let's expand to other countries because we've made all this fantastic content and, you know, our coding content includes coding with Ana and Elsa from Frozen. I think that's going to be more applicable in another country than to an older -- it's better for a 10-year-old in Venezuela than for a 40-year-old in the United States. That said, I would say probably three or four million of the coders on Code.org are over 40 years of age,

and our videos, in particular, are very applicable. So we have this video series that explains how does the Internet work and a video series that explains how do computers work? Each of those video series is just 30 minutes long. So it's a short, five minute videos each, and one hour worth. And those are, I think, good for any adults to watch. In fact, everybody here should watch them. If you don't know what TCBIP or DNS is or how a CDU works, it's one hour with the videos. And they're taught by the people who invested the first computers and the first people who invented the Internet. So that content of ours -- actually, Alaska Airlines is now playing it in their airplanes as one of their featured videos just because it's useful for all adults to learn.

LINDA: And we had a staff showing of those videos. There are a lot of nontechnical staff members going, oh.

SPEAKER: Did you plan or maybe have an idea or something to add support or hardware? I don't know, like (inaudible) or something like that?

MR. PARTOVI: Yep. That's a great question. We really like the idea of hardware in classrooms because kids -- it just is a different way of thinking about things, of writing code that controls the physical world. The challenge is it's usually not cheap. There's a lot of new toy robots that, you know, in America there's these companies like Sphero makes a robot. Or another company called Wonder Workshop or Lego. None of these are cheap. And so --

SPEAKER: We are trying to do that.

MR. PARTOVI: For most classrooms, you know, if the individual kit costs $100 or $200, then to have enough for everybody to do it costs like $2,000. And the robot is almost as expensive as a Chromebook. It just becomes too much.

What we've chosen to do is using a very small circuit board that's about this big, and it has a system called arbianoche -- obviously you're familiar because you mentioned it. And that circuit board costs about $20.

SPEAKER: What --

MR. PARTOVI: Our maker is Adafruit. And it's called the Circuit Playground. And we actually, for the schools, for the lowest income schools in the United States, we subsidize the cost of the circuit boards, so it ends up being -- instead of being $200 per kit, it's $200 for the entire classroom. And that's much, much cheaper. And so we'll discount that more than 50 percent for low-income schools. In fact, the maker of the Circuit Board discounts it as well and helps us do that. And we're big fans of physical computing for doing that, and part of our curriculum is actually deeply integrated with that particular board.

MODERATOR: So thank you everybody. And a big thank you to Hadi.

So if everybody would like to go into the main auditorium, the next session will be soon. But thanks, Hadi, again.

(Applause)

(Recess)

JANE: If you can take your seats. Can everyone, please, take your seats. Thank you.

Welcome back from lunch, everyone. A small housekeeping announcement, not a lost ball at this time, but if you have taken your headset out of the room, can you just ma sure it makes its way back to your seat at some point this afternoon, so we can account for all of them. Thank you.

So, I promise, first of all, that I'm not going to make you jump up and down again, because you just ate, and we don't want anyone getting a cramp. So, this activity you get to do a little more calmly than this morning. We are spending the day talking about leapfrogging, we are talking about going over obstacles, past obstacles, around obstacles.

And I want to do a little activity right now that's going to focus us on taking obstacles, what we think of as barriers and turning them into opportunities, because if we are really going to jump forward in education towards big solutions to big problems, we have to be incredibly creative in our thinking.

So, at the Center for Inspired Teaching, we base our teacher training on

improvisational theater, and this is an improvisational theater activity. I'm going to ask my friend, Adam, to come help me. Come on up, Adam.

My own kids love this activity, and they are really, really good at it, and I will tell you that one of the founders of Improvisational Theater, a man named Keith Johnstone, says that adults are atrophied children. I would like to challenge you today, right now, to prove him wrong.

So, in a minute I'm going to ask you all to find a partner sitting next to you, or near you, or a couple of partners, please find somebody who speaks the same language as you do, to make this easier. And for those of you watching along on the webcast or in the overflow rooms, you can do this with a partner if you have one, or you can give yourself some challenges, be as creative as you'd like.

So, this is how it goes, and once I turn this over to you, this is what you're going to do with your partner. One of you is going to be climbing a mountain.

Adam is climbing the mountain. Adam, I see you're climbing a mountain.

ADAM: Indeed I am.

JANE: Here is a lightning storm for you as a gift.

ADAM: Thank you so much, Jane, for the lightning storm. I am going to take a lightning rod, use the storm's energy to power my cell phone, and then use the cell phone to call for a helicopter to take me up the mountain.

JANE: Excellent! Excellent!

ADAM: Thank you. So, I see you're also climbing a mountain.

JANE: I am.

ADAM: Wonderful. So, I am going to give to you a pack of ferocious wolves.

JANE: Thank you --

ADAM: Of course.

JANE: -- for this pack of wolves. I am going to take the pack of wolves, and I am going to send them to attack the beers that have been eating all my food, so that I can

have my food, and make it up the mountain okay.

So, that's how it goes. You are going to give each other -- take turns giving each other presents, your partner is climbing the mountain, you give them a present that is not at all helpful, and may be downright unhelpful, and their job is to take that gift and turn it into something they can use to help them climb the mountain. Go!

(Discussion off the record)

JANE: Okay, take one more minute, and make sure you both have had a turn. Okay. If everyone could come back; back down now in -- back to our room, back to Monday afternoon, back to post lunch, back to our panel, back to your seats? Okay. We are going to get started with our panel this afternoon. Thank you.

I was an elementary school teacher for a long time, so I may have to pull out the elementary school teacher tricks. But that seems to have worked, yes. We've got the hand claps.

So, I hope all of you have come back from lunch ready to face any obstacle in education and beyond, and turn it into an opportunity, and I know that something that the next panel will be talking about a little bit, so I'm going to bring Rebecca back up here to introduce them. (Applause)

MS. WINTHROP: Yes. For sure, give Jane a round of applause, just for keeping us awake at the bare minimum, nevertheless, inspiring us to overcome obstacles.

I am really happy to welcome you all back post-lunchtime for this session, on teacher training, and teacher development.

I'm going to introduce two people. The first is our featured speaker, Professor Ju-Ho Lee, who will come up and share some of his insights and experiences when he was Minister of Education of South Korea. You have his full bio in your pack. He is also one of the Education Commissioners of the International Education Commission, and he's also Chairing the Education Workforce Initiative, that had a whole consultation and discussion at lunch time.

And so many reasons to welcome Ju-Ho to the Brookings stage. And then

after Ju-Ho speaks for a little bit, he will step off the stage and Jenny Anderson will come and moderate panel discussion. Jenny, you also have her bio, along with all the panelists in your packet, is a wonderful Education Journalist from Quartz Atlantic, and we are very lucky to have you, Jenny. So, Professor Lee, welcome to the stage. (Applause)

MR. LEE: Thank you, Rebecca, for your nice introduction. I am very honored to talk about Leapfrog in Education Workforce based on South Korea's experience, and more recent work by Education Workforce Initiative.

South Korea achieved very rapid and sustained economic growth, and now its GDP -- per capita GDP reached to USD30, 000. So, this is great achievement, of course is mainly due to its investment in people. So, the engine of growth was definitely human capital, in other words, education.

So, when you look at the right-hand side, you can see that Korea has universalized basic education within just one generation after its independence. So, you can see that the enrolment rate at elementary level reached to 100 percent in early 1960, despite that Korea had a war in early 1950s.

And the second line, which is about the enrolment rate in lower secondary level, which has reached to the universal level in 1980. So, after its independence in 1945, it takes only 35 years, just one generation, to obtain universal basic education.

And afterwards, Korea has one of the highest enrolment rates in higher education in the world. So, this very rapid increase in enrolment rates, noted by the Education Commission as progressive universalism, has been really the key factor contributing to the economic growth, sustained economic growth.

And above all, our teachers were at the heart of this remarkable process. You probably know that Korean students ranked at the top in PISA Test, and the PISA Test in 2015 asked the students very interesting questions, whether they want to become -- aspire to become teachers. And you can see, Korea is outstandingly number one, with a big margin with the second.

So, when you are asking Korean students what kind of jobs they are taking after schools, the teacher comes first, even before lawyers, lawyers and doctors. So, that's one of the success elements that lies behind those rapid economic growth and education development.

So as South Korea leapfrogged in 3rd Industrial Revolution, which is often called digital evolution. So, leapfrog, the word "leapfrog" is very familiar in South Korea, and you can see that all the mobile phones and TVs are all produced by the famous Korean companies.

But Korea is now facing daunting challenges in 4th Industrial Revolution. You know that throughout this leapfrogging in 3rd Industrial Revolution teachers played key roles, but teachers are now also having a lot of problems, because you see that Korean students are not happy, and also Korean teachers are losing self-efficacy.

You know that Korean teachers are best paid, and the best students became teachers, and teachers are respected by all people, but they are losing their self-efficacy, because their pedagogies are outdated.

The students are losing interest, and they are not paying attention to teachers. The lecture provided by teachers uniformly to help the student in the classroom they do not make students interested.

So, this so-called best production system, you know, the best production system is often used, or in describing the 2nd Industrial Revolution, but this is also very closely related to the way we teach students in the classroom. Without big transformation from best production to best personalization in education, I don't think we can address the challenges caused by 4th Industrial Revolution in education.

So, many policymakers in Korea -- is now talking about radical change, a big transformation in education from best production to best personalization.

So, from learn to test, to learn to learn, from shallow learning based on rote memorization to deep learning; from vertical learning based on lectures, to horizontal learning,

where teachers are playing a role like a coach, while students are doing projects with their peer students.

So, when we are discussing the ways to transform whole education system, I personally think that teacher education and training system is the key. How we can harness education technology and learning science to teach teachers, so that they can actually teach so-called high-touch, high-tech learning is the key.

You know that this is the model of original state university, and I heard from ASU that more than 65,000 students already benefited from the adaptive learning system, where artificial intelligence and big data can help students to have all the different learning tests within the same classroom.

So this turned out to be very effective in increasing the ability to understand and to remember, but this does not -- this artificial intelligence does not replace teachers because teachers can focus more on high-touch learning, in the area of creating, evaluating, or analyzing and applying.

So, this is really interesting model of combining high-tech with high-touch learning. So, this is quite a specific model, but I think it can be extended to apply to K through 12, and why not, we can start adopting this model to teaching teachers.

This is one example how we can radically change our system, education system from best production to personalized learning system.

So, Korea now became a donor country in 2009, and we are discussing how we can help other developing countries. And we know that Korea benefit enormously from Peabody Project because we have a huge knowledge transfer from Western countries, including USA, and we have many educators, experts learned from Western tradition and Western ways of teaching through this kind of knowledge transfer project.

Then when we are able to help other developing countries, we have to do the same thing, that's our concern. We know that although we did a big success, but our model doesn't work anymore in the new era.

So, maybe it's time for Korea to work together with developing countries to leapfrog, rather than suggest them to follow the so-called Korean Model.

So, this is what I understand about leapfrogging strategy. So, maybe this tells us why I am working with now Education Workforce Initiative, because you know that even Korea who successfully leapfrogged in the 3rd Industrial Revolution era, now facing a daunting challenge caused by 4th Industrial Revolution.

So, I don't think any country holds the best model for education workforce right now, we all have to figure out how we can overcome this challenge. But it is not really easy to make a transformation at the national level, especially in the area of education workforce, teachers.

I have my own experience as a Minister; I have done a lot of changes in education area, except for teacher area. It's really hard, politically difficult. So, then why not collectively work together at the international community level?

I think it's really high time for international community to join forces to focus on change in -- radical change in teachers, harnessing and embracing education technologies and learning science.

So, that's how Education Workforce Initiative was set up, and we are going to produce two important outcomes. The first one is Education Workforce Report that will be published next year, early next year, and we really want to get new ideas, different approaches, to design and strengthen education workforce.

And second, EWI is doing a series of country-specific proposals of education workforce reform, so we are working with, now three countries, including Ghana, Sierra Leone and Vietnam.

I'm going to ask you right after this seminar, to talk about how we can help Vietnam to introduce ASC model, to teach their teachers, if Vietnam can be successful in introducing ASC, maybe Vietnam can leapfrog, even Korea.

So, that's how we aim at radical changes in developing countries. Maybe

Vietnam alone cannot make the kind of bold change, but if international community like EWI, and also working with ASU, and other partners, help a country like Vietnam to make a radical change in education workforce, maybe they can make a difference.

Thank you very much for your attention. (Applause)

MS. ANDERSON: So, I'm super excited for the panel. We have an incredible amount of talent and experience up here. I don't want to talk for very long, because their experience is what you are here to hear about.

I just want to briefly mention, last Friday, some somewhat alarming, and probably not surprising to anybody in this room, the data came out with respect to teacher-leaving rates in the United States. They have been rising every year for the past three years, they were about 5.1 percent in 1992, and now they are more than double that. And in high-need schools, it's double that rate as well.

As we were leading the panel earlier this morning, Former U.K. Education Minister said to me, the situation in the U.K. is catastrophic the rate at which teachers are leaving.

So, I think we all know that we are not doing a good enough job of making this a rewarding and engaging, and a professionalized career for them, but the solution to that attrition is in, I think, the bulk of what we are going to be talking about today is this professional development and how we can do it better.

I think he mentioned, too, that we spent $16.8 billion just in the United States on this, and basically teachers don't like what they are getting. So, I think we can definitely improve on that.

Rebecca also noted this morning, that of all of their 3,000 innovations they looked at, a whopping 9 percent focused on helping teachers get towards the breadth of skills. You know, it's getting them the breadth of skills they need to get their students the breadth of skills. That's what we are here talking about, right.

Students need the breadth of skills, a breadth of competencies, and the

breadth of mindsets to succeed. Well, how are we going to give them, the teachers? I don't think anyone in this room is going to dispute that it's the teachers that's the primary motor of change here that we need to focus on.

So, that's what we want to unpack here. What are the obstacles to getting better professional development, and what are some solutions? We want to go as deep as we can, and in as short a time as we can, on some examples we have right here as to what's working, and also what hasn't worked and why. So we understand that better so we can create more effective solutions.

I'm going to let the panel introduce themselves. They'll do a better job than I will. And then we'll dive right in.

MS. RICKER: Good afternoon, everyone. Thank you so much for having me. My name is Mary Cathryn Ricker, and I am a National Board's Certified Middle School English Teacher, by licenses in the State of Minnesota. And I am currently Executive Vice President of the American Federation of Teachers by Election. It's great to here. Thank you.

MS. ANDERSON: I'm going to just stop for one second, because Vishal gave me the best idea before we started, so I'm going to steal his idea. Tell me why you do what you do.

MS. RICKER: Yes.

MS. ANDERSON: And each of you, if you could just say why you do what you do, that would be helpful.

MS. RICKER: Absolutely! Absolutely! So, folks in the teaching profession in general, like some other professions, medicine, for example, social work, et cetera, usually, like me, they are looking for a job where you can take your skills and leave the world a little better than the way you found it at the same time. And that's why I went into teaching.

And while I was a classroom teacher I realized that I had an additional interest in leaving my profession a little better than the way I found it as well. And so that's when I began to use my union activism to do just that. So that's why I do the work I do.

MS. ANDERSON: Vishal?

MR. TAREJA: Thank you. Good afternoon, everyone. It's really great to be here. I am the Co-Founder of a non-profit based out of India called Dream and Dream, and we work with young people and teachers, helping young people overcome adversity, and to thrive in the 21st Century to use the creative life skills approach to do that.

Why do I do what I do? I'll tell you a recent story. Recently we had a trainer who joined us, a trainer who helps us train teachers, she comes from a rural village, she grew up in a large family, she accomplished a lot herself, she became a principal of a local school, she runs five community computer centers to teach children computers, which is also on the Board of a local committee that overlooks development in the neighborhood.

Yet when she came to us, she had this very low self-esteem, a sense of self. And here is someone who is highly accomplished, and through the course of the training we realized that every time she tried to do something, tried to overreach, or be ambitious of the aspirational, there's a small voice at the back of her head, which was the voice of her father who kept telling her she's not good enough, that she grew up with every day.

And even though she was selected to be a trainer and not her husband who was also well accomplished in his own right, they couldn't believe it. How come she got selected?

So one of the reasons why I do what I do, is because I believe deeply in the concept of dignity, and I think one of the big pieces of work we need to invest in is, bring dignity back to the role of the teacher. Bring dignity back to the teacher. Thank you.

MS. ANDERSON: Thank you. Vicki?

MS. PHILLIPS: I'm Vicki Phillips. I'm currently serving as the CEO in Residence for Educurious. I'm a former Superintendent two times, a former, what you might think of the State Minister in this country as state -- Chief of Basic and Higher Ed. I spent nearly a decade at the Bill & Melinda Gates Foundation as their Director of Education.

And I would say there are two reasons why I do this work. One, because I am

just a passionate believer that there's something magical about that learning bond between kids and teachers, and that we should give that bond all the power that we possibly can. And two, because I'm a first-generation college student myself; I'm a poor kid who got a lucky break, and I actually believe that all kids should have that opportunity by design.

MS. ANDERSON: Thank you. Ju-Ho.

MR. LEE: Yeah. Why I do what I do. Basically I'm trained as an economist, and also in academia, now, I'm coming back to academia, and publishing papers in economic journals. But ideally it's to just begin in changing education, because I believe in the fact that education is the engine of growth, and also all the powerful equalizer. As Rebecca talked about the skill, inequality, I think it is really a big challenge that all the countries are facing. And education is the most effective tool to reduce inequality.

MS. ANDERSON: Thank you. And your presentation before really showed us just what can happen when you actually embrace this, when you make it a national priority, when you empower it, when you maybe do it differently this time around. But it must be particularly powerful having living the example. That you've seen it, that you've seen the evidence, you don't need to be convinced by a text book.

I want to start briefly, and I don't want to get -- I don't want to spend too much time on this, but I do think, Rebecca and I were talking about this, when I read the report, and I was writing about it, I said: why are there so few? Why is that 9 percent number 9 percent? I don't get it.

You know, if we all believe in teachers, and we believe the teachers are the sort of path to change, why are so few education innovations focused on teach development, on professional development, towards the breadth of skills?

So I'd love for you all to answer that. I'm going to pick on Mary Cathryn first.

MS. RICKER: Absolutely.

MS. ANDERSON: Why so low?

MS. RICKER: You know, I'm going to focus on a couple answers and then

probably add answers, as our time goes on. I'm going to start with the idea that we actually are still treating professional development and an add on to a teacher's experiences, and those places where it has worked, I would venture a guess that you likely have found professional development where they are treating it as a part of a teacher's working condition.

Not at the three extra days tacked on to the end of the school year. Not as the extra hour every Tuesday after school, not as -- again, not as an-add on, right. Like, we are hiring you to be a teacher, oh, and by the way, from time to time you'll have to do professional development, the verb that is always used is, you have to do professional development. And so I do believe that is one of the shifts.

And we, right, royal "we" have shaped a profession that says, professional development is something extra, not part of your legitimate working conditions, and so I do think that is -- that is one barrier is like, as soon as we name it, we can start figuring out how to break it down.

I also think that the second shift that needs to be made is that historically, teachers have also been managed, and, you know, we have infantilized teaching both in that sort of soft, focused world view, like: oh, we love teachers. And in that professional view of: they must be managed, teachers do not have the capability of making decisions for ourselves.

And so there is a shift that has to be made, because as soon as we start treating teaching as a career of professionals, who have the -- who have the intellectual capability of making decisions for ourselves and shaping those working conditions and things, then, you know -- then we have shifted from managing teachers, you know, to a career where you actually are shaping the profession yourself.

You know, there are some reasons, we have historically not put decision-making in teachers' hands, and those reasons are all fairly outdated, they were actually probably fairly biased when we made them, actually.

And there is actually, historically, you can see, fight after fight after fight in keeping decision-making from teachers hands, whether that is fighting the right of teachers to

organize and form a collective voice in a union, or whether that is -- the current way of doing that is teacher-proofing material, right, like having -- you know, your shrink-wrapped curriculum delivered to you, and told you can break the seal September 1st at 8:05.

Like, there are ways we have been managed as opposed to creating the sort of career, that I think it would also get at the attrition point you made, right?

MS. ANDERSON: Right.

MS. RICKER: Creating the sort of career where the decision-making shifts to classroom professional.

MS. ANDERSON: And this is something you see when you travel around the world, and in a place like Finland or in Singapore, what you see is a huge amount of agency, the teachers have agency, they are very well trained, but they are also very well trusted. I think that's part of what you're getting at.

MS. RICKER: Absolutely.

MS. ANDERSON: Vishal, can you take a stab at that from the context of India, why so a hard to do effective professional development, and make it a priority, and get it done at scale.

MR. TAREJA: Yes. From the Indian context I think it's a bit more complex. I think one is, there are certain structural challenges. If I just put some data out there, between 1960 to 1993 we moved from 1,200 teacher education institutions to about 1,500 teacher education institutions.

But in 1993 we set up the National Commission on Teacher Education, the National Council on Teacher Education, and since then, till about 2011, we set up 16,000 teacher education institutes, 90 percent of them private. And the data that's coming out now, which is saying that 75 percent of them don't even have a program, they're fake, so they just give out certificates.

So, it's become more business than actually getting investment in education. So there are structural challenges. The second is, of course India is huge, right. I mean there

is a requirement of nearly 12 million teachers in the country. There are 12 million teachers in the country, so you just need more hands, right. And to train such a large population, you know, is going to take on its own complexity.

MS. ANDERSON: Right. Yes.

MR. TAREJA: However, I think those are systemic challenges that can be addressed. I think a bigger challenge that we are not addressing, and which is probably, you know, contextual across the world, is our own mindset around teachers. Our mindset around teachers, I think in the last three or four decades, has shifted from someone that we looked up to, to someone now, we look down upon.

And I think it's really -- for me it's a reflection of, can I look within myself, and can I really trust the teacher? Can I really give agency back to the teacher? Can I really give decision-making power back to the teacher? Am I able to -- am I creating the enabling environments in my policy frameworks, in my implementation, in my professional development, to help the teacher feel that they own this, they own their classroom of 40 or 60 kids. I think that's where we are failing. Yes.

MS. ANDERSON: Vicki?

MS. PHILLIPS: I think that nearly everything that we know works, which is a lot of, like, you just said, making it personalized, putting, you know, it in content and context, having teachers learn at a lot of their own pace, going from just minimal improvement to really deep, sophistication and mastering your craft, making sure that's by teachers for teachers, that you're actually the deciders, the collaborator, the coaches, the calibrators. All those things that we know work are things that we just haven't done, right?

We've done them so little. And so I think it feels like a really big, overwhelming task in many ways to try to change every aspect of that, that's one issue. The second is, I think we have really failed to create the kind of enabling conditions for all of this to happen.

Still, lack of time, particularly in this country, for teachers to really come

together and collaborate, to be joined by larger network of teachers out there that they can reach out to and help to reduce that sense of isolation, and that they can share ideas and problem solve, and find solutions with.

And then the third thing I would say, is that we haven't yet figured out how to embrace, harness, however you want to frame it, tech-enabled solution, so that we can get the best of face-to-face with technology that can actually help that kind of personalized learning for teachers, that we actually want for students, also to be viable.

MR. LEE: So, in making a good teacher policy, it takes a long-term commitment by government and my teacher unions, and many other players. But government changes every five years in --

MS. ANDERSON: You're saying politicians aren't long-term thinkers, I thought that was just in the U.S.

MR. LEE: So, this is the problem. I mean, because of this problem, I think it's time to consider the role of international community really focusing on teacher issues, when we are providing aids to developing countries, we can focus on teachers, teacher development above any other area, so that we can think about ecosystem or making a change in teachers.

But really the void is there because we did, indeed a long-term commitment of major player, and maybe this is the role of international community with long-term commitment, and we can make up all kind of consensus building, through international community, because it's quite difficult, at the national level to make a compromise between teacher union and minister, because you always -- you have a lot of issues to fight.

But at the international level, when you think about long-term changes, we can make a good consensus between important players. Education International, and U.N., and other leaders can join together, to have a kind of project to make a change in teachers.

MS. ANDERSON: We have to make it cool, internationally to be investing in teachers, and to be rethinking this, and rethinking this in a really broad way. The conversation in Davos, it was very interesting this year, very much talking about automation and the fallout

from the automation, and how are we going to reskill our works.

It was just sort of an amazing kind of deficit of understanding that perhaps we could better skill them in the first place, and education is the tool for that. And I kept asking these great business titans, and government leaders, like what about education? Oh, yeah, education is really important. Nobody had a plan. And so I do think that mindset shift is incredibly important.

Now let's get into the meat of the what, of what we see -- I'd love to maybe pose to you all, hope and despair. What do you see that gives you hope, and what do we need to fix? But let's focus on the sort of solutions that are working?

And Vicki, I'd love to start with you and go back to your technology piece. We talk a lot about technology, personalized for students, adaptive technology for students to get better scores, to get broader skills. Can we do this for teachers, and how? What does that look like?

MS. PHILLIPS: Well, you know, one of the privileges I have at the moment is helping a couple of ed-tech startups, and one of which is Educurious, which is a great example of your high-touch, high-tech sort of criteria earlier. And I should say that in the audience is actually the Founder and most recently of Educurious, Michael Golden, I'm just getting this sort of continue to nurture Educurious along.

But Educurious is an example of both the student and the teacher-facing side, in that it is all focused on project-based learning, so that teachers use project-based curriculum in science, social studies, and English language arts, with all of those contemporary, career-connected skills we'd like built in, to engage students deeply in projects and authentic questions that matter to them. Connected to, instead of experts, that allow those students to connect with other adults, virtually, to see people in other careers that they might not have aspired to, and teachers then get that same experience.

They get to develop their muscle, if you will, their sophistication in project-based learning over a period of time. They then learn how to adopt -- or how to adapt, and

then how to innovate against that, and that level of professional development and support, over a sustained period of time, seems to have teachers having more efficacy, students having more agency, and classrooms being a much more engaged, happy and vibrant place.

So, it's a good example of what happens when you use technology as, not the sole driver, but as a great enabler of good curriculum and professional learning. And the professional learning is obviously a continuing combination of face-to-face, as well as virtual.

MR. LEE: Can I also --

MS. ANDERSON: Please.

MR. LEE: So, about the product-based learning, I really wanted to encourage Korean teachers to adopt project-based learning, but the most frequent I heard, response from teachers is that they have to teach the student on subjects. So, how they can find time to do project with students. But if we can introduce adaptive learning technologies, artificial intelligence, robots, or big data can help teachers to reduce the burden for teaching subjects. And they can focus more on project-based learning. So this --

MS. PHILLIPS: But the interesting thing --

MS. ANDERSON: Sorry. We are going to have robots doing math, and then teachers doing projects?

MR. LEE: Maybe in the future, in the future, yeah.

MS. PHILLIPS: The thing about project-based learning is that it doesn't have to be devoid of the discipline, so what Educurious does, it's full on units that then get added up into coursed, in biology, for example, or science, working on it now, sixth to eighth grade, or social studies, or Project America course, for example.

So, teachers do not have to sacrifice. They are discipline in their subject area, for project-based leaning, and projects don't just mean, wait till the end of the year, and do something cumulative.

It means kids get to really interact with interesting questions and projects along the way, and all of those contemporary skills that we want kids to learn, like

communication, and collaboration, and critical thinking can be built into those projects and opportunities. And so that, you know, kids and teachers both get that kind of, deep, engaged experience you were hoping for earlier.

MS. RICKER: And no thoughtful teacher is actually going to trust a spreadsheet saying that some basics have been met. They are going to want to see it, and feel it and witness it themselves, to make those projects that much stronger, and that much more personalized, quite frankly.

MS. PHILLIPS: That's right. And they can because they can learn how to do project-based learning well, and then they can adapt and modify it into other subjects, into other areas of interest, into other passions that they think are really important to them.

MS. ANDERSON: And just to bring it back. This is a bottom-up not a top-down approach. And that's, as we talk about this, let's make sure we kind of reference how much of this is the international community talking about this, and making it important and a priority, national governments, setting standards, assessments, you know, whatever that -- and this social, I think someone earlier referred to it as the social movement, the bottom-up. So, which of those are most effective?

Vishal, let me throw it to you right now, because yours is very much bottom-up, right? This is about empowering people. Can that work at scale? How will that work?

MR. TAREJA: So, I think this, we are sitting on a more fundamental question here, and I kind of want to push back my co-panelists a bit here. I think I go back to the earlier question of what is the purpose of education, and I think it's very easy to get stuck in the house, and there are enough solutions of the how available in the world today.

You know, with the artificial intelligence mobiles, I know in India with our complications with education we are able to bring in a lot of technology-based solutions in education, the entrepreneurs in the information technology field are bringing in cutting-edge solutions using technology, but they are failing. I mean, another recent research of Khan Academy, for example, being introduced in India, a big fanfare, the results were that while

everyone is signing up for the Khan Academy programs

MS. ANDERSON: The Khan solution.

MR. TAREJA: Each kid is actually spending less than eight minutes on it. So, again, the question comes to: what's not working? Why are the solutions not working? And I'll bring in two lenses, which are my lenses of despair, one is that education is a political subject, we have to acknowledge it, and then internally, as we bring in political buy-in and political will into transforming education, we will get stuck in these five-year election cycles.

Education is not even a subject by which political parties fight elections in India. It's not even talked about. So, we have to accept that technology, and then make it a political subject. The second lens, which I believe a lot of the West is struggling with, but these are real lenses in countries like India or parts of Africa, is that 48 million children in India under the age of 5 are stunted. And the next big country is Nigeria with 10 million children.

Now that's a big challenge, it's a complex challenge in India, it's overwhelming almost. How do you address the challenge where 48 million children are not even able to access the education you're bringing to them, because they don't have the skills to access it?

MS. ANDERSON: Right.

MR. TAREJA: And by access I mean that they don't have the capacity to actually access how to learn mathematics, or how to learn a language, because they are growing up in adversity.

SPEAKER: Right, mm-hmm.

MR. TAREJA: Now, internally, as we acknowledge again that lens that there are children growing up in adversity, and we have to help them catch up with their developmental milestones.

MS. ANDERSON: Right.

MR. TAREJA: We can keep talking about education strategies and how (inaudible), none of these strategies are going to work with children growing up in adversity. However, I'm going close on a hope.

MS. ANDERSON: Or else you say, however, our panel is exactly about the teachers, so tell us how we are going to empower the teachers? (Laughter)

MR. TAREJA: Yes. So, it's important that, you know, we see that there is light at the end of the tunnel. In our own experience of 18 years of having worked now, and with about 6,000-odd teachers that we worked with in India, the good news is, teachers in rural communities, semi-urban communities, urban communities, young people who are growing up in adversity, have already recognized that the world is changing, that the world is becoming increasingly complex and uncertain. They are adapting.

Our teachers are adapting, with all these complications, and boundaries, and political incompetency around them, the teachers, because they are so deeply committed and invested in children, they're adapting, with us or without us.

MS. ANDERSON: Right. Mm-hmm. So, it sounds like the trust is there, and the agency is there, and they're doing good things with it. Mary Cathryn I want to go to you.

MS. RICKER: Yes.

MS. ANDERSON: And we are running out of time, we are going to -- oh, gosh, okay. We've got to move to the questions really fast. But I wanted to talk to you about the role of the teacher themselves in designing their own learning, and designing their professional development. How do we do that? What's the how?

MS. RICKER: Yes, absolutely. Well, and I connect it back to the hope and despair question you asked as well, because to your point, Vishal, the hope I see is actually we are incubating, promising educational practices because teachers have brought them to us.

So, to Mr. Lee's point about Education International, so Education International and OECD are right now working on something called Pedagogy Plus, that was -- you know, again, that is a really promising joint project.

Locally, with my members of the American Federation of Teachers we are incubating actually an entire community revitalization project of which public education is a

part in McDowell County, West Virginia, called reconnecting McDowell, where it is intentional to invest in the public school system there, and we are investing in the economical situation, the housing situation in the community, we are making sure we are bringing partners from the local government, partners from the small businesses that exist there.

So that everyone -- everyone is invested in McDowell County because they live in McDowell County, and so everyone is, rather than trying to point fingers and blame, everyone comes to the table and say: how do we solve this problem, right? Like, we have low graduation rate, how are we going to all pitch in to solve that problem?

We need to attract teachers but we have no housing for them, how are we all going to pitch in to solve that problem? It's really inspiring, and because they are somewhat removed from that -- from that election cycle, essentially, that's right, they will commit to long-term solutions.

They will commit to something that may bear fruit in two years, in four years, in five years, because they feel like the investment is long-term, they are not trying to make a headline a month from now, right, they are really trying to -- because they are all planning on living in McDowell County, they are going to do that.

Peer Assistance and Review is a fascinating story. So, Peer Assistance and Review is something that was started in Ohio, in Toledo, Ohio, over 35 years ago. And it was started as a way of, really as a way of assuring that if someone whose job is renewed in their first couple of years of teaching, that they deserve it.

So, it was a model to really, like make sure that if you achieved tenure, you've earned it. Well, since then it has evolved, and as people heard about Peer Assistance and Review, then Rochester, New York, wanted to start a model, then you know, in Saint Paul, Minnesota, I was able to negotiate a Peer Assistance and Review model, using American Reinvestment and ARRA funds, that not only started with that initial SEED idea, that started 35 years ago, but also said, do you know what, our PAR Program is going to be full spectrum.

Every teacher should be able to take advantage of it, not just to earn tenure,

not just to correct if you're stumbling, but if you are a strong teacher who wants to reinvest in yourself you use PAR to earn your National Board Certification, to perhaps shift grade levels, to perhaps add a license, if you want to meet the needs of a new group of students. And so they are -- like where we've been incubating ideas and then sharing them out, they have -- they catch on like wildfire.

MS. ANDERSON: So, there's this interesting tension we've got here, right, between sort of bottom-up, and community-led, and stakeholder-led, and then what Ju-Ho was talking about, this international, sort of really taking even higher-level pressure.

MS. RICKER: That really has been (crosstalk).

MS. ANDERSON: I have to go to the audience or I'm going to -- so I'm going to take a couple questions and then, Ju-Ho, I do want to come back to you in the closing.

MR. LEE: I have another point too.

MS. ANDERSON: Yes. So, do we have a microphone, please? Thank you.

MS. ANDERSON: If you can say your name, where you're from, and short questions, very short. Go ahead.

QUESTIONER: Hello. My name is Marcello Belasalfaro, and I am from the ADB. I live in Ruai. Vishal said something that led me to what Rebecca said in the first session. You said that we have to acknowledge that this is a political issue.

Rebecca said, which is the demand from leapfrogging; and in Latin America we see a problem. In every poll that -- in every survey that we made families are asked: I'm happy with this -- with the education our kids receive. So, if it's not a political issue, if families are not pressuring for leapfrogging, what can we do? In Latin America we have some experiences of civil society organization advocating for quality and equity.

MS. ANDERSON: So where is --

QUESTIONER: But I want to ask you, what can we do in this scenario?

MS. ANDERSON: Where is the demand going to come for change? Ju-Ho, why don't you start with that?

MR. LEE: I talked about the role of international community, kind of outsider could be a better innovator, given that insiders tend to be very --

SPEAKER: Can you come closer to your mic?

MS. PHILLIPS: His mic has dropped.

MR. LEE: -- so the insiders are slow to make a change, that when they are making it slow, then outsiders can step in to spur changes. But I'm not telling that only outsiders should push the change, but you can utilize the outsiders to contribute to the changes.

I will talk about one example that I have made for vocational schools in Korea. We call Meister High School Initiative, and when we really want to turn around those failing vocational high schools, we invited former CEOs to lead a failing vocational school as the Principal.

So, these former CEOs, with their networks, and their experience, they really had a great role to turn around those failing schools, and also they provide the training opportunities for teachers. They even did design their curriculums, for example, some were providing a major -- like LED lighting, this is a new technology. How you can -- how the teachers can teach LED lighting technology. So, you ask professionals, engineers in the company to come to school to teach the teachers.

So, those kinds of examples really show that the outsiders can play a very positive and strong role in making a change. So that the teachers in those vocation schools are happy now because their schools are being radically upgraded, and their students are getting jobs in good companies, and they are getting good opportunities to train themselves in the companies. So, this is one example of how you can leverage those outsiders, innovation to make a change inside.

MS. ANDERSON: Right. And you mean outsider by not just another country outsider, by another industry, by another outsider, multiple layers of the --

MR. LEE: Yes.

MS. ANDERSON: Mary Cathryn wanted to say one thing, and then I'm going to go to the next question.

MS. RICKER: Yes. I would also say, so that's very familiar, and with the Phi Delta Kappa in -- I think for 30-plus years in the United States as you grade your own child's schools A or B, and you grade the schools in your community B or C, but schools in general are --

MS. PHILLIPS: A disaster?

MS. RICKER: Yeah. And I think one of the things we need to do, first is treat parents like they're right. If you believe that the experience your child is getting is a strong one, then don't accuse a parent of not knowing any better. Like, they must be right, because in 13 years of teaching parent teacher conferences I never once met a parent who didn't desperately care about their child.

Ad so the follow-up question is more important: why do you feel like your child is getting such a great education? And as you start listening to parents explain what they are experiencing, because of the project-based learning, or because of the access to world languages, or because it's that teacher who knows my child and really cares, and I feel like they are safe and cared for there, and everyone knows my child's name, or whatever.

Now, you have started to create a list of nonnegotiable public education experiences every child expects for their -- or every parent expects for their own children, which is really the sort experience we want for all children.

MS. ANDERSON: Thank you. Let's go right here, please?

MR. MUSKIN: Joshua Muskin, Geneva Global. I'd like to get back to the question that you -- the last question that you asked, for which I don't think there was a satisfactory answer. How do we get teachers helping teachers? And I'm intrigued by the model from mass production to mass personalization that you gave, Ju-Ho, and you talked -- the learn to test to learn to learn, and the three levels.

And I replaced learn with teach: teach to test, teach to learn, shallow teaching,

deep teaching, and then instead of learning, vertical training versus horizontal training.

And you talked about the Peer Assistance and Review, it seems, for most of your language that you are talking about training done to teachers, and I'm used to working in context where no one is reaching the teachers.

Our mountainous Tajikistan, rural Uganda, rural Ethiopia, and what we've been doing a lot of work on, there is cultivating education communities of practice, so that teachers aren't just sitting there with their arms crossed, waiting for someone telling them what to do.

So, I'd love to hear some more talk about: how do we get teachers, not the teacher owning her classroom, but teachers owning their teaching, and teachers owning their school, so that they are working as a community to cultivate their professional development, mutually, and the outcomes that they are getting from that. Thank you.

MS. ANDERSON: Vicki, let's start with you?

MS. PHILLIPS: So, I actually was going to say, when I popped up my hand a moment ago, that I actually think that one of the most exciting developments is that teachers aren't waiting for us, that teachers actually are beginning to work with each other to create networks. I mean, sometimes we are helping them create them, but more often not, they are creating them now themselves, because they see this need.

And on any piece of research you do about what teachers want at least in this country, they say they want training that is by teachers for teachers, and that they want to problem solve with other people who they know are in the classroom and have experiences like them.

So, you could look at anything in this country from teacher-to-teacher, to teacher partners, to teaching channel, to a whole array of other things, or even on social media where five teachers everyday reach another million teachers, and help them problem solve.

There are so many great examples right now of that very thing, where, I

actually think teachers are leapfrogging us in many ways. And that our job is to continue to give power and help that catch fire, and then begin to help them wrap the other kinds of, you know, opportunities around it that shift the conditions, help them give voice.

I mean, teachers in this country are starting to give voice and shift policy as well. And not just through their unions. As much as they might respect and love their unions, teachers are now starting to do that in their own states and places, through their own connections and networks, if you look Teach Plus, or Hope Street Group or other things.

MS. RICKER: I would say it's fascinating that -- because teachers are creating this work themselves, and the AFT has a Teacher Leaders Program that essentially creates a cohort of individuals who are solving problems in their districts that the district has not addressed, or is unwilling to address, or whatever.

And when teachers come with ideas, for example, they will create these, whether they are formal cadres, or even informal cadres, right, every teacher knows that the parking lot conversation is sometimes the professional development they get in an entire eight-hour PD day, because that's where you really sharing these ideas that excite you.

It's when the union brings them to the bargaining table, and says we actually want to institutionalize this idea, because it came from teachers, that a district gets really threatened. Like, who do you think you are, telling us how to train you?

And so that is domestic. And the situations you're talking about, internationally, I think you absolutely hit on, sort of this Peer Assistance and Review model, and that is, you know, rather create a formal structure for the sake of creating a formal structure and have the one principal teacher, right, lead teacher, why wouldn't you have a cadre of peers who say, you know, you -- like, we acknowledge that you are the strongest math teacher among us, so you are going to mentor us in mathematics.

And I'm the strongest writing teacher among us, so I will mentor all of you in writing. That does not mean we are not trading ideas back and forth, but recognizing each other's strengths, then we are creating -- we are creating models that have no end then,

because we are challenging each other but we are also leaning on each other, and we are creating a supportive structure as opposed to, you know, sort of a hierarchy.

And so I think you've touched on the right thing, certainly in whether -- either in remote or incredibly population-dense areas.

MS. PHILLIPS: It's where technology can play a big role.

MR. TAREJA: It's (crosstalk) take another question.

MS. ANDERSON: Let's take one more question, and then if you've got something on that we'll come back to it. We also just didn't address like the question of time, right, and I think time is an important element in all of this.

MS. PHILLIPS: Right.

MS. ANDERSON: In how you create time for all of that to happen. Back there, with the glasses, the checkered shirt?

MR. TAREJA: There are two people in glasses.

MS. ANDERSON: Oh, yeah, two people. (Laughter) Oh, and I just noticed that.

MR. TAREJA: What are the odds of that?

MS. ANDERSON: I know. Now I feel guilty. If you can go really fast, then the other gentleman in the checkered shirt and the glasses --

MR.ZULU: Okay. All right. Yeah. I will try to make it quick. So, my name Aliya Zulu; I work for the African Institute for Development Policy, it's a policy think tank based in Nairobi. And my question really, might end up being a comment; it's more to do with the work we do engaging African leaders across the Continent, and trying really to understand where they see the big gap in terms of our education reforms, and so on.

And I was very, very pleased to see the example that the gentleman from South Korea talked about, because I've been wondering whether, you know, we as education experts, we are learning enough from international experiences on how to set effective educational systems. Or maybe whether we are too fixated with this, more experiments that

are happening in classes on how to do this, involve the community.

I mean, educational reforms have been going on for so many years, there are countries, the developed countries that went through these experiences, there are the emerging countries like South Korea that have done it even during our lifetime, and in terms of now, how you help governments like in Africa, look at the scale of the problem.

I mean when South Korea was bringing the Americans the 1960 birth rates were probably around what, five, four? African countries, the populations are going to double in the next 20, 30 years most of them, the number of people. And so the scale of the problem is so huge, and to what extent are we engaging these high-level, macro-level policy processes to help governments set systems that will actually create this enabling environment that will help these small, small experiments work.

I think we are spending too much time on doing small, small things and not really playing the political game that will enable education be prioritized, and go set up the systems, I mean the systems for training teachers. I don't think it's a million -- I mean it's a question that is so hard. I think there have been ways that countries have done it. To what extent are we actually learning from this, and we really dealing with this macro level system issues.

MS. ANDERSON: And I do think that you've highlighted -- it's a good point to end on, because I think you're highlighting a central tension which is this: what do we do from top level, and what do we -- we've talked a lot about the bottom up, and the power of that. What do we do from the top down?

I'm going to have to throw that one to Ju-Ho. I feel like that's right up your alley.

MR. LEE: Yes. I think we really have to strike a balance between bottom-up and top-down, and still, I was really struck by one teacher's comment when I was asking, why one of my policy has failed to take root. And the teacher said, when ministries are making order, teachers really don't want to follow. So, this top-down by minister never works for

teachers.

MS. ANDERSON: Right.

MR. LEE: So, I was really surprised to understand that, but that is the kind of -- the sentiment among teachers.

MS. ANDERSON: Right.

MR. LEE: So, so we really have to set up a good ecosystem for teachers, voluntary, can make a change. So, how to build an ecosystem which could be very sustainable, and also embracing technological changes, and also the participation from the communities, and so forth, maybe we have a lot of experience and experiments already, but I don't think any country has been successful in establishing good ecosystem to make a constant change.

So that's why, I mean that this symposium is really timely I think. And we work together, and maybe we can build a consensus, then we can try at the international level, and at the national level, and even at the regional level, and we can make a champion to make a success in building good ecosystem. And then spread those success cases around the world.

MS. RICKER: Can I just say, also I think part of getting past the politics, actually is diving right into the politics, and have the courage to say that this work will not be revenue-neutral. We must be done trading, right, it's technology, or it's professional development. Like those are conversations people are actually having, right, you know, it's class size, or it's recruiting more diverse teachers. No. Actually if we are going to make progress, progress will not be revenue-neutral. And so we have to have the courage to say that.

MS. ANDERSON: Right. This is going to be an expensive proposition but it is so much for this --

MS. RICKER: Valuable.

MS. ANDERSON: (Laughter) -- a valuable, a worthy investment.

MS. RICKER: That's correct.

MS. ANDERSON: All right.

MR. LEE: I just want to make one comment.

MS. ANDERSON: Yes.

MR. LEE: Because this is leapfrog seminar, I think Korea is the best example of leapfrog, and what Korea leapfrogged; when Korea leapfrogged we leveraged the 3rd Industrial Revolution, the digital technologies. So, look at the Korean companies, Samsung and LG, they produce world-class digital products.

Now, we are having a 4th Industrial Revolution, and many developing countries can leverage these new technologies, in post-Industrial Revolution to leapfrog. Leapfrog in education workforce, leapfrog in economy could be possible only when these countries can embrace and harness those new technologies.

MS. ANDERSON: So, it feels like to me we need to go very high level, we need to convince governments that this is a massive priority, this sort of leapfrogging initiative. And then we need to invest in it, we have to acknowledge that it's going to be a very valuable and a long-term, outside of the political sphere investment.

And then we need to actually use all of that to build up agency sort of bottom-up, and a lot of trust, a lot of space for the collaboration for the teachers to have power, and the role of technology is critical. That is the only way we are going to get to scale, I think. We have to end.

MS. RICKER: That's an outstanding synthesizer now.

MS. ANDERSON: Wait, Vishal can end our panel for us, and I have a few housekeeping, and you're not allowed to leave until I'm done with it.

MR. TAREJA: I just want to say that while we are looking at it from the space of the 4th Industrial Revolution, I think we also need to look at it from a space of, that we are sitting on an existential question around, where are we as a human race heading, and where does the role of empathy, and kindness, and love play there? And what's the role of education

in that? So, we don't just look at the economics of it, but really the meaning of life and why do we educate our children.

MS. RICKER: Amen.

MS. ANDERSON: Yes. In Davos, they kept saying, well, the robots are going to do lots of things, so why don't we focus education on the things that the robots can't do? And that is all of the skills: that they can't do critical thinking particularly well, yet, right? They can't do empathy particularly well; they can't support each other and be emotional and connective. So, I think that's a great ending point.

Okay. Thank you very much to all of you. It's such an impressive panel.

MS. RICKER: Thank you. (Applause)

MS. ANDERSON: We are going head into a short coffee break, and then we're moving to Education Innovations and Practice. You have to pick one of two rooms. Find the room you want to go to. A list of the presenters for each room is in your packet, and not on the screen behind me.

Staff members are throughout the building, they can help you. The book is on sale outside. You should definitely buy it. Writing a book is a labor of love. So, support that labor of love by buying the book. And if you're using an interpretation headpiece, please store it under your chair. Don't take it with you.

Thank you.

SPEAKER: Welcome everyone to Session 4, which is Innovations in Practice. We're very excited about this session, because it's really going to give us the chance to ground the day's discussions of innovative educational practice and some really concrete examples from the ground.

The session is really about transforming and bringing to life the word innovation that we've been using all day and perhaps not always defining.

So today over the course of the next hour, in both this room and the room across the hall, three different innovators are going take the stage and share with you their

stores and their innovations.

They're each going to really try to tell you how it is that they've made their innovations come to life and what it's doing to transform and leapfrog the experiences of learners across the world.

After this session, though, you're going to have the chance to interact with all the innovators, both in this room and the ones across the hall at our Innovations Fare, which is going to be in the Summers Room right to the right of the staircase when you come into Brookings.

Although we won't have any question and answer time in this session and although unfortunately we won't get to see the wonderful innovators across the hall, we're going to have that 5:00 to 6:00 p.m. session to really get to know everyone.

So without further ado, I will introduce the first of our three presenters, Claudio Sassaki. Claudio's experience in education began in the creation of Movimento Joven, an NGO focused on developing kids' interpersonal skills.

A Brazilian national, he co-founded the adaptive learning platform Geekie after a career in investment banking. His platform has since come to serve over 10 million learners across Brazil and improved learning outcomes significantly.

Today he'll be talking to us about Geekie and the power of individualized learning, so let's welcome Claudio to the stage.

MR. SASSAKI: Hi, good afternoon. Well, my name is Claudio Sassaki. It's an honor to be here to share a little bit with you of what we are doing with Geekie.

Oops, that's not me. That was not planned, though.

SPEAKER: Yay, Claudio, let's give a round of applause.

(Laughter)

SPEAKER: So instead let us welcome to the stage Linda Liukas. Let's give her a big round of applause first.

Linda is a programmer, a story teller, and an illustrator from Finland. While

learning to program, she began to draw pictures to help her grapple with the coding challenges she faced. These pictures featured a little girl named Ruby and eventually became the basis for a children's coding book that has since been translated into over 25 languages. She'll be teaching us today about her Hello Ruby method and sharing why and how we might come to fall in love with technology.

So let's welcome Linda.

MS. LIUKAS: So my name is Linda. I'm a children's book author, I'm an illustrator, I'm a programmer. I'm originally from Helsinki, Finland, and I write children's books about technology.

This is my thesis if coding is the next universal language -- we need more mics. Beautiful. So if coding is the next universal language, instead of grammar classes we ought to be teaching poetry lessons.

With that I mean the same way we learn a natural language, not only by conjugating your regular verbs, we learn a natural language by speaking it, by reading it, by falling in love with random boys on the streets, and flirting with it. Coding is not a natural language, but we need a much more diverse way, a much more -- like different pedagogical tools to teach it.

So I write stories and they started with this little girl over there called Ruby, who is kind of my alter ego growing up, but then I started to really see the world of technology for stories.

So I imagined what if Apple was a character, it would obviously be the snow leopard who's beautiful but doesn't want to play with the other kids because it only likes well designed and nice things. And if Lennox was a character, it would be the really book smart thing who was ruthlessly efficient but somewhat hard to follow.

I figured that there is this area in coding education that is having this renaissance moment right now with everything -- the wonderful teams at Code.org and Scratch are doing, but where are the stories? Because stories after all are the way we learn

about ourselves, about each other, and the about the world around us.

So as mentioned, I write stories about technology. I've written books about coding, about computers, about networks, and about artificial intelligence, and they've been translated into languages all over the world.

But the thing I think about now when I think about what I do is I don't teach kids coding, I prepare them for a world where more and more of the problems around are technology problems. In order to solve the biggest and the hairiest problems in the world, we need a much more diverse group of people to get excited about all of the possibilities technology offers.

So with that in mind, meet Ruby. She's six years old, completely fearless, a little bit bossy, very imaginative. And when Ruby's dad tells Ruby, oh, Ruby, we're running late for school, dress up really quickly. Ruby dresses up, but she leaves her pajamas on because dad didn't specifically first tell her to take the pajamas off.

And when Ruby's told, oh, Ruby, your room is a mess, clean up all the toys. Ruby cleans up all the toys, but she leaves the pens and papers on the floor, because come on, dad, pens and papers are not really toys.

It might be that I'm raising the most obnoxious generation of kids ever to this day, but they also learn something very profound about how to speak to a computer. Namely, you need to be very careful when giving commands. The commands need to happen in the right sequence. You need to be careful when you name things, take into account all kinds of situations that the computer might run into.

And most importantly the thing I'm most jealous for a computer scientist, the idea that even the biggest problems in the world are tiny problems stuck together.

So with that in mind, I wanted to kind of give you in this 12 minutes an A, B, C to technology education, and we start with A, for algorithms.

I want you to actually be a part of this exercise. Because like many of you who have studied (inaudible) and education far longer than I know, you can't really offer a

whole new area of content by only giving a pre-organized vocabulary. True learning is grounded in action and that's especially true when we talk about such an abstract concept as computer science.

So I want you to pair up in pairs of two. The other person is the computer, the other person is the programmer. The programmer's role is to give the computer instruction on how to brush their teeth, not wash their teeth, that's my Finnish-ism over there, but brush their teeth.

Remember what we just learned from Ruby, computers only understand commands that are very clear. They need to be given like did you remember to open the toothpaste when you were going for the toothpaste and so forth and so forth.

So I'll give you roughly one minute to go and then we'll review what happened. So programmer coder brushing teeth exercise. Okay. Go.

(Audience participating in exercise)

MS. LIUKAS: Okay. Okay. Let's wrap it up. Okay. Okay. Hush. Hush. Sorry, programmers, I am the boss here. I decide, hush, hush, five, four, three, two, one, eyes on me.

How many made a mistake, raise your hands. Amazing. Let's celebrate that in a second. How many discussed with your partner about how to sort of make the program better? Amazing. Not that many. Okay.

So the reason why I'm raising these two points up is because they are so foundational in computer science. It might be that your program was good, it might be that you remembered to take the tool -- the cork away from the toothpaste, it might be that you remember to stop the computer from moving its hand.

But the far more fundamental lesson you just learned is two things that I saw important in computer science that we even have a special name for them, the first in making mistakes is called debugging.

So no computer programmer makes perfect code at the get-go, so that's why

we need a special word for the fact when you go back to your code and you try to find that annoying bug or a problem in your code and you fix it out, and there's a lot of strategies on how you can do this.

The other thing you just need was pair programming. So computer science is a collaborative effort, two pairs of eyes sees better than one pair of eyes and that's why we need to keep talking.

The final thing you just did is creativity. You worked together with your peers to solve a problem and all of your programs looked different from one another.

So algorithms are what you also did. You did a step-by-step sequence to solve a problem. When we think about it, recipes are algorithm, but it might be hard to make the connection into the world of computer science from here.

What I'll show you next is how a commuter would break down a problem like this into sequences. So if I asked you to sort these four numbers into order of magnitude, it would take you maybe three seconds per -- and if I asked you to do these ones, it would take you a little bit longer. But if I asked you to do all of these, it would take you far longer. For a computer, all of this is really fast and really easy.

What a computer would do, it would start from the beginning, it would compare two numbers to one another and go like oh, 1 is smaller than 56, let's keep it like that; 56 to 4, let’s swap them around; 56 to 70, let's keep it like that; and 70 to 20, let's swap it again, and then it would start from the beginning. This is called a bubble sort algorithm that a computer scientist wrote a step-by-step instruction on how to sort numbers, for instance.

These algorithms are everywhere around us. They are in Google or Bing. When we search for results, there's an algorithm that specifies which search orders you see. There's an algorithm that specifies what sort of apps do you see on social networking sites or what kind of updates you get.

And there's ads in the kinds of videos you are shown in YouTube, and this is the reason why having a very basic understanding of what algorithms are so fundamental to

computer science.

So the, B, I want to show you is for Boolean logic. There's this famous saying that computer science has as much to do with computer as astronomy has to do with telescopes. But in some ways, the computer is a very profound character in this whole realm of science, because it's at the core of computing.

Computers they become this very abstract devices that steal a lot of complexity from us, they are these glowing boxes that we don't know how they work anymore.

Sometimes I wish I could squeeze myself to the size of a silicone chip and learn how computers work from the inside out. Fortunately that is possible if you're a children's book author.

So I plunge Ruby into an adventure. She goes to dad's office, she types her password in but the computer doesn't work and all of a sudden the white mouse wakes up next to Ruby and says, oh, Ruby, I've lost touch with the cursor, can you help me find the cursor? And Ruby says, of course, I'm the (inaudible) computer diva girl I know of.

And together they fall deep, deep inside of the computer to the layer of electricity where there's billions of tiny switches that only know how to go on and off, on and off. Little Ruby she says, oh, these switches are not much use, I'll need to climb higher, so she meets the logic (inaudible). After that she meets the CPU, the processer of the computer that is really good at bossing people around and she meets the operating system.

And finally they do meet the cursor, but more importantly she gets this very foundational idea of computers, not as magic machines, but as logic machines. So I think the most important thing I teach to kids is not coding skills, is ownership and sort of self-efficacy around technology.

A final example I want to share is this one: So I give kids these little stickers with on/off button on them and I tell to them, for this afternoon alone, you can make anything in this room into a computer by placing this sticker on it.

And I've collected a monthly collection of everyday items like tuna cans and

shampoo bottles and lipsticks, and the kids they first object and they say, Linda, this is too difficult. I don't know the right answer for an exercise like this.

I tell them, neither does your parent. They might have just heard about this thing called IOT or the internet of things, but you guys are going to grow up in a world where your teddy bear is a computer, your toothbrush is a computer, and it's up to you to design that future.

So a little girl comes to me, she's chosen a bicycle lamp and she goes, Linda, if this bicycle lamp was a computer, we could go on a biking trip together with my father, we could sleep in a tent, and this bicycle lamp it could also be a movie projector.

And that's the moment I'm looking for, not the moment when the kid understands the difference between RAs and hashes and Ruby programming language or writes the perfect if/else statement in JavaScript, the moment when they understand three very profound things that we adults have a hard time remembering.

First of them is that the world is not ready yet. There's so much we haven't invented or discovered, because the engineers think only about a certain set of problems -- or the current engineers of the day.

The second thing is that she realized that technology is a wonderful way to make the world a little bit better and a world a little more ready. And the third and most important thing was that she had for a moment there the self-efficacy, self-belief to think that she very well could be the world's first invest computer bicycle lamp, movie projector innovator.

So I'm going to stop with an idea about technology that a little girl told me. Technology is built on humanity and computers, while we think about the world in this binary way that there's technology and there's us humans, we're actually intertwined. Because the first computers in the world, they were humans. The very last computers in the world will be again humans.

Being a computer used to be a profession and the word technology actually

means the skills and competencies to solve problems, that's comes from Greek.

One of the most beautiful descriptions of technology was given for me by a little nine-year-old girl who defined technology in this way.

She told me that technology is electricity that allows. Technology is electricity that allows. It is used to play. I use it to have a conversation with my mom. We use a WhatsApp application. And then finally, and most importantly, people use this technology.

That's what I want you to remember. Thank you.

(Applause)

SPEAKER: Thank you so much, Linda, for sharing your story and the story of Ruby.

Up next we do have Claudio in fact, so you've already heard all about Claudio. Thank you for welcoming him. He's going to tell us about Geekie, the adaptive learning technology.

MR. SASSAKI: I hope it works now. Well, good afternoon. My name is Claudio Sassaki. I was a teacher for about seven years, then changed careers and never thought I was going to be working with education again until I had kids and moved back to Brazil. So they are a big part of the story of why Geekie exists so, there I go.

So Brazil is a country which in my view I think the biggest problem is the unequal access to high quality education. We live in a country where roughly 85 percent of the kids are in public schools.

So when we -- when I saw the possibility of using technology to personalize learning for me was just a big haul.

When we -- if you heard about Geekie, you probably heard about the adaptive platform in which we enrich students directly. Through that platform over the last few years, we've reached roughly more than 10 million students throughout the country.

In 99 percent of the cities in Brazil today, there is someone studying with our platform and primarily through their cell phones -- 60 percent women, 40 percent men, so

that's the impact we have had.

But when we look at Brazil, most people don't know but it's a country in which the dropout ratio in high school is roughly close to 50 percent. Out of those who finish, approximately 10 percent learn the basic in Portuguese and math.

So for us, it was a rude awakening. Personalization is not only -- through enriching students directly, but I think what we've been spending a lot of time is how can we do that inside the classroom, so that's what I'm going to talk about today.

What I want to talk about is heroes, super heroes, which we also call teachers. What I want to tell is a little bit of a story of a typical teacher in Brazil you may be of familiar with, but Vanice, he's one of the 2 million teachers in Brazil. He earns approximately thousand dollars per month on average. Just like him, there's -- roughly 99 percent of the teachers earn that same salary.

He's married, two little girls, and to be able to afford his living, he has to work in roughly two or three schools at the same time, so that's his -- that's his routine. So he barely has any spare time to spend with his family and friends.

When we look at his wake -- let's say Saturday and Sunday unfortunately he starts the week, or the weekend, not being able to spend that much time with his family, because hopefully he will prepare his classes. So of course the material that he has doesn't provide all the materials he needs to turn the classroom into a more engaged classroom.

The number one reason that students claim in Brazil for dropout is the lack of interest and connection within the classroom and real life, so that's his challenge. So he spends a lot of time over the weekend browsing content online, videos, et cetera, to try to prepare his classes.

When it comes to Monday 7:00 in the morning, it's an early day. He still has four -- at least five or six more classes in that particular school. He may work three shifts -- morning, afternoon, and evening. So it's already 7:20, 7:25 and he hasn't really started to teach, because he still needs to spend time checking attendance, checking homework. In

Brazil usually a third of the time the teacher spend in the classroom is with other stuff other than teaching and learning.

So of course it is frustrating, because when it comes to Tuesday, he needs to continue covering content, because that's what he's supposed to do. Then he realizes that half of the class, at best, is just not keeping up with what he taught yesterday.

So he needs to stop and go back and try to remediate what those students who are still lagging behind. It's not only his problem, because they're probably lagging behind for a long time, but he needs to do something.

So it's boring of course for the students that theoretically mastered yesterday's content, because they were just there listening or pretending they're listening.

When it comes to Wednesday, that's a tough day, because he has three schools that he teaches and he needs to prepare exams. So one exam per class, so it's probably going to cost him four hours of his days to prepare. We're not only talking about preparing, but correcting those tests takes a lot of time.

Then Thursday, I mean, it's frustrating because he's struggling in the morning with classes, then in the afternoon he has PD or he has group discussions. Usually the Pedagogical Coordinator is not up to date, he doesn't have the date available, he doesn't know what's going on, so it's a little bit frustrating.

When he talks to his peers they also don't -- the curriculum list in Brazil is not fully integrated teachers, just kind of follow their own stuff. So it seems like everyone is fighting their own battles.

So loneliness, a lot of work. When it comes to Friday, it's frustration. He's exhausted of course, and it's not only frustration but it's also a little bit of sadness because at the end of the day, his students are not learning.

When you think about Brazil, it's roughly 50 million students in K to 12. And again the learning outcomes just by any matrix you look, Brazil is a struggling country. So at the end of the day, students are not learning.

How could this be different? So this is just one alternative, of course there are many, but this is what we believe.

So Saturday, Sunday, it's usually ten minutes he has to look at data. If that data comes in a way that makes his life easier, of course he will use it. Then instead of spending time looking for good quality content over the internet, if we can support and provide that content already to him, so he has the ownership to choose what he wants to use, and just by looking at the data he knows how his students are more or less, so he can kind of tailor the difficulty of this content to his -- so he can start the week in a different way.

So Monday he would use a platform. It's a flexible curriculum that introduces the topic to his class. I think at the end of the day a good thing to do would be have a little assessment to see where students are. Based on that data and he doesn't need to correct, because the information comes already corrected, his job is not to correct but is to get that information so he can use it on a daily basis.

When it comes to Tuesday, one of the options is, and we are talking about personalized learning here, is divide this classroom into three different groups. So one group is going to be a targeted small instruction, which is essentially spending time with him addressing individual needs.

The other group, what we are calling independent study, it could be a project, it could be an activity together. It's really not only mastering content, but it's really empowering students to work together on something that not only covers content, but also develop their skills.

And then the last one is, what we are calling digital contestation, is really targeting or bringing content that is at the level that students need and that they choose to cover, so you also exercise ownership here.

So the point is instead of having only 50 minutes with the students, we are multiplying his time by at least two or three. We're talking about the 100 or 150 minutes with the class.

So on Wednesday, he continues to do his station rotation methodology. By the afternoon, he's already experimenting another feature which we could help him, which is feature to quickly produce assessments.

Since you already have the data, you can suggest assessments that are very much aligned with each of the classrooms that he teaches. If he would do that manually, of course it would take a lot of time. That's why we believe in using technology to save teacher's time and make it more efficient.

So when it comes to Thursday, of course the meeting with his Pedagogical Coordinator is much more interesting, because the coordinator has real-time data, has already thought about suggestions to work together with him so he can address or create specific strategies to work with his students.

The work with the teachers, there's a lot of room now to talk about interactions since this platform. The curriculum is flexible. They can work together in cross-activities on the same topic together, so that makes a lot of sense for the students who are receiving that content.

And then on Friday, I mean, it's really the end of the week. I think it's much more excitement not only because it feels that students are learning because the level of engagement is totally different than what he used to be, and of course he deserves to go home, spend time with his family, and fulfill his role as a father.

I think just to make it clear, when we think about personalization at the school level, I mean, the technology piece or the platform piece is just one piece of the puzzle.

I think what we have learned over the years is to do that in large scale, we're really talking about school redesign. It's thinking about not only the technology that needs to be flexible, but also targeting instruction, it's also data driven decisions, and it's also empowering students to work alone and reflect about their own accomplishments.

So in a nutshell, this is what we do. I mean, what we realize is technology can be very powerful as long as it's used to support the works of the super heroes, which are the

teachers. Thank you.

SPEAKER: Thank you, Claudio, for sharing Geekie with us.

Last but not least, we have Karima Grant. Karima is a Senegalese-American born in New York City and she spent decades serving learners across two continents. Her career and education began as a preschool teacher in Harlem, New York, and eventually took her to her parents' home country of Senegal.

While teaching there, she noticed a profound lack of creative learning opportunities and that's what led her to found in 2011 ImagiNation Afrika.

This afternoon, she's going to explore with us the value of playful learning and how ImagiNation Afrika is bringing these sorts of creative experiences to learners across the nation, so let's welcome Karima.

MS. GRANT: So hello everyone. Hello (all respond), because this is what we're talking about, we're talking about people. I really appreciated Vishal's comments earlier about really why are we educating people.

So as Adam mentioned in 2003, I made the decision to return to Senegal. My mother's from Senegal. Senegal if you don't know is a small country on the western most tip of Africa.

We're very well-known actually right now because of music. We're kind of on the map. We'll be in the World Cup. That's your opportunity to applaud, please. Thank you. Very good. Thank you.

And in 2003 I returned. I was an educator. I had worked in Harlem serving some of the most disadvantaged communities. And in 2003 when we made this decision to return, myself and my husband, who is also an educator, we went to work in one of the country's top private schools and one of the most prestigious programs in the world actually in the school.

So we were of course very, very excited, because of course we met some of the most intelligent children, some of the children who were scoring the best in the country,

and I was just all set to write home to everybody and say, we have solved the educational problem. What we cannot do in the U.S., we're doing here in Senegal.

I just want to put this in perspective, 60 percent of our population is under 25, 60 percent. So there I am with the best and the brightest in the country and I'm so surprised, because they're outscoring people, they're getting into top U.S. universities, but they're unable to imagine an Africa prosperous, thriving.

They're unable to even imagine how we can get water in our capital city to be flowing 24 hours a day, because that's the reality of where we are in Africa.

So here's some more statistics, just to put this all in perspective. So we have zero to 14 year olds, we've got 41 percent, 20 percent, 15 to 24 percent, and this is the reality for those other students who are not in the stop schools, 63 percent cannot read, 78 percent cannot perform basic math skills.

So if the top, the most elite in the country, can't figure this out, what are we saying to ourselves as a nation, how are we imaging development.

So for me, I taught for about five years and then I was very lucky to be able to transition to work as transformative leadership trainer. Transformative leadership trainer, we're the people, particularly if you're in the private sector or the NGO world, we're the ones you call out when you do team buildings and you want everybody to kind of work better, how to solve organizational issues.

So I would call out. I was very excited. I really had a wonderful career working across Africa with different kinds of teams. But then again there was the same problem, the continent's best and brightest, sometimes even working in our ministries, unable to problem solve, to imagine the ends of projects, to be able to critically think, and to even communicate and to elaborate.

I began to think the problem was not necessarily with these children, but as I once heard with the environment. If we are trying to grow anything -- I don't know how many of you are gardeners, even weekend gardeners. If you have a problem growing a flower, what

do you do? You treat the soil, you treat the water.

And for me what I began to do was to begin to look at the environment that was surrounding children and I realized that the thing that was missing from our environment was play. In our rush toward development, we were not honoring or understanding play.

Play as we all know not only develops children's confidence, social skills, and enhances creativity, but play is the way that human beings train their brains.

We have research now that's demonstrating as young as six months, we are challenging our brains and we're promoting our brain development through play.

So for us in 2003 I founded ImagiNation Afrika with the idea of transforming how African children understand themselves and their contribution to development. So I'm just going to pause there, because I want you to understand what we're really doing with ImagiNation Afrika.

So I'm going to ask everybody to get up, stand up. Make sure you have enough room to do like this with your hands, please. I'm going to try to do this with the mic, I don't think it's going to work.

I'm so glad Adam's telling me my voice is not loud enough, my husband disagrees, so it's great.

So very simple this game. Please go like this with your hands and repeat after me big fish, (repeating). In Senegal our big fish is called a chauff. Chauff is also the name we call for a very attractive man. So when I say big fish, you will go like this big fish, (chauff). Big fish, (chauff); big fish, (chauff); big fish, (chauff); big fish, (chauff).

Very good. Now, go like this with your hands. That is small fish. Small fish in Senegal we call yaboy but many people who come from poor communities know it's the fish that's very skinny with a lot of, lot of bones, but it's usually the tastiest fish. We won't talk about the men we call yaboys.

So you keep your hands like this, this is small fish, (yaboy); small fish, (yaboy). Yaboy, very good. Can you hear me?

The point of this game is to do what I say and not what I do. Very easy, yes, when I say big fish, what will you do, (chauff); when I say little fish or small fish, what will you do, (yaboy)?

Very good. Ready. Again, you're going to do what I say and not what I do. Let's go.

Big fish, small fish, big fish, small fish, big fish, small fish, big fish, small fish. Excellent. Give yourselves a round of applause. Let's go a little faster, because we've rested, we've eaten, we've talked about things, our brains are buzzing.

Here we go, ready, and big fish, small fish, big fish, small fish, small fish, big fish. Some of you are just lost. It's a little early to get lost in the game. Let's try again.

Big fish, small fish, small fish, big fish, small fish, small fish, small fish, small fish. I adore you. She just stood there for a while and looked around and said I don't think I'm doing this right. Let me change my hands.

One last time. Come on we can do this, can't we, yes. He's looking at me, he's like please not now, why, why. Shall we again. All right. Here we go, big fish, small fish, big fish, small fish, small fish, big fish, big fish, small fish, small fish, big fish, big fish, small fish. He was just unsure, he was like how about medium fish. So thank you all very much.

What was happening in that game? Some of you got it. What was happening, sir, can I ask you? What was happening in that game? I'm putting you on the spot.

SPEAKER: Well, you were testing my listening, that's why I wasn't looking at you.

MS. GRANT: Why didn't you look at me?

SPEAKER: I didn't look at you.

MS. GRANT: Why didn't you?

SPEAKER: Because I was listening to you. You said don't do what you say -- I mean, don't do what you do but what you say, so I'm listening to what you say.

MS. GRANT: Very good. Many of you got lost, because you were looking at me and we have a great paradigm in our head that says what, seeing is believing.

One of the challenges is that the human mind, this is where research and learning comes in. The human mind doesn't function that way. Believing is seeing. We see the world as we believe it.

So for African children growing up in spaces where we don't see African engineers and African mathematicians and Africans building bridges and we see teachers, African teachers, in poor classrooms.

The work that we do as ImagiNation Afrika has to include changing these paradigms. So this is what we do, we change paradigms. This is the work that we do. We're a value-spaced organization. These are our core values -- child centered, play, global thinking, local partners and accessibility.

What we do is we bring play-based learning to develop problem solving and critical thinking skills. We work with preprimary and primary school, focusing tremendously on early learning. We use arts and cultures and we also have one of Dakar and Senegal's first maker spaces.

We have, we call it, a hub, because we had a lot of problems using the word children's museum. Essentially we have a children's museum, it's a hub for children's learning and innovation. It's one of the first in West Africa.

What we use is local culture. Because as we're talking about shifting paradigms, we want children and the ecosystem around children to really understand that local culture has everything we need for learning.

Learning is not something that needs to be imported and that things that are -- for instance, our local tailor shops, our local marketplaces are all spaces to reinforce mathematics, reinforce critical thinking.

We also because we have an ecosystem approach and we believe so deeply that because learning is anchored in the reality that's surrounding around children, we always

work to develop community members and local expertise to deliver programming so that they begin to understand themselves of how do we hold learning particularly 21st century learning.

Again, because we have an ecosystem approach, we work with local institutions. We work with public spaces in municipal governments to become stronger learning spaces for children. We develop programs that increase successibility for children.

This actually is one of our -- an example of the impact we're having. This year just actually about three months ago, we signed a partnership with the Ministry of Culture in Senegal. Every year, every two years, Senegal holds an international art exhibition called Dak'Art Biennale.

For this year, we were chosen to actually help connect this international art exhibition to the local curriculum that children are using and to create spaces that made it accessible. So for us this was an example of creating learning spaces in public spaces and making sure that the responsibility of children's learning wasn't just happening by the Ministry of Culture that's there.

This is what I'll leave you with. This kind of paradigm thinking through play, this kind of reflection that we just did through this game is probably at the heart of what we do.

We work to develop teachers and other educational professionals through teacher development and the creation of resources. We make teachers play. We work to change the paradigms of what is a teacher, what is their role, what is learning, and what is play.

I think we heard it earlier, one of the challenges that we're not asking ourselves, particularly in African and other developing countries, is what is the point of education, what the point of learning.

So we have those kind of very in-depth kind of teacher development programs where we focus a lot on who the teacher is being and how much the teacher's being impacts how students learn. This is us.

We promote creative thinking and problem solving through play, because we

believe that play is what's going to develop Africa's future, so thank you all very much.

(Applause)

SPEAKER: Thank you so much, Karima. Let's have one last big round of applause for all of our innovators.

(Applause)

SPEAKER: So remember that you will have the chance to interact with Claudio, Karima, and Linda as well as the three innovators who are across the hall at today's Innovation Fare, which is going to be happening at 5:00 p.m. in the Summers Room. Again to the right of the staircase, there are lots of signs, you can't miss it.

In the meantime, though, we're going to get started very soon with our final session here. I do want to have -- give you one last reminder. Please if you have any of the headsets for interpretation, make sure they end up back in this room. We do need them for this final session, which is going to be starting at 4:00 p.m. sharp. So you have ten minutes to get situated and come back here. Thank you so much.

(Recess)

SPEAKER: So welcome everybody to the session where you're going to have the opportunity to experience and see what three amazing innovators have done.

You're going to have a chance to see what Juan Manuel Lopera, Jane Ehrenfeld, and Rodrigo Dearmas have done in three different countries actually, so Columbia, Uruguay, and the U.S.

You're going to also have the opportunity to realize that innovation can come from every country and everywhere.

We're going to -- I'm going to just quickly run through the dynamic of the session.

There's going to be three presentations, 15 minutes each -- actually they were

given 14, but we're going to give them one extra minute. It's always welcome. There's not going to be any time for Q&A, sorry about that, but at 5:00 you're going to have a chance at the reception and Innovations Fare that we are presenting, you're going to have a chance to actually see, touch the things that they are going to present you and interact with them, ask them any question you might have, and eventually share contacts so you can follow up and start future cooperation. You never know.

So we're going to start with Juan Manuel. Juan Manuel actually has an amazing life story. He comes from Columbia from a very violent neighborhood and he decided at some point that he wanted to find a way to make accessible to every child in Columbia through the advantage of technology, the different tools, and periodical practices that he had experienced later on in his life.

So he created Aulas AMiGAS. He's the founder and the CEO. I'm not going to go farther. Please go ahead and share with us your amazing innovation.

MR. LOPERA: Thank you so much. It's my first presentation in English, so I'm a little bit afraid. I hope you understand everything I say.

This is managing. This is most innovative CD in the world in 2013 and it's the forward coolest CD do be seen in the world according with (inaudible) recently.

However, it was never like this. It was a little bit worse in the past. Some of you know that in the '90s, (inaudible) was the most violent CD in the world.

While in U.S. there was eight murder per each 100,000 people. In Columbia, there were 400 per each 100,000 people or citizens. There were 400 murders per year. So that what's the reason, because it was the most violent CD in the world?

I don't know if you can imagine where is the possibility, the probability that a kid that is growing up in a violent town, a drug town, of Medellin in the '90s, how is probably is that he's going to become a good person. He's going to give something to his society instead of becoming one more murder in that list of murders Medellin.

So let me -- I was growing up. My mother say I was beautiful when I was --

that was when I was beautiful and I was growing up in a violent town, in a violent neighborhood in Latin America and in Medellin.

Before I was 12, my grandma, any aunt, my cousin, my friends, even some teachers were murdered before I was 12, and my family and I choose to be locked in our home before 8:00, because there was some paramilitary groups that thought they need to clean the violence and the way to do is go into the poor towns and kill everybody after 8:00.

So where is the probability that I could be a good person in the middle of that violence? And I can tell you that the unique reason I was different was because of a great teacher that I had.

When I was 12 there was a teacher that I said he was like a super hero, because they spent time, time that the government didn't pay for, because they had a very low salary. However, they invest their own time for giving us the support and the motivation and inspiration for doing something different than go into the corners in our town and taking a weapon or taking drugs.

So finally to make a summary, I finally create a company dedicated for teachers. We have more than 200-people team today working for teachers in all of the world. We have our own -- a lot of presence, more than 100,000 of our device that we are going to tell you a little bit more, but we have become the most innovative company in (inaudible), in Latin America according with MIT tech review the last year.

So the question is how to reply -- or how to make this happen again and again. The same history that I had with my teacher, how to make more teachers something like this.

Finally this is the main purpose of education I want to say that -- actually what is the purpose of the education if not (inaudible) that the people that don't have any opportunity to change their life, finally they can change their own life and change the life from others that is around them.

So what is the key for making these changes? I want to tell you that even the

public policies are very important. The technology are very important, but my teacher didn't know anything about public policies and didn't know nothing about technology.

They never went to the university to become a teacher, only his high school and after that he becomes a teacher. So maybe the solution is not only in the public policies of education or technology or education, the answer that I want to give you is something about teacher who inspire.

There are some soft skills in the teacher's ability or the capacity for them for creating -- for using technology or for making coding or something like that. There's something more important than that inside the teachers that we need in emerging countries for making the difference in education.

So if you are watching this URL, I suggest you to take note of this as teachers who inspire, because I'm going to give a TOMi, the revised, for some of you that go inside that URL.

So the question is how make teacher who inspire in 21 century, because it's more difficult -- all the days is more difficult for a teacher to inspire their students. The students of the 21 century is harder and harder to be engaging than inspired by the teachers.

So the answer that we are listening in all the world is innovation and education that looks like the magic work that becomes the solution for most of the problem that we have in education.

However, we also find hundreds of tech tools that was put inside classrooms in Latin America for example without any success. And the result of that -- or the answer of the reason why technology is not being used is ever the same that the problem is the teachers, that the teacher decide not to use the technology inside the classroom.

So my team and I was thinking about this and thinking what should we do for getting really success inside a classroom with technology. When we try to figure out the answer, we find that there are many challenge that the teacher actually had beyond just teaching with technology inside the classroom.

Teaching is only one of the pedagogical moments that a teacher is facing inside the classroom. They need to make planning base it on context, base it on projects. They have more challenge for making their classes in 21 century.

But also they need to go to the classroom and engage their students. Now there are more multimedia, they are using Instagram and Snapchat, so they need support in how to make more engagement during teaching.

But they also spend a lot of time (inaudible). The process shall be better and better because they only don't need to know if the students know or don't know something. They need to support, personalize the education to the students about the evolution results.

I'm so sorry again for my English.

After that, the teacher needs to be in contact with the parents. The education is not a challenge only for the teachers, it's a challenge for the family, so the communication is so important.

In theory, the teachers need to be in contact with the parents each one per day -- one time per day as less. For example, I was visiting a school here in Bethesda. I see that in Bethesda even in U.S., the teacher had 50 students in the same classroom. So how is possible that the teachers can talk with 50 parents per day.

Making it working is also a challenge teachers have with other teachers to learn about how to teach in the 21 century and grow professionally.

The base every -- the matrix and connectivity is a common thing. So what kind of technology does the teacher need to improve education and finally they have to understand how to use a lot of tools. Not only technology less a classmate or like a digital whiteboard or laptop inside the classroom, but also they need to know a lot of -- hundreds of technology that they need to deal with.

But the average teacher doesn't know how to use all this technology inside the classroom. So that was something that I really happened in other sector. For example, for Bana 21 century citizen, you need to know how to use a GPS, a digital camera, internet

connection, something like that.

My mother, for example, never understood how to use a digital camera and a GPS. However, when their parents are devised -- actually my mother understood how to use it for -- like an iPhone, so she becomes a 21 century citizen.

So the question is where is the revised -- where is the technology that we show to invent so the teachers can improve their lives using technology and each one of these a challenge.

That was the way how we invent TOMi. Finally this is like Alexa or the personal assistance for the teachers. This is something that actually the teacher more than 10,000 teachers half have really bought from us in Latin America.

This is a personal assistant that help the teacher to planning, teaching, and a lot of other thing that I'm going to show you fast, because my time is -- however, this is breaking the gap of the connectivity inside the classroom.

So for example I have here in my device thousand of digital contents from internet connected with TOMi. TOMi synchronize all the content that the teacher is going to use inside the classroom. In that rural area where there is no internet or the urban area where poor quality internet, the teacher can use it to share internet with all the classrooms and serve an internet like if there's actually a connection.

So it's an academy for teachers. The teachers find it resource for learning. This is a curricular planning assistance. The teacher can plan better and easier their classroom -- their classes. They're representative of thousand of free digital content that the teacher can use and synchronize for sharing it with students inside their classrooms.

This of course creator, so the teacher can create contents and share it with other teachers. This is a quiz back, so they can play with the students inside the classroom. This is a digital whiteboard, I will not have time for this, but maybe you'll see it while I was starting.

You can put TOMi in front of any projector and it's going become interactive

with this pen. I don't know if -- can you see the mouse there? So it's a digital whiteboard, an interactive one, very easy to use, but it's also augmented reality device, so you can put augmented reality contents inside the classroom using TOMi.

It's also a rating system, so the teacher spends a lot of time writing exams. When they make the rating, they don't know what to do with the resource of exams, so they only need to put the paper in front of TOMi and TOMi's going to rate it and it's going to personalize an improvement plan to the students, so he's helping to the teacher to teach.

This is an automatic offline login. This is like attendance taken, so the students only need to show a QR to the TOMi and he's going to log the student inside the classroom.

This is communication with parents, because everything that is happening inside the classroom, for example the result of exams, is going to be sent in to a free application to the parents where the results of exams and recommendation of how to improve the level of the students.

Almost finishing, this is a travel personal computer what you are seeing there. It's a computer as well. So we have Word, Excel, PowerPoint, everything that the teachers need in the same device.

Finally as I told you, it's a local interactive content of work. When you turn TOMi on, there's going to appear a Wi-Fi connection that wasn't before and the students can connect to it and surf an internet and take matrix of their education.

So that's all that -- what we are doing, we are working for teachers. I think we need to make technology to improve the life of the teachers, so there is always going to be better students.

In teacher who inspire (inaudible), if you go there and you put your information, we're going to sort a TOMi for someone of you. So you are (inaudible) to go and sign in. Thank you so much.

(Applause)

SPEAKER: Thank you so much. It was great. Just one quick note for everybody. The presentations that you're going to be seeing today are going to be available at website, Alene, in a couple of days or so? Yep. So you can actually have access to all the contents that is going to be presented today.

The next innovator, grade innovator, is Jane and Jane actually doesn't use technology to innovate and that's just pen and paper. She's actually the executive director of the Center for Inspired Teaching. But actually when I ask her before the presentation how do you want me to introduce you, she said, I'm a teacher.

And so what she's going to talk about is a way to work with teachers so that they can motivate students. And when she was telling me about when students wake up in the morning, they don't want to go to school. I have three kids and I know that. So we are so eager to hear you. Thank you.

MS. EHRENFELD: Thank you. I have three kids too and they also often do not want to go to school in the morning, so I understand. Maybe we can talk a little bit about why they don't want to go to school in the morning.

So before we do that, let's start with some math. I need your help solving some math problems. We're going to be super innovative right now.

So let's start over here, 57 times 6, so what do I do? Can somebody just help me go through this? What do I do first, anyone -- 6 times 7, so I'm going to put the 2 down here, put the 4 up here. What do I do next, 5 times 6 is -- come on, shout it out, 30 and I've got to -- so I've got -- that's my answer, agree, thumbs up, we're good, cool.

How about this 138 plus 74, super challenging. Should we go through it, 8 plus four 4, 12; put the 2, carry the 1, 11, so I'm going to put my 1 down here. Everyone agree we got it right, awesome.

How many of you saw those math problems up there and had a bit of a sense of unpleasant feeling maybe in the pit of your stomach. How many of you felt like we're going to do math and we're going to do this kind of math.

How many of you -- I'm not even going to ask for a show of hands, because I think I know the answer.

How many of you remember being a student and showing up for school super excited about something. You were interested in something, you were excited, you were ready to learn, and you walked into your classroom, whatever grade level, whatever age, how many of you remember walking out at the end of class feeling like all of that creativity had been kind of stomped out of you, feeling uninspired, disconnected, disengaged?

When I talk to audiences and I pose the question, how many teachers do you remember from your childhood experience, who made you excited to go to school every day, who really connected to you, who made your education feel relevant and engaging, most people can think of maybe at most three, four, five, if they're lucky. Some people had a really, really incredible education and we'll just put those to the side for a second.

But I can think of about three. I can think of my 5th grade teacher, my 11th grade English teacher, my history teacher in high school who were extraordinary and who made me excited to come to school every day.

The rest of them, it was a blur and I didn't want to walk into their classrooms, because what they were doing didn't feel relevant. It didn't feel interesting. It felt kind of like that, just sitting and doing the same old stuff every day, memorizing a lot of facts and formulas.

Seventy percent of American students today associate school with negative emotions. That's shocking, 70 percent associate school with negative emotions. They're bored, they're stressed, they're disengaged.

I'd be willing to bet that of the 30 percent who don't associate school with negative emotions, a whole bunch of them are happy at school because of things that have nothing to do with what's happening in their extra classrooms. Maybe they're drama club and that's why they get up in the morning, maybe they're on a team, but 70 percent are unhappy in school.

When they're unhappy in school, they're disengagement rates go up, their

dropout rates go up, their attendance rates go down. We know this. It's not surprising when they're walking into classrooms that feel disconnected, unexciting, uninspiring.

While I agree with you completely, I think teachers who inspire, we call them inspire teaching -- teachers, they don't necessarily need technology and the technology when it's available is amazing, so you'll get to see it -- you got to see a little bit before, you'll get to see some next.

There will be some at the Innovations Fare, and it's incredible and, yes, students are absolutely excited to engage with these technologies and teachers too, but what happens if you don't have the technology. What happens if you're in a place where you can't engage with the technology or the technology is maybe just a little part of the day?

So at Inspired Teaching what we believe is that the most critical innovation and education is actually rethinking school, rethinking how teachers teach and how students learn, that if we can do one thing to really tremendously innovate and we can do it in a million different ways with a ton of different technologies, we are going to think about how to create school contents where students are authentically engaged in and inspired by what they learn.

So the way to do that we think is through the teacher, that the teacher is the lever for change. Again we absolutely agree that teachers are the levers for change here.

And it might be daunting to think about different teachers in different context, different schools, different grade levels all transforming their teaching, but I absolutely can tell you that it can be done. We've been doing it for 22 years here in the D.C. area and it's absolutely possible.

So I want you to stop for a second and imagine a world where kids are actually excited to come to school every day. What if I told you that here in D.C. Inspired Teaching runs two different programs for high school students, arguably the most bored of all of the students, where the students come from across the city on a weeknight, on their own time to engage with us in history classes and to engage with their peers on social justice and current events and they do it for nothing more than the chance to learn with us.

Some of them get course credit, a few of them, but most of them are getting on trains and traveling across the city on their own time at night, because they are so hungry to have these authentic learning experiences.

What they tell us when we ask is that they're not getting them in school. They are hungry. We give them pizza, but that is definitely not the hunger that we are feeding and the pizza is not so good that it explains why they're getting on the metro at night when they're tired and they have homework to do to come and engage with us.

Can you think back to the activity I led earlier, thank you -- thank you for this bag of rocks we call it, so taking a challenge or perceived obstacle and turning it into an opportunity. We have to do that.

In a lot of context, students are leading the way for that. We have a really tragic example right now in the United States around gun control. We see students taking an incredibly challenging situation and demanding change and bringing it into their schools and engaging with their teachers and their principals and their school districts and saying something has to be different and that's amazing.

But I've also encountered schools where they're doing this in incredible different ways across the United States, and I'm guessing it's happening around the world in isolated schools, where students are being involved and engaged in their own learning.

It is not surprising as I said that getting kids to even show up to school is an incredible challenge. So in the United States we have dropout problems, we have attendance problems, we have engagement problems.

I'm guessing a lot of you work in contexts where that's even harder, where just getting kids to show up for school is even harder, and believe me I am not minimizing at all how -- the real challenges that keep kids from getting to school, violence in their communities and taking care of siblings, supporting a family, I've taught in those contexts. I absolutely understand.

I have to -- that cannot explain the entirety of the problem, it just can't. I know

for certain that kids will move heaven and earth to get to school if school is a place where they want to be. They absolutely will, so we've got to do things differently.

We've got to of stop beating our heads against the same wall and packaging the same old compliance based direct instruction and fancier packages and thinking that we've changed anything.

So how do we do that, it can be through educational technology and it can be as simple as the teacher and the students and some really innovative teacher training.

So that's what we do will at Inspired Teaching, we do innovative teacher training and we use, as I mentioned before, the basics of improvisational theater to help teachers learn how to engage with each other and their students.

So let's go back to math for a second. I need -- I was going to do 12, but I do not have space for 12. So six folks to come on up here to do a little bit of math with me. Please do not be shy. I promise you this will not be painful, six, six people. Thank you. One, two, three, thank you. I need three more, yeah, just stand right here. Awesome, thank you. One, two, three, four, fabulous. Okay. So I have six people here. Agreed, we're starting with six folks?

SPEAKER: Gender balanced --

MS. EHRENFELD: Yes, we are gender balanced, excellent.

Without talking will half of the people standing up here put their hands on their heads, half of you. Thumbs up, half of the people on stage have their hands on their heads. Fabulous.

Will one -- keep your hands there. Sorry, you're going to have to do that for a little longer. Will one-third of the people who have their hands on their heads come over here with me. One-third of the people with their hands on their heads, keep your hands on your heads, keep your hands on your head, yep, fantastic.

I'm going to ask you to move over a tiny bit here. Awesome. Keep your hands there just for a minute more I promise.

What's the math problem we just solved? Where did we start? What did we start with, 6, so we started with 6.

What did I do next?

SPEAKER: Half of 6.

MS. EHRENFELD: Half of 6, so in English, I'll just say, we would explore this a little further if we had more time, but when we say of, half of 6, what are we talking about; does anybody know the operation we're talking about?

SPEAKER: Division or a fraction?

MS. EHRENFELD: Division of a whole number, multiplication of a fraction. We're talking about multiplication.

So 6 times a half, you agree, we've done 6 times a half, then what did we do next?

SPEAKER: Times a third.

MS. EHRENFELD: Times a third. Okay. Where did we get, where did we end up, with 1, 6 times one-half, times one-third equals 1. Everybody agree? Cool. Thank you, volunteers. I appreciate it.

I think the hardest part of that was just holding your hands a long time.

So let's go back to the math problems we started with or you can think about this math problem. How many of you were doing a formula that you memorized? Sometime in school as you started to do this, you knew the formula, 7 times 6 is 42, I heard a lot of that.

How many of you if I had started over here and I had just put this problem up on the board would have solved it the way you were taught in school? So we multiply the numerators, we multiply the dominators, we reduce the fraction if necessary, bam, we have an answer.

How many of you would have really, really engaged with why multiplying fractions works the way it does? You wouldn't have. You would have missed that.

So now imagine you're a student and you're standing in the hallway of a

school and on the left side there's a classroom where they're learning math the interesting way, I would call it, they're learning math by engaging fully, physically, emotionally, they're fully involved in their learning and on the right side they're learning math with a formula, which side do you choose?

And I've definitely engaged with students -- sorry with teachers in the training where I pose this question, where they say they would pick the side with the direct instruction. Why? It's easier. You can memorize formula. We're done. But I'm going to end by asking you, challenging you, to think about what the purpose of education is.

Is the purpose of education to get compliant students as fast as possible through the education system having memorized a bunch of facts and some skills that are probably going to be obsolete by the time that they graduate or is the purpose of education to create authentically engaged, excited learners who are prepared for the incredibly complex fast changing world that they're about to inherit.

Which one is our purpose, you have to educate for the purpose you want. We believe that that panel lies directly through the teacher and that by training teachers a little differently, or a lot differently actually than what we're used to, we can help them create classrooms where students are incredibly excited to come to school every day and where they graduate preparing to inherit the world that we're handing them. Thank you.

SPEAKER: Thank you, Jane.

So our next speaker, we're actually moving now back to robots. We left technology for a while and we're going back to technology.

Rodrigo is the co-founder and director of UYRobot. He comes from Uruguay and he started off as an entrepreneur, but he became actually social entrepreneur. I was talking to him before and he told me the story -- it's a wonderful story too.

He was an engineering student and they were trying to build a tape robot, but it was really when they try tested the robot with the students that he saw the magic in the eyes of a child.

So he actually saw the eureka moment when the child could actually make the robot do what he wanted to do or she wanted to do. I don't know if it was a girl or boy, politically correct answer.

So he is actually going to -- has been trying to lower the cost of access in technology for kids and this is the robot that he's going to present us.

Thank you, Rodrigo.

MR. DEARMAS: Thank you. I'm going to talk about robotics, yeah. I'm not a teacher. I'm robotic student, so this is our view of this thing.

So as I'm going to talk about robotics, let me ask you a question. How do you imagine robots? Let's see, let's close your eyes for a moment, please all of you close your eyes, all of you, all of you. Great.

Now, please imagine a robot. All of you imagine a robot, perfect. Now open your eyes. I already have the answer that I'm going to ask. This robots are like the one that you imagined, (yeah).

Well, we do -- we have workshops in schools and in high schools and we ask every kid in our workshops that the first thing in the workshop is to draw a robot. Imagine a robot, please draw it, and these are the actual drawings of the kids.

All of you -- all of us imagine the robots in that way. I have, I don't know, but thousands of these drawings and 95 percent of the kids draw like this.

So we try in UYRobot to change that mind. Yep. We tried to engage children in the stem field using robotics. We developed different robots and different materials to teach this kind of things.

So what we try to do is that the kids when we ask them where people make robots, they say Japan, in USA, NASA. No. You can do robotics in Uruguay. So in 2014, with my friend John Pereira, we founded UYRobot.

Since the first moment of our startup, we give all that we have to that startup. Our life become UYRobot. So it is a good thing. UYRobot it's increased the revenue, the

team, over this year. Nowadays we are six people. We are a little team, but in Uruguay it's very good team I think. We have now offices in Uruguay and in Costa Rico.

So what we make back in 2014 was this robot. This is the robot, this is the (inaudible). It's like a car for a computer.

If you know something about the education in Uruguay, you can know that in Uruguay in 2008 the -- one computer per every child in school age.

In 2008 we don't have all the electronic devices we have nowadays, so every child had a computer. They had the most priciest thing of (inaudible), yeah, the computer, so we made this robot that use the computer as part of it. You put the computer over the robot, you connect it through USB, and you can program the robot, yep.

This is a great robot developed by us in the faculty of engineering when I was a student and we love what we do here. We make the robots accessible.

Now, remember that we are in Uruguay and it's South America and a lot of things don't happen there. So -- sorry. We work in the university, we made this robot. And after that, the project finished. So we want to continue with that development. We think that this robot needs a little tweak, so we made it -- we produced it, we made it a product and we start selling this robot.

What's the great thing in this robot, it's that you can make it or every kid can make it, yep. We designed all the pieces in the robot, the electronics, the platform, all in the robot that it's completely open source. You have all the plans, (inaudible), all in the -- in the internet and we developed the electronics in a way that you can build the electronics with an iron, a soldering iron and with rail. That's the most complicated tool that you have to use.

In that way we try to make every kid a developer. Every kid make -- have this robot. Well, what it has -- another thing that it's great from the robot is that it comes with censors, with a basic set of censors like distance censor, (inaudible) censor, light censor, but also you can make your own censors. You have some generic models that you can easily make some new censors. For example, (inaudible) censor, halifax censor, whatever you

imagine.

These censors are plan played, so you not have -- you do not know how the electronics work, but you can plug it and make it work. So also it have compatibility -- mechanical compatibility with Lego, with Mechano, with other kids that were in Uruguay at that moment.

This robot is used not only in Uruguay, we have some of these robots in Nepal, some in Costa Rico, some in (inaudible), some of them are in the USA, in San Francisco. Very less than the quantity of road that we want, but it's a start.

So for what teacher are using these robots. For example, in this case teacher in Uruguay want to teach the children about how light pollution affects the nocturnal animals, nothing to do with robotics. So the teacher made -- the children make simulation. Now the robot is (inaudible) and follow a path with light censors. And if the children, this is handful of children, if the children don't put the light, the robot go to the cave. And if the children put the light, the robot get lost. In this case, the cave become destroyed, yep.

In that way, the children -- the children learn about robotics, learn all the (inaudible) that they had to learn, but also they learn about robotics, they learn about math, they learn about programming, they learn about teamwork, all the things, and it's a great video on YouTube. You can check it out.

Well, (inaudible) association in Uruguay use the USB for the child, electronics of the robots to make -- to measure and plot the graph of the -- a graph of our thrust of a robot engine. They use load cell on the program language that we developed, I use that to plot that graph, different usings of this robot.

Well, it's great -- it's a great robot, but we find some things in the -- with the years that we need to make a little change.

In Uruguay or in South America there are three problems in robotics. One is the price of the robot. We tried to make every child make one, but that don't happen. We try to lever the prize, but it's still prizes, that's one problem. The other problem is the viability of

this robot. If you have the money, you can't buy the robot because there's no place to buy it, also the lack of resources.

We have less than we want and resources -- we don't have resources in Spanish, for example. So we want to change that. We are now developing new robot, what is called -- this one.

Well, this robot could be used as toy or first robot. We are going to try -- we are going to -- it will be going for children for years.

We are going to lower the price for around $100. We are developing the different mobile apps and programming environment for this kind of children, and we are very focused on content.

There are lot of content that we are make for kids, for parents, and for (inaudible). But we have developed a (inaudible) environment that it's called robots. It's based in -- developed by Wetter Bender in (inaudible). We offer support for different robotic kids, for Lego, for (inaudible) the robot that we have before, for (inaudible) and also we are developing some other programming environment for children that are four years old.

Well, this is not only an idea, it's a reality. We have some prototypes and we have tested it in our workshops. And in the repair and robotic geeks, you can go and test it in the (inaudible) in a while.

So what we are doing now, we are continuing -- we continue to make workshops. We are trying to finish the development of this robot and trying to make it happen and to make it $100 the cost.

Thank you very much and see you later in the innovator.

(Applause)

SPEAKER: Thank you, Rodrigo. Thank you every one of you, for the audience for being here and sharing this experience with us. I just want to quickly summarize with a few takeaways that I wrote from the session. I actually think there was a bottom line between the three presentations and it's very connected with teachers.

And the first one is a teacher can touch a child and a child can later touch millions and change their lives through technology. That's one of the things that I learned from Juan Manuel.

From Jane, I learned that we need to rethink how teachers teach and how students learn so that they can get inspired and excited to go to school every day.

And from Rodrigo I actually learned that everybody can make a robot, which is great news for kids, but it's also great news for teachers. So thank you so much for those.

Before we leave, I just have a quick announcement. There's going to be a raffle of one of the TOMi's, so for that you need to register at teacherswhoinspire.com. So you go there, you register, and you will be participating in a raffle to win one of those.

Finally just a reminder, please remember that at 5:00 there's going to be reception. During the reception, you're going to have the opportunity and the innovations to actually look, touch, experience, ask questions to our three great innovators.

Thank you so much.

(Recess)

MODERATOR: Hello everybody. My name is Marcelo Cabroi, I manage the Social Sector Departments of the IDB. I don't know if the Department manages me or I manage the Department. But that's a conversation for after, for the wine.

I'm super happy to be here. I think that this innovation in education is really a topic that we should pay and we should be paying more attention. I have five minutes in order to do introductory remarks. I'm not going to take five minutes, I'm not going to take any minutes. What I'm going to do is ask you how many of you actually have the agenda for today? Do you have it with you? Okay. If you want the long version of the files of this panel that we have here, you can read it there. Okay?

In the meantime, to take advantage of the time, I'm going to ask my fellow panelists here to introduce themselves in a very short way. And that the agreement that we have is that it's going to be short enough to tell you who they are, a highlight, and what their

occupation is or travel today. Okay? And then we're going to go directly to questions.

And it's going to be a little bit different because we're going to stop at the middle of the panel for questions from the audience. Okay? So I'm not going to let you get to 4:45 and then ask questions, I'm going to ask you to make questions before. Okay? This is a great opportunity for you to interaction directly with the panelists.

So I'm going to start from the right to the left. And this not an illogical preference, this is just the way we decide that we would do it.

MR. TUOMINEN: Yeah. First of all, thanks for the invitation. My name is Saku Tuominen, coming from Finland. I'm going to break the rules immediately, but that's -- this has been the way things has -- anyhow. So being here following the discussions all day, I'm again, once more I'm amazed the things we heard from Senegal, from Paraguay, Uruguay, from Columbia, from South Korea, amazing things. And I'd say that practically every teacher, every education expert in Finland would love those beautiful ideas and so on.

If I would do a test which one of them has heard of any of these in a way ever, I'd say no one. And that's the key problem in the world of education. No one knows about the things that are happening in other countries. And that's the mission we have at HundrED. We want to make the beautiful work that is happening in classrooms visible.

We are identifying great education innovations, we are packaging them, and we are promoting them. We've gone through roughly 1,700 innovations from 160 countries. And that's the track. We want to be the world's leading expert on this area by 2020.

MODERATOR: And you feel that people - -

MR. TUOMINEN: They are paying attention. People are paying attention, but its early days. So it's not only about gun flag, it's not only about packaging, it's about doing hard work, making people excited, telling such a stories, being out there discussing with the teachers, understanding the obstacles and so on and so on. It's a long process but it's fascinating. Thank you.

MR. ISTANCE: My name's David Istance. For a number of years, I was for

many years at the OECD. For a number of years I headed a project called Innovative Learning Environments at the OECD: I left there halfway through last year, and finished then a report on Pedagogy with a young colleague at the OECD. I'm delighted to say that I have become a non-resident Senior Fellow here at Brookings. And Rebecca mentioned this morning, there's work going on teaching and learning, and I will be engaging more and more in that work.

MODERATOR: David, are institutions such as the OECD or the IDB, relevant in the discussion about innovation in education?

MR. ISTANCE: I think they are actually. I think the OECD can talk about the OECD better than some of the other institutions. The fact that there's an ear to a whole variety of stake holdings, including governments, gives, I think, a wonderful opportunity for presenting particular ideas. A framing legitimizing questions about innovation that in some political context would be hard to do. And the fact that you operate in an international context takes you one step removed from the day-to-day political confrontations and allows you a certain freedom, which I think is a freedom which I was delighted to indulge in when I was at the OECD, and from now on in Brookings.

MODERATOR: Thank you, David. Anna.

MS. PENIDO: Good afternoon. My name is Anna, I'm from Brazil. And I've been trying to transform schools since I was a student. Now I'm Head Director for a non-profit whose mission is to inspire innovations to improve the quality of education in Brazil.

We have the most known website that covers like innovations in education in the country. We also foster innovations, new solutions, especially for middle and high school students. And we are now very much into listening to the students and trying to learn from them what the innovations must be, how to change schools to really make it more meaningful to them.

MODERATOR: When they show the map that Rebecca show us this morning, Brazil was dark blue, almost dark blue. Why?

MS. PENIDO: We are very creative.

MODERATOR: Okay.

MS. PENIDO: That doesn't mean that we are really changing the whole system. But we have a lot of I would say almost isolated initiatives, they are very, very interesting. Which gives us a lot of things to publicize in our website. But as still when it comes to regular public schools, we have a long way to go in order to really make those isolated innovations something more systemic and sustainable.

MODERATOR: So creative but not necessarily sustainable just yet?

MS. PENIDO: Exactly.

MODERATOR: All right. Gina.

MS. LAGOMARSINO: Hi. I am Gina Lagomarsino, I am the CEO of Results for Development. Our mission is to support the change agents in low and middle income countries who are working to build strong and sustainable health and education systems. And when we say change agents, we're talking about government leaders, but also innovators, like the people in this room, many of the folks here, as well as civil society leaders.

And we manage something called the Center for Education Innovations, which profiles about 800 different education innovations around the world in over 100 countries. We have a sister program in health that's similar. So I think that's the reason I got invited to this panel, because we're working on that.

My personal background is actually in the health sector, so I'm feeling a bit daunted to be on this panel of education experts. My colleague, Molly Eberhardt, was originally invited to be here. She's one of our Directors in Education. But she's about to have a baby any day now, so she is not here and I'm here instead, you got me.

MODERATOR: We are super happy to have you here. And we might learn something for sure from health anyways.

Is anybody listening to your findings? I mean going back to the first location that we've heard.

MS. LAGOMARSINO: Is anyone listening?

MODERATOR: Yeah. I mean you have 800 people there that are talking.

MS. LAGOMARSINO: Well people are coming and looking and getting information. I think the challenge is to try to really better understand which innovations are working well and to try to synthesize the findings across those 800 innovators to see if there are some similarities across the programs. We look to see if we can find active ingredients that are at work in multiple innovations and then try to synthesize those and share those with would-be innovators. Because I think that's part of the goal is to look to support specific innovators to scale up their programs but then also to help others around the world, whether they're government leaders who want to transform their systems or other private innovators to actually see what works.

MODERATOR: Excellent. Thank you, Gina. Last one on the list.

MR. GONZALEZ: Hello. Thank you for the thoughtful invitation for being here. My name is Javier Gonzalez, and my main interest actually has to do with one of the main issues in Latin America, which is inequality. And we're quite a failing society in that sense. I really believe, unfortunately, actually we still are the most unequal region in the world. And this due mainly to very unfair institutions. And therefore we have to really innovate in the way we create these instructions. There's rules of the game as in view to society.

And so that's why I stared my -- I mean my professional life actually in the government. I worked in the mutual education, mutual finance. Then I moved into academia where I'm still affiliated with the University of Cambridge where I teach actually Political Economy and Institutions.

And then I came into SUMMA, which right now I'm the Director of SUMMA. Which is an institution which maybe I could summarize as trying to mobilize aliens to action. And basically is how do we use knowledge that we have to really change society? And therefore we have a very broad definition of innovation. And that goes beyond projects, beyond dimensions, is really trying to re-imagine the way we actually, well, design our

institutions well. And not only formal institutions, but social institutions, through location. So I think it's a powerful message of also equalizing, basically, the way we treat each other in the world.

MODERATOR: So how would you treat innovation that is not proven?

MR. GONZALEZ: Well actually that's a very good debate. In SUMMA we were just talking about that. We have created a map of innovation, which is a compliment to what other maps are doing very well actually, which is actually detecting what's out there. In (inaudible) 21st, for example, it has done a great job in that sense. What we're trying to contribute is another layer. Which basically is trying to say okay, some are very promising innovations, but we're very interested also in saying which of those actually really work. Because it's an ethical issue here. Which has to do with the fact that governments have to, I mean if they really adopt an innovation, they're actually putting a lot of money, public money into it. So we really have to be very careful in what kind of innovations we really promote. And say, I mean, and polish in a way. Because basically it's not – there's a risk that when you polish something, then governments tends to think, or even citizen society, will tend to think that you are actually backing up that innovation, and we're not really sure.

So I think you have to do both. You have to be constantly looking out, you know, in the field to detect the new things that are happening.

MODERATOR: Can I hear the rest of the panel in that question, particularly how do you treat innovation that is not precisely proven? Go ahead.

MR. TUOMINEN: You know what, I think that in that case it's not really an innovation, okay. Because for me I've been working with innovation all my life and I've been teaching innovation. The test comes by various ways to define what innovation is. If you ask me, I think first of all it has to be innovative. Which means that it has to prove something new within the context. So that's the first one, which is obvious.

Then the second one is that it has to work. It has to be impactful. Because otherwise it's an idea. So idea, and then once you get the feelings actually it is working,

there's some kind of impact analysis, then it's innovation.

But not even that is enough. It also has to be scalable. So for me, innovation is a great idea that has proven to be working and that has potential to work in other places. And those three are the key criteria we are using at HundrED. So every innovation we are thinking it's new, it's working, and it has potential to work in other places. Otherwise we wouldn't select that one.

MODERATOR: Gina.

MS. LAGOMARSINO: So you told us we should disagree.

MODERATOR: Absolutely.

MS. LAGOMARSINO: So I would say that it is -- I agree with you that we need to focus on proving whether innovations work. But in the process, most innovations do start out as an idea. Most of them --

MR. TUOMINEN: Of course.

MS. LAGOMARSINO: -- need to be tweaked and improved upon in practice to actually get them to work. And of course in different contexts they need to be developed again often.

MR. TUOMINEN: Of course.

MS. LAGOMARSINO: And so I think one of the things we do is we use an adaptive learning methodology. We're supporting a number of the different implementers that we profile to help them take a really good idea and then test the different components or active ingredients of that idea in practice. Maybe even test multiple different mechanisms to see which one works best --

MR. TUOMINEN: Of course.

MS. LAGOMARSINO: -- rapidly, and then enable them to change that innovation, to switch the program design, switch the way they're implementing it, so that over time it can actually be more impactful. And so I think it's important to do that kind of implantation research alongside broader impact evaluation in order to ensure that innovations

work.

MODERATOR: I give you 30 seconds to refute that.

MR. TUOMINEN: In a way I fully agree. But both the new idea is roughly, about 80 percent of the new ideas don't work. And that's why innovations are the ideas that did work. And once you have an innovation it's an ongoing process so you are improving, developing every innovation endlessly. But the innovations, for me, are ideas that understood.

MODERATOR: Understood.

MR. TUOMINEN: Yeah. So I think the innovations, actions that actually work, they know it in their work. But also it's interesting to see when we look at innovations, the underlying mythologies that -- I mean if you look at a very good report that Brookings Institution actually just published and can we learn from. And you look at the innovation, that basically they're packaging a lot of practices that for example with the EF would have been working on which practices work. So to take all this different programs, innovations, they have an underlying, for example, practices that have to do with feedback, recognition, peer to peer learning, etcetera.

So it's very interesting that in some cases you could think of maybe programs that haven't been tested yet. But the underlying practices actually have been tested. So there's a complexity here that I think we should be aware of.

MODERATOR: Certainly, certainly. Anna. I saw you first, then I say that I saw David, you're going next, okay? I promise.

MR. INSTANCE: That's all right.

MODERATOR: Okay.

MS. PENIDO: We're also a little bit more flexible in that for us. For instance, we want to explore what's going on, even if it's not proven yet. But to really understand what type of problems are really relevant or priorities.

MR. TUOMINEN: Is it difficult to do that with public money?

MS. PENIDO: I'm not saying that innovations have to be done with public

money in the beginning, right? And actually what we heard from Rebecca is that the non-profits actually innovating more than the public sector. But, you know, as a spotter like you or us, calling us, we like to explore what's going on. And what type of promising solutions are there for the relevant problems that we are facing, and try to support them as well. So it's not only about waiting for those, you know, promises to become proven practice, best practices, but really trying to help them become those innovations.

MODERATOR: Thank you, Anna. That's very helpful.

MR. ISTANCE: I was just going to pick up in agreement with Fellow Thomas that the role of showcasing innovations can take you so far, compendia of individual innovations. But I think there's, you know, we have many reports which say "Here are a set of innovations." And the theory of change seems to be "Well, if you try this it might work in your context." And I think there's quite a need for digging in and trying to understand why is it that particular powerful innovations do seem to work in their context and the transferability issue. In other words, to combine the sort of freshness of particular examples with quite a profound analytical exercise of trying to understand whether they work. And then combine that with the provision, I heard that this morning, of guides and tools, to help people innovate for themselves. So I see along that sort of showcasing role and the sort of convening role, the role of trying to understand and of providing tools and guides.

MODERATOR: David, we've got the title Innovation Community, I think. Is there such a thing as an Innovation Community?

MR. ISTANCE: Well I think that's quite, you know, thinking of how we understand educational change to be, I think it's worth problematizing that. At a global level my sense is that there's more evidence of a kind of global innovation community than there was 10 years ago. That's my sense. But, you know, that's a rather intangible thing. That's helpful, but I'm not sure that's where the real action is. I think we understand that it's that kind of miso level between the micro and the system wide level where really the action's going on.

We have a lot of talk about ecosystems, not ecosystem, but ecosystems. And

once you start talking about ecosystems we're straight away into networks, into communities of practice, into dense interlocking ecosystems. Well once you're doing that, then it seems to me that yes, there may be a community, but we're really talking about communities in the plural.

And that also alters our understanding of scale. Which people have talked also quite a lot about. Because then there's not one scale, there's not going to scale mean going to a whole country. We're talking about how dense those ecosystems are and how sustainable they are. And that is a very different understanding of scale, I think, than a sort of can you scale up to Finland or to Brazil or wherever it might be.

MODERATOR: Anybody else on that one?

MR. GONZALEZ: Yeah. I would like to say I think there's a lot of innovators but I don't think there's a community yet, or there's a very weak community.

And I say this based on a study we're doing right now in SUMMA in eight countries, SUMMA density, with different partners in the region. And basically what we're seeing is that there's really two paradigms in this. Of course you can go for the tumpotherian way of thinking of many (inaudible) jobs being very (inaudible). But the other thing is about ecosystem and you want to make change to ecosystem. And when you look at the ecosystems in Latin America, they're very weak. And it's basically you have very weak institutional frameworks, there's not too much resources being given to education. Not too much interaction between actors.

MODERATOR: Somebody would say that weak ecosystem is everything for innovation.

MR. GONZALEZ: I would say not. And I've seen it actually work in the case of -- let me tell you about Chile. In 2016 we did a study in which we saw that it was a very weak ecosystem. There were no formation of researchers, teachers were not near producers nor users of information. And Chile took a step, I was lucky to be involved in the design of those programs. We created systems of innovation, which created critical masses. We

created the (inaudible) Chili which promoted the formation of -- we designed a tax grade for innovation. When we did that, and you look what happened 10 years afterwards. The country's totally different, so the capacity of not only protectoral innovations in knowledge, but especially the impact on social policies. It's another situation. So I think stronger ecosystems do actually produce more innovation that we can see in that very specific case.

MODERATOR: Gina, can I ask you to follow up and plus the issue of health.

MS. LAGOMARSINO: Okay.

MODERATOR: How do you see health and innovation there? And there's a community, of course.

MS. LAGOMARSINO: Yes. So I definitely think there's a strong, obviously there's a strong community of innovators. Brookings, thanks to you for bringing it together this community. There's also a strong health community of innovators.

I think one of the big problems is that the communities of innovators, both in the health sector and the education sector, aren't always talking systematically with communities of government implementers who are managing large systems and ideally trying to reform those systems. And I think a strong ecosystem would bring those two communities together in a more systematic way.

Yes, of course, so the government implementers can be inspired by all the things that are going on here and think about what might be the school system of the future, how could they leap frog. But also the reverse. I think it's important for implementers to hear from people that are either working to reform or are too tired to even try to reform anymore, what the big challenges are, what the barriers are, what the problems that need to be solved. And also to help the innovators think about what kinds of institutional environments you need in order to be able to make the innovations sticky and scalable in that system. Because sometimes there's a lot of very non-sexy type of institutional reforms that are required if you want to introduce the innovation into the system and have it adopt into that system and the scaled. So that's a great challenge in both health and education, to get those communities.

I will just note that we've been looking to try to create a better ecosystems between those two, and have been working with the World Bank on that a bit.

MODERATOR: That's great.

MS. PENIDO: We might not be an ecosystem yet, but I think that we've managed to put the issue on the agenda, at least in Brazil. And everywhere where I'm going they are many, many people talking about innovations in education now a days.

MODERATOR: Sorry. But how do you balance in Brazil? How do you balance this complexity that Gina's talking about? I mean doing public policy in education or health, it's very difficult.

MS. PENIDO: That's what I was trying to --

MODERATOR: Okay.

MS. PENIDO: Okay. So actually in Brazil we are collaborating a lot. I mean the Federal government and state and local governments with non-profits and startups as well, trying to create solutions in a more collaborative way. So each one supporting the initiative with a different expertise or different resources or knowledge. And it's been quite interesting to see things really growing up and especially being implemented, which is the main challenge I think because, you know, having good ideas and drawing beautiful plans, this is a lot easier. But making things really work in the field is a lot harder. And because of these collaborations we are managing to progress in some initiatives.

MODERATOR: Let's examine it for a moment. So you spot innovations, okay, you define innovations with three criteria. They were great. Then what do you do? That is to say when somebody from the government come to you and say "Look, you know, I want to replicate what you are saying that is working here." What do you do?

MR. ISTANCE: Well first of all, I think that anybody, well like the database of Brookings (inaudible), there's a lot of innovations for this. So it's not the problem that we don't know about the innovations. The problem is how to really make them spread. And it's a lot of hard work.

So first of all what we do is that we identify the empowering to teachers. Then we package them in a beautiful way so that anybody can understand. Then we are promoting them in events with videos and so on. Then we are having innovation summit in Finland. Then we are having ambassadors in 50 counties at the moment to promote those. Then we are creating media weekly and so on. And that's only the very beginning. Because then the work starts.

And I think that if you are trying to understand the education ecosystem or industry, I think that each and every one -- I'm going to events in 20, 30 countries and the debate is always the same. Which means that we need to have pref of skills, 6 Cs, 4 Cs, and so on. No one disagrees. And then there are a lot of innovations that can actually solve the problems.

So we know what the problems are and we have the solutions. But something is lacking in between. And I think that it's fundamentally, it's a sales problem, it's a distribution problem, it's an agent problem. Which means that we think that education innovations would scale magically. That doesn't happy in any industry. We need to have someone who knows what other countries want, knows the conflict, knows who's the forerunner, who's more traditional, what are they looking. Then they are promoting, then they are selling, then they are helping in implementation, then they are helping in funding, and so on and so on. And that's something that is lacking from the education. And I think that within five, 10 years, there's going to be a lot of companies, a lot of organizations, lot of agents that are doing hard work in promoting innovations and also helping in implementation. And we want to be that as well.

MODERATOR: So that innovation is first global and then local?

MR. ISTANCE: I would say that at the moment when you asking whether we have a global education community, of course everything is relative. But I say that compared to many other industries, I'd say it's almost non-existent.

MODERATOR: Thank you. So it's 4:30 already, past 4:30. We're going to

open the mic for questions. We have plenty of questions, so we're going to take all of them. Identify yourself and make them relatively short so we can pack as many as possible. So I don't know who has the mic but there's a lot of -- you just decide to whom you give the mic. There you go.

MR. CLEVES: Thank you, and thank Brookings for the conference, very inspirational in many ways. I'm Steve Cleves from the University of Maryland. And my question is how can we separate the talk of innovation and leap frogging from the discussion of the awful conditions in so many of our schools around the world. With poor teachers' salaries, with huge class sizes, with little teacher training, with teacher status so low. And no discussion of the resources needed to do something about that. We do a decent job of educating advantaged students around the world. But the adversity and poverty facing poor children, I don't see how we can talk about innovation and leap frogging without talking about the transformation needed to get everybody up to some level.

MODERATOR: Okay. I've been debating with myself many times whether we are wasting our time talking about innovation in education. I don't think so. But I'm going to let my panelists here answer that question, or at least debate it.

Who wants to take it? I have two takers, three takers, four takers. So let's start from the left to the right again, no preference. Your time will come for sure. Go ahead.

MR. TUOMINEN: That's an essential question, and I think that's interesting in discussing with teachers in every country. I'd say most of the teachers actually hate the word "innovation." They are excited but they hate it. Because they have a feeling that it's messing up the system, it doesn't really work, it's for profit, it's about so on and so on. Which it isn't. So I'd say that the word "innovation" has an image problem, and for a good reason, in education. And we have to fix that one.

And I think that in order to make innovations spread we have to listen to teachers. We have to understand the struggle. We have to educate them, we have to give them resources, we have to follow the process together with them. And that's not something

that is happening. So I think that if we are messing up the system with new innovations or whatever, it's going to be extremely harmful. So I'd say that's kind of like one of the key things in here which I'm worried.

But then again we have to understand is that like Rebecca was saying in the morning, the best innovations are not extra work, they are helping teachers. And so we have to understand that as well.

MODERATOR: Anybody else?

MR. ISTANCE: I was just going to say that I mean certainly the innovations that we've looked at through the Innovative Learning Environments Project, several of those were precisely innovations because the adversity was so extreme. But you have to innovate. You couldn't go on doing what you were doing before.

MODERATOR: So you make real points here.

MR. ISTANCE: Yeah. So I mean that's one thing. But I do think it's also extremely important not to, this whole question of borrowing and transfer and so on, that you don't take a model that works in a leafy suburb of a rich society and think that that's going to work all over the world. So I agree entirely that the context, the conditions and so on, are really important. But not to counter pose innovation with adversity.

MODERATOR: Okay. We're going to take another question from the audience.

MS. ADAMS: My name is Kathryn Adams from Leda. And my question is related to a word that keeps coming up, and that is "ecosystems," that foster innovation. And I wondered if the panel could speak about what they're observing are the conditions that create that ecosystem that allow us to foster innovation so that more people become innovators.

MODERATOR: Gina.

MS. LAGOMARSINO: Well you asked me before about the health sector. Maybe I can give an example from the health field, permit me that might be helpful here.

So I think there's a lot of innovators in health that are focused on, you know,

sort of new technologies, use of mobile, etcetera. But we've also focused in health on how you can make people that are actually running the systems, government practitioners, into innovators themselves to solve some of those systemic issues that our first questioner mentioned. And we created about eight years ago something called the Joint Learning Network for Universal Health Coverage. Which started founded by six countries and their governments as supported by our organization, the World Bank, and a number of other partners.

And what it does is it brings together people from those countries, true practitioners that are facing common challenges across countries. And they identify the problem they're trying to solve. And they work together to develop solutions to that problem. And then they take them back and they adapt them in their own context and implement them. And then in the process they actually create global public goods around how to think about those problems that can be used by others.

And now that network has grown to 30 countries. Currently there are 13 different technical collaboratives going on with different mixes of countries working on each. But it's really making those government leaders into innovators. And we've been trying to think about is there a way we could create something similar for ministries of education, maybe starting in the Continent of Africa with some other countries weighing in.

And one thing I'd like to solve when we do this in education is what I mentioned earlier. I think we didn't, in the health network, do enough to bring together the innovators and the policy makers to solve those problems. I think if we did this in education ideally we would create these sorts of collaboratives to focus on problems and it would engage --

MODERATOR: So you would start from problems to solutions?

MS. LAGOMARSINO: Yes.

MODERATOR: That's the way you think it should be done?

MS. LAGOMARSINO: That's one way. Because I don't think all -- sometimes

we think of innovations as nifty new products or tools or technologies. But sometimes you need an innovative way to solve the problem of, you know, ghost workers in the system. How did a country figure out how to get rid of ghost workers so that they could then save those resources to spend on kids?

MODERATOR: And to answer you, I think so. Go ahead.

MS. PENIDO: In order to really foster innovations we have to change mindsets, cultures, beliefs, and that's not easy. It's not about trying to stimulate them to change small things that they are doing, but change completely. And so what we realize is that we really have to create an opportunity for the beneficiaries and, for instance, students, teachers, parents, to participate in the transformation process.

So it's not that they are not going to use references, innovations that have been tested all over, but those might have to be like the raw material that they are going to work with. But we have to imbed, to inoculate the virus of innovation inside the system so they can really recognize the problems and find solutions and use all these information to really change things in a more contextualized way.

MODERATOR: That's very provocative. I want to ask you about Brazil and other countries in Latin America which, when you ask people if they're happy with the education their kids are receiving, they would say yes. When they help you assess the system, they say it's a disaster. Okay. So how do you --

MS. PENIDO: The parents say that they are happy with the education that the --

MODERATOR: Yes, so how do you --

MS. PENIDO: But when you ask students, they would give you another very different opinion, another version of the problem. So what happened is that we have actually to educate people so they can understand what good education is about in this century.

MODERATOR: Great.

MS. PENIDO: You know, they still have a different perspective on what a

good education is. And we really have to educate. And students, they know better.

MODERATOR: Thank you, Anna. I'm going to take two more questions, or three more questions or four more questions, I'm not sure.

So why don't we do something? Why don't we give -- once you have the mic, then pass it on to the next one so we can do it quickly. Okay?

MR. DOUCET: Sounds good. Armand Doucet, I'm a teacher in Canada on the East Coast. I'm finding the debate today very interesting. There's one thing that I'm not hearing a lot about. I believe that teachers do want to innovate, specifically to facilitate their job. What I'm not hearing is how are we going to align the mission and vision from top end policy to give us the liberty to actually do that? There's no teacher that walks into the classroom and says "I don't want to reach every kid today."

So if you look at the United States, the reality is standardized testing is hovering over all classrooms. So to innovate, you're taking some risk. And when there's socioeconomic risk and your job's at risk, then you know what, I gotta bring food on the table. So when are we going to actually have real talks about policy within the society, within a country that has a taxation system that would have health care, mental health, social working, so that we would actually get that out of the classroom, in some ways, to help teachers? That's what I'm not hearing today, which is very scary. Because I do believe that teachers do innovate in the classroom. So that's my question.

MODERATOR: So I'm going to paraphrase you a little bit so you going to forgive me. It's very difficult to innovate unless you change radically the rules of society. Is that a good -- I don't know if that's good paraphrasing, but let me try that one on the panel. Javier.

MR. GONZALEZ: Yeah. I mean I truly agree on the fact that these show in varying conditions. Let's take one example. And when you look at the most effective, or one of the most effective practices has to do with feedback. In order to do properly feedback you need more lecturing time. So you need (inaudible) in the early condition, that's actually a

regulation, of course. But also you need resources. And going back maybe and so linking to another question that has to do with indeed the fact that the funding is so low that actually hinders innovation. So let's talk about Latin America just for a second.

In the City we're spending $9,000 per child per year, in Latin America it's around $3,000. And we know there's a relationship between resources and quality until up to more or less $8,000 in the resources here. We have done a done a study on that, and many others have actually seen that in consistent ways. So we know that resources are sparse too. Not only they're low, but actually we're diverging with the rest of leaders.

If we look at for example Mexico, Brazil, Chile, we compare how much they were spending in the year 2000, how much they're spending in 2013, for example. We did that in SUMMA. And what we saw is that there was a gap of $3,000 per child per year. And now it's more than $5,000. So the point is it's low, it's diverging, and that has a real implication for innovation, as you were saying.

Because among other things, that means a lot of teachers have more than one employment. So two employment in Latin America is a very serious issue right now. It has to do with funding, and therefore if you have more than one job, of course you won't be able to even innovate because you have many contracts, you have to be moving from one job to another.

So innovation, and just to finish with that and the innovation part that you were saying, is innovation is not separate from insufficient or regulatory innovation.

MODERATOR: Let me go beyond that regulation and go to testing. So is innovation and testing, are those two terms compatible or not? Anna, I'm going to give you first, and then one.

MS. PENIDO: You know, we believe that actually moved us was really trying to change the national curriculum. Because what is being assessed? What is there that, you know, what the system says that children have to, students have to learn. So by changing the curriculum and imbedding the 21st Century skills in a more innovative approach to what they

have to learn. We are now trying to really make more complex changes in the way learning is assessed.

But on the other hand we really have to -- how do I say this, problematize the demand for education. Because at least in my country, politicians and, you know, governments, they just work under pressure. So if society's not pressuring for this different type of education, they will never change.

MODERATOR: Standard of state, of course.

MR. ISTANCE: Whenever we are improving or developing education, I think that we should always start with the fundamental question, which is what is the purpose of education? If you ask from me, it's to help every child flourish in life no matter what happens.

And as we heard today, as we all know, the world will be extremely uncertain. Which means that no one knows what works. So then the key thing in the school is that the question we are hearing again and again and again is that how do we know that this works? Well, with many of the things, you don't.

And then the question I'm asking is it a good thing that something doesn't work. Because that's exactly the world we are moving into. So for example in Finland, the essence of the Finland education system with the teachers is consisting of two things. We love our teachers. We give them freedom, we trust them. And then we are saying is that please do the best new things. And if some of the things don't work, it's great because we are learning. And I think that should be the essence of education in every country if we want to be preparing our kids for the future.

MODERATOR: Thank you very much. Now I'll take another question. Go ahead. There's a microphone there, a microphone here. So we're going to go with that first and then second. Okay.

MS. GALALISA: Natalia Galalisa from the Global Innovation Fund. I want to complicate matters a little bit more with --

MODERATOR: (Inaudible)

MS. GALALISA: We've heard about sort of innovations and the role of innovations in unburdening teachers and helping them deliver. But in countries with very low state capacity there are plenty of bureaucrats who also needs to be unburdened. And in these countries the real question is last mile, service deliver or implementation. And so where are the innovations that are helping unburden those bureaucrats? So let's say, you know, while we innovating on procurement, are we innovating on monitoring systems and easy to use dashboards for people who are sort of constantly hearing about innovations that they have to scale up and the challenges that they have to solve, and quality assurance tools. So how many innovations are thinking about, you know, once the scales, how are we going to know that the impact is being maintained because we have good quality assurance to --

MODERATOR: That's a good question. Thank you for complicating things. I think that's a great complication that you have. The second mic was here, so we're going to take two. Go ahead.

MR. LARA: Yes. Hello, my name is Alejandra Lara, I'm the -- I don't know if you remember me, I actually in the past I challenged the IDB, the Chess Master, live. So right now I'm going to challenge the panel. And especially the person sitting on the right, I'm sorry, I don't remember your name.

Right now we created a startup, a non-profit from the Brain Sciences. We are providing the behavioral approach in early interventions and strategies in developing countries. That's the whole rationale. So when you deal with the behavioral change, I think you mentioned something related to that, it takes time, right, to see results. So my question to you specifically and, of course, I would like to hear the view of the panel, if our non-profit's going to work in the future.

What is the reasonable and feasible time for a non-profit to show results? I mean remember that we need to deal with credibility, which is a big thing, right? And we need to find related projects to prove ourself that this program is going to work. So what is the reasonable time? I mean what is the, you know, what do you think is a good time to see if

those things will work, and also hear your view? Thank you.

MODERATOR: Okay. This is the story. Where's Emma, Emma Laston? Emma put me, I think it was last year, I don't remember, I think it was last year. To play again Grand Master, a Chess Grand Master. Okay. On stage. He was blindfolded, okay? And he won in like 15 moves against me. Okay? But this guy here helped me to get to the 15th move, otherwise it would have been five, according to what they tell me. Thank you very much by the way. So we have two questions. That was the story.

Two questions. The first one is the last mile of innovations and implementation. The second one is a not for profit, there's a lot of not for profits here, when is the right time to show off what they do and to ripe and go mature with their products? So.

MS. LAGOMARSINO: I think it can take, just to take the second question, I think it can take a little while to get to the point where you can really show that something works.

And just to give an example. Our adaptive learning team has been working with a number of different individuals. We worked with World Reader in India on their Read to Kids Program, which basically makes for free available an app that parents can download lots of different books and read with their kids. Seems very simple, right? But there's been a lot of testing that we've been supporting them on to figure out what are the right behavior change, messages, and channels in order to get parents to actually take up and start reading with their children. And we just got the first set of results back, after doing a lot of this rapid testing, the first set of results, which took two years to get. We had 200,000 families interact with the application, and about 7,000 actually started using it regularly.

The question is, is that a success, is that a failure? It's 7,000 more kids that are getting read to on a regular basis. There's also a lot that didn't take it up, so there's still a lot more to learn. And so I think that's the way we've been thinking about this. How can we help them continue to learn how to take that 7,000 and make it into 50,000 next time.

And I hope that's the way you and many other innovators will think about this.

It's not about proving that it works and then flipping a switch, but over time figuring out how to improve your implantation, your product, your design, so that it will be more impactful.

MODERATOR: And so that's why it's so important, partnerships and funding. Funding long term or medium term, so you don't have to do it tomorrow. And partnerships of course you need to create credibility with your product as well. You cannot do it by yourself, it's very difficult to do. That would be my advice.

MR. ISTANCE: Previous, to the first question, I think that we need to have innovations in every level of the system. We need to have classroom innovations but also management, leadership innovations, systematic innovations, last mile innovations, and so on and so on. So we should be discussing about all of everything.

Then going back to your question, which is a great question because I've been having my own companies 30 years. I've been innovating, creating concepts, creating companies and so on. So the key question is, when do you know what is the right time to stop. Should you punt or should you stop. And that's complicated.

But my gut feeling in here is many of you might disagree, but I have a feeling that you kind of like sense almost from day one is that there's something great, it starts to gain traction, it's growing. It's not simple but you have a feeling is that we are going to places. If it's a struggle, if it's uphill day after day after day, most likely there's something wrong. And that's when you change, change, change. And then you get the feeling that is wow, now it's going.

So I'd say that if for the past six months if it's been a struggle, most likely there is something wrong.

MR. LARA: So it's intuition and building?

MODERATOR: Exactly. All right. What I'm going to do now, because I have -- so I'm going to take very quick questions, a hundred words. And very quick answer, hundred words. So we're going to take all the questions that we have in the room left. So we have one, two, three, four. Okay.

MR. EVANS: My name is Phil Evans, I'm from the International Baccalaureate. And I wanted to just piggy back over the ecosystem question for innovation and so maybe tie it a little bit more to professional development.

In my experience as a teacher, often professional development was very tucked down, and we had to sort of sift through it. And, you know, in the International Baccalaureate the idea is come to training, number one, and then implement, collaborate, reflect, improve, then maybe in a couple years come to two.

So how do you -- like what are the elements, particularly in some of the countries where we have a lot of innovation happening. When it comes to professional development, what does it look like and how do we structure that or the systematic elements that make that work?

MODERATOR: Thank you. That's going to take more than a hundred, but we're going to do our best. Go ahead.

MR. RETALATAIV: Hi. Daniel Retalitiv from the Minister of Education of Peru. Maybe to hear from someone different from the government, the famous bureaucrats that deny innovation.

So really quick, to go back to a question that you did, Marcelo, and it wasn't answered. The ethical side of trying to innovate with public funds. Because innovationists, if we understand a trial, error, trial, error, it's okay in private or research, it's the shareholder's money.

MODERATOR: I mean what's the question? Go ahead.

MR. RETALATAIV: What are the comments that you can have about the ethical side of trying to innovate with taxpayer money?

MODERATOR: We're going to press these guys, they say that.

MALE SPEAKER: My question is a little bit rude. If we had this meeting 20 years ago, instead of innovation we would be discussing technology the same way, right? So we are using innovation as the (inaudible). Innovation is a very broad issue. I mean we use it

for everything.

I want to understand what program are we trying to show and what's the innovation, and not the other way around. In the past we discussed technology without saying what technology should solve. And now we are doing the same. What are we trying to solve? Because if we want to solve things, we have to go all the way through the innovation. There's no point of talking around innovation in doing and not in testing.

MODERATOR: And the question is, what we're trying to solve?

MALE SPEAKER: The question is what your vision, what innovation is are we discussing here? General innovation in particular. What's the aim? What's the three most important goals for the next 10 years?

MODERATOR: Got it. There's somebody behind you that wants to ask a question. And the gentleman there is going to be the last one.

MS. PISTACCHI: Hi. Andrea Pistacchi, CEO of the Christy Company. We provide affordable financing for education infrastructure at a large scale.

I didn't hear any mention for the most part of the private sector that does not belong to the NGO sector today. And yet they have by far the most money. And my question is what about the innovations of public/private partnerships? That word is overused, but proper use of private capital to bring solutions to scale in an equitable and ethical way.

MODERATOR: Thank you very much. And last one, not least.

MR. MUSKIN: Thank you for that. Joshua Muskin, Geneva Global.

We've been talking a lot about innovation as product, something that we can prove, that we can disseminate. I'm going back to our friend from Canada, and wondering how do we look at innovation as process? If we go to the classroom and we give the teacher a beautifully crafted innovation. After they've done it two or three times, the students are getting bored of it. So how do we create, and someone talked about the enabling environment, how do we create the opportunities and give the freedom to teachers to innovate as a perpetual process of their pedagogy? Thank you.

MODERATOR: Okay. We have a challenge. Five questions, five panelists. So how do we solve the problem?

MR. GONZALEZ: Well if I start --

MODERATOR: Which one are you going to take?

MR. GONZALEZ: I combine two. First of all, when we are discussing about innovations I think we have to separate development, ideas, creativity, design thinking, innovations. And all are crucial, but they are slightly different. So if I'm thinking about innovations, what I would do is that I would identify the innovations with having a lot of momentum. And then I would concentrate on helping those thread. Because you cannot force --

MODERATOR: Independently of the problem?

MR. GONZALEZ: You can have private money, you can have public money and so on, but I would concentrate on those.

And then the really good question of what would be, if I would choose one problem to solve, using innovations. For me it would be how to make the world of education or education innovations global. Because there's a lot of creative innovations that don't spread. If you can get the know-how, the knowledge of each and every country and use those, that would be brilliant.

MR. ISTANCE: The issue I suppose I would focus on, what's the innovation for? Especially, I mean you can have innovations with lots of things. Would be particularly about engagement. Engagement of learners, engagements of families, engagements of teachers, engagements of communities.

We have to use short hands, we used the word innovation. Personally I'm not terribly sold on it. I would be quite happy to think about powerful teaching and learning that's effective, that's equitable, and that's sufficient. I mean if I didn't use the word innovation it wouldn't keep me up at nights. But I think its engagement especially, I think. Because once you have engagement then all sorts of other things can happen.

MODERATOR: Who wants to take the one on the private sector and education?

MS. LAGOMARSINO: I can.

MODERATOR: And then he'll tell us --

MS. LAGOMARSINO: Yes. So clearly there's a role for private capital in funding innovation. But I think there is a risk sometimes. It certainly happens in health where people feel like there's going to be something like innovative financing that will come in and solve all the problems of the gaps in public sector funding because money will miraculously appear because private organizations will put it in.

The reality is private organizations often want to make money and there needs to be a revenue stream to support them. And often that revenue stream is coming from government ultimately because governments are the ones buying the innovation from the private sector.

So it's great to have capital investment to help develop innovations, but ultimately there's someone that has to pay, and when we're talking about school kids around the world who are getting public education, it's usually governments that pay. So I think that we have to balance of notion of how much there's a panacea with private financing.

MODERATOR: Okay. Thank you very much. That's for another conference altogether.

MS. LAGOMARSINO: Exactly.

MODERATOR: Anna, I'm super interested in you at least trying to tackle the ethical conversation. I often put you in a difficult spot. I hope not.

MS. PENIDO: I'll use an example for that. So the Municipal Department of Education, the City of Sao Paulo, they created an education lab and named five people from very different sectors, private sectors, startups, teachers, whoever wants to collaborate. They picked the problems that really hurt them the most, the most painful problems. And they created this environment where those people can create solutions together. And then the

commitment of the Department of Education is to implement it in a way that they can really follow up on the evidences that it's working and support the improvement of the solution. So it's not only about investing a lot of money in buying things, but actually creating space for sometimes even without money, allowing the innovations to happen. But of course they are very clear on the problems that they want to solve, and problems related to inequalities, relevance. Those are the two main priorities nowadays in Brazil.

MODERATOR: So what you're saying is that there's an ethical place for the government to --

MS. PENIDO: To convene, to convene all these people to, you know, try to innovate together. It's not only about buying things.

MODERATOR: And risk appetite should be there too?

MS. PENIDO: Sorry?

MODERATOR: The risk that entails?

MS. PENIDO: The risk is shared with lots of stakeholders, you know, it's not only in the government's responsibility to make it happen.

MODERATOR: Thank you, Anna, that's very good.

MR. GONZALEZ: Tackling some of the questions. Regarding the private sector, I think the private sector does have a role, but the point is where and when? And I think there is distinction between uncertainty and risk.

The private sector won't go where there's uncertainty at the end. That's why it's so important, especially in social areas, the occasion dual of the state. Because the private sector won't go there. They will go where there's risk, and even there will have to have some kind of funding to promote that.

Regarding Danielle's question on ethical, how do we make this ethical? I think has to do with how do we create this in a systematic process of innovation within the government. And I know, of course, you've been involved in that. And I guess how do you visualize the profits of innovation in a very clear way of how do you test, how do you

experience that?

And a very good example is actually them allowing in Peru --

MODERATOR: You have to make it, again, you have to make it clear what you're trying to achieve. That's what you're saying?

MR. GONZALEZ: A very well thought process on how you innovate from the public sector. It cannot just be any idea which exists in the region. Sometimes leaders have great ideas and sometimes they're wrong ideas. So the thing is how do you create a more, let's say a clear process based increase?

MODERATOR: Let me push you a little bit further. Okay. So you said the wrong ideas.

MR. GONZALEZ: Yes.

MODERATOR: Who's to say that it's a wrong idea?

MR. GONZALEZ: Okay, let me go to -- so the point is basically is where you start. I just had a conversation two weeks ago with a Minister of Education in the region. And he was saying we want to promote innovation.

MODERATOR: Yes.

MR. GONZALEZ: And what I said is let's start then from where we know it's working. So let's say, not the wrong idea, it's basically the most uncertain ideas. You should start, from an ethical perspective, using your resources where there's a lot of certainty that those things will work.

So for example a maximum effective practice that we have been working with EF is a good place to start because you know those practices actually happened and are working based on evidence, based on the last 10 years of research in the world.

So an ethical way of starting innovation is not only having an institutional process of how you do this in a very kind of projective way, but also where you start from, and how you envisionalize it through lab or center of innovation and the means to go between two (inaudible.

MODERATOR: Okay.

MR. GONZALEZ: And to finalize the question of which would be the most important to this question, I would say just one thing in Latin America, at least my perspective is diversity. How do you integrate the rest? I think that's the challenge, most important challenge for the next 30 years is how you integrate migrants, social classes, sexual diversity, etcetera, etcetera.

I think in Latin America we're very lagging behind in how to understand the other, those other that are different from ourselves.

MODERATOR: Okay. I need to finalize this, and I have to do two things. I have to do the announcements, which if I don't do this I don't get paid today. But you have to promise me that before we do that, we recognize our panelists. They've been great sports. I promised that I wouldn't interrupt you, I didn't interrupt you that much, but a little bit. And I think that you've been great and I want to thank you, all of you and all the great audience that we have.

So now the parochials, let me see. Thank panelists and audience, I already did that. It has been a long day, but we hope it has been fruitful, we hope so.

Waiting on the other side, this is getting better. Waiting on the other side of those doors, I guess, we have wine and cheese. So if you like wine and cheese, you only have to step outside. The innovator who spoke in Session 4, the Session before this one, this is the fifth one, and the last one, we promise, have tables set in Summers across the lobby. Okay?

I want to encourage you, of course, to go and get Litro, it's on sale at the Registration Desk, and it should do for a great reading. And lastly, if you have a headpiece, they don't work very well outside of these premises. So, please, if you would leave them on your chairs. Thank you very much, and enjoy the reception.

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