

THE BROOKINGS INSTITUTION

WEBINAR

AI AND THE FUTURE OF TEACHING AND LEARNING

Washington, D.C.

Monday, June 29, 2026

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PANEL DISCUSSION:

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WINTHROP: Good morning, good afternoon, good evening. Thank you all for joining. I know we have thousands of people registered from all around the world. Thank you for taking your time. We are here to talk about AI and the future of teaching and learning, and also technology and the role of technology in the education process. I am Rebecca Winthrop. I direct the Center for Universal Education at the Brookings Institution. We have been looking deeply, particularly at this question of AI, starting a couple years ago when we launched the Brookings Global Task Force on AI and Education, and we shared the findings of that task force earlier this year. And there has been a lot of conversation in the US and around the globe around what is the role of technology in classrooms, in schools, in the teaching and learning process. And I couldn't be more tickled to have wonderful experts and friends join us today to have an open dialogue and conversation about this topic, as well as taking your questions. And you can always continue to submit question at events @ brookings.edu.

So I'm really pleased to welcome to the platform, please come online, Michael Horn, who's a lecturer at Harvard and co-founder of the Clay Christensen Institute, and Andreas Schleicher, who is the director of education and skills at OECD. Michael will be leading us in a conversation, and hopefully Michael be sharing your wisdom, too. Over to you.

HORN: I appreciate the opportunity, Rebecca, and it's always a pleasure to be with you both in this forum and to have this conversation, and I think it comes at a critical moment in, in the world around technology in general, and certainly in our schools, as we'll discuss. Just to frame the conversation before we dig in, if you will, it's an interesting moment, I think, because there's a lot of seeming paradoxes out there. There's a widespread global backlash around the concerns and challenges and harms from social media. Parents in many cases, lawmakers are part of a backlash against technology in classrooms themselves.

In the United States, for example, we are seeing a lot of legislation backing up these parents to limit screen time, to limit technology usage and the like. And then, on the other hand, you have AI that has been growing in our consciousness certainly through large language models over the last few years, and I would argue in many countries is actually ubiquitous, whether we know it or not, through a

variety of platforms intentionally or often unintentionally in the classroom and in school systems certainly.

Now, you also have this other weird thing where usage of AI will go up when students in schools are in session. And yet, if you look at higher education and the graduations at colleges around the country and around the world in many cases, students don't seem very excited about the prospects of AI. So once again, you have AI up and prospects and hatred of it also there as well. And then finally, the last paradox I would just highlight is even as you have parent, parental and student concern over these AI and other technology models, you also have a group of families migrating to brand new school models created by educators that are in many cases powered in some sense by technology and AI.

And so we have a lot of different currents, and so I think we've got the two right people to help us sort out what is going and help us understand the signal, if you will, from the noise. And Rebecca, maybe let me start with you on this one. Just let's divide the conversation in two parts, if you will. The first part, let's just talk about the technology in education in general, not AI specific, a more of a reflection of where we are now, but also the last really 10, 15 years. And then the second half we'll get into AI, where you both have done a lot of specific work. But starting with your family engagement education research network, like I, I mentioned the parent backlash to technology, but dimensionalize it. Help us understand what's really going on here a little bit more.

WINTHROP: Thanks, Michael. Let's start in the US because you are seeing a big backlash around technology in the classroom in the US, and then we can talk about the rest of the world, and I think Andreas can weigh in too. But in the US, I just I think we need to go back a few years, and part of what I think we need to look at is just how are parents doing? So in 2020 two-thirds of parents said, and this is, at the onset of the pandemic, that parenting is harder today than it was 20 years ago. And yes, the, the pandemic was just beginning. It wasn't full-fledged. But a lot of parents said that is because of screens and technology and trying to manage this online world that is confusing and sometimes dangerous for their kids, but yet they have to use it for school and homework.

And then in, fast-forward in 2024, the US Surgeon General, Vivek Murthy, under put out an advisory, a public health advisory, which is something that the US Surgeon General does, saying, "This is an,

here is an urgent public health issue." And his advisory was saying that parental anxiety and stress was a public health issue because it had gotten so bad. They had done a fair bit of research, and they found that at least 40% of parents in the US are, feel so stressed and overburdened that they can't fully function and be there for their kids. And there, they saw a big difference between parents and not and people, adults who did not have children.

And I just wanted to put in context that this backlash comes on top of a, a really big struggle, parent, that parents are, have been facing, certainly in the US, around raising their kids, navigating the online world. And then we see a b- Jonathan Haidt's book, *The Anxious Generation*, came out, which really catalyzed sort of ongoing interests and discussion and awareness that, hey, maybe we shouldn't have phones in school. That, I think, is the most impactful thing that has come from that book. And again, in the US, this was rather a new concept. It was not a new concept in the world a decade ago. So if you look at the rest of the world, a decade ago you had France who was saying, "Let's limit screen time in schools," and they progressively changed.

And Europe and many countries years and years ago were taking phones out of schools. You also had places like China who were saying, "You know what? This social media stuff is not good for our kids. It's not healthy." They, have a very different governing system, so c- so could control things and said, frankly, it would be every say what you will about geopolitics, but every parent's dream is to do what China did for their kids online regulation where they said you can only play video games for three hours on the weekends, and you can't be s- scroll- scrolling social media between 10 and, PM and 6:00 AM.

And in the rest of the world, we do see a growing sort of movement. A- and now increasingly it's against social media accounts, so having young people have a social media account, being able to access social media. Australia was the first one to do this for under 16s. It's catching on. But now that AI as a software is everywhere, it's in social media, it's in Google searches it's in our ed tech, you're seeing an increasing sort of backlash by parents. For example, in the US Fair- the Fair Play Coalition with a lot of, child psychologists said we should put a moratorium on student-facing AI use for five years in schools.

And really at the core of this, you see this sort of wave, at the core of this is a loss of trust. Parents do not trust school systems to do what's right by their kids. And they realize that, you can take s- they can take the phones away at home, but homework is still assigned on- online, and that a lot of kids are accessing social media on their school laptops.

HORN: It's interesting your answer already maybe helps explain one of the paradoxes of lack of trust, but if I've chosen a different school, maybe I have trust in that because I made a conscious movement. Andreas, let me bring you in here though, 'cause I'd love you to give us, some data around the use of technology in education globally so that we all have a shared understanding empirically of what's going on. Rebecca started to mention some of the country differences and the like. Just help us understand about usage in different geographies, impacts both at a macro level, but I also know you think about the micro level, the actual use cases in the classroom as well. So give us some of the data that you all have collected.

SCHLEICHER: Yeah. First of all, our data show when we survey students that access is now pretty universal. That's, I think, post-COVID something that you can take for granted even in, less developed economies. In fact what's interesting, five years ago we would've said there's a kind of digital divide between students from wealthy families and less privileged ones, and now this is actually flipped, we have just completed our baby PISA assessment where we looked at five-year-old children, and what you could see is that five-year-olds from disadvantaged backgrounds have a lot more access to devices than five-year-old from privileged backgrounds. And my privileged backgrounds, parents are more likely to read to their child, which is a good thing, actually positively correlated to cognitive, social, emotional outcomes.

In disadvantaged homes, kids are more likely to see a screen, which we the same data show negatively correlated with, cognitive, social, emotional outcomes. So I think the, in a way, the, if there is a divide, it has flipped the other way around, but I would say access is pretty universal. Now, access isn't use. I think that's where the interesting story starts. And we see still quite big differences between countries, particularly when it comes to intentional use. By that, teacher-directed work where, this is integrated into classroom practice. There are some countries where that, we look at

Korea where that is now, or, China where this is now basically quite closely integrated into everyday teaching practice.

And there are some very well-developed education systems Japan would be an example, which actually ends up at the low end of the spectrum so it's nothing to do with GDP. It's really about kind of policy, the intensity of use. The big differentiator is also technology used for leisure And that, that's much more related to, the kind of regulatory policies that Rebecca just referred to, and you can see some countries that have become very restrictive. I think cell phone banks are becoming more the norm than the exception across countries, for good reasons, by the way. Whereas we do not see, much of a correlation for teacher-directed work with technology. In some countries it does have a positive, impact. In others not so much.

And it's a kind of quite flat curve. For technology used for leisure, you can see a steeply negative curve in every country. That is pretty, pretty clear that basically, and it could, causation can always go both ways. You have non-performing students resorting a lot of technology or technology actually, have we do not know that. But what is very clear is that relationship is steeply negative. We also see that you have now in many countries, 40, 50% of 15-year-olds who say, "I can no longer concentrate in my mathematics lessons because of my smartphone or somebody else's smartphone." So I think that technology used for leisure is something where we see huge differences across countries, much more so than with, teacher-directed work, and largely that is affected by, an outcome of, regulatory policies that have been taken.

But much of this actually predates AI. I think AI obviously, puts a completely new dimension to this. AI also has put use of technology much more in the background. The most powerful users of AI technologies are not student-facing. Again, there you can question it. The most powerful users of AI are, learning analytics, where, students get in that kind of information on how to learn better. Teachers get, information how to teach better. Schools get information how to, become more effective. That's, I think, where AI has added a completely new dimension now to this. But no, overall, access pretty universal and then, exposure is when it comes to leisure, very much an outcome of regulatory policies now.

HORN: It's interesting that you mentioned the leisure point, 'cause one of my impressions also of what's driving a lot of the backlash is parents, quite frankly, like very upset when they find out that their kid was on YouTube for, you know- ... an hour of class, right? They can't figure out the educational value. It's certainly not active learning and things of that nature. Andreas, you also mentioned that the, that tech use is quite heavy though in places like Korea and China that have been high achieving. So m- maybe help us understand in terms of effectiveness. So the leisure, if that is negatively correlated pretty consistently, w- where is it effective? Where is it not? What are you what are you learning about the, the next level question rather than just tech good, tech bad?

SCHLEICHER: Yeah. I think the big issue really is pedagogical intent. And I do think we can learn a lot from countries like Korea, China, Singapore on that, where you have, you know, very clear first of all, they will still minimize screen time. Again, they use technology largely as a source of, knowledge. How to figure out how different students learn differently and to, personalize that learning. I actually had my first exposure to AI in, in 2018 in Shanghai, and it was a really interesting experience.

I was watching a primary school, primary classroom learning calligraphy. That's one of the biggest headaches of Chinese teachers. We struggle with 30 characters, and they have to learn 4,000. So it's just massive. And for them, it's not just a technique, it's an art. And you saw those students, drawing the characters with ink and on their tables. Inside their tables, they had integrated scanners, and on that table students had a tablet that was giving them real time feedback on the quality of their drawing. Teachers got real time feedback on where students had misconceptions, with ... it was just amazing how on the one hand learning was very traditional, and at the same time technology was super empowering, both learners and teachers.

And I think that's, Korea would be a country where you can see that with the digital textbooks, no? It's all adaptive. I think the, the big differentiator to social media is that these things are about creative uses of technology, not consumptive uses of technology. It's not, putting stuff to students. It's really about enhancing cognitive activity. Really, I think that's the one thing I would always, point to that, you do not become, fit by watching sports. You become fit by doing sports. And the same is with AI, where you use AI to, enhance cognitive activity to get students engaged, to understand how they learn, you're gonna see benefits.

Where, you try to, and don- where the consumptive aspects dominate, drawbacks. And I think some countries have really figured it out. What's also very interesting for us is how much it, the variation there is in actually teachers being on top of this. You have, some countries where teachers are very creative, very active designers of innovative learning environments, and others where they are, slaves of scripted algorithms and lesson plans. And I think that's, I think, another dimension really important here. General purpose AI tools, I haven't seen much, good coming out of this. Most of the, good applications are really designed and used for educational and pedagogical purposes now.

WINTHROP: Michael, can I --

HORN: Yeah, please jump in.

WINTHROP: Jump in really quickly? Just on Andreas' earlier point about how most countries who are high-performing are u- either using AI in a very pedagogical integrated way. I love the calligraphy example. That's a great example. I would say technology. Let's go back to technology, but it's not heavily one-to-one screens. So I had ... This is just a story that illustrates this. Had a lovely meeting with a delegation of folks from Estonia, Ministry of Education and others, and as Michael and Andreas, Estonia is a, a very sort of tech-forward country across the board, including in education. And they were shocked to learn that a lot of schools spend.

Kids have 80, at least above 80% of their time face-to-face e- with their, educational experiences intermediated with a laptop, for example. And they said, "That's crazy. We have 80% person to person, eyeball to eyeball. We teach handwriting. And we read books, paper books." And of course we want our kids to learn technology and have the benefits of technology and, maybe 20% of the time it's tech intermediated, but it's very intentional, and it's not a universal platform which is really different. A lot of school districts I talk to, they're like we're 80%, our l- learning is intermediated by technology." So I think we need to completely flip that. I think we've lost our way- yeah, and that's a good- In the US.

HORN: Yeah, I think it's a good rule of thumb also for people thinking about it. The way I've thought about it is similar to what Andreas said, which is, the person that does the work does the learning at

the end of the day. And so look, if you're on 45 minutes of a reading program and- Over the course of the entire day because you're getting very direct instruction, you're working to read, and it's giving you feedback and so forth, fine. It's a purpose-built technology. Ideally, there's research around it. Ideally, I would argue there should be an outcomes-based contract when the school is working with that vendor so that they're actually very clear about these are the outcomes that we expect, this is the time that students will be on it, and we're both holding each other to that end of the bargain so that there's clarity on both sides.

And then Rebecca, to your point, it's, okay, so you built some basic knowledge, you built something, and now what are you doing with that, right? And now this is where conversations, small group projects, things like that start to come into play. And look, maybe technology is used in the context of a project, I would argue for older kids. I get suspicious when I see younger kids on, on laptops making things. And but again, it's a function, it's like a small part of what you're doing, not the not the plot itself. And I think that's what we've often flipped where we see this go awry. I wanna ask one more question on this before we jump into the AI specific piece.

Rebecca, you think a lot, you wrote *The Disengaged Teen*. You think a lot about engagement, motivation, which in, in the learning sciences stands somewhat separate from the cognitive science and a lot of the memory work, right? But it points to what Andrea said around the importance of actually doing the work and act- like actively learning as well. How does that all fit with this, right? Like the student motivation piece in how they're maybe moving through their own experience in school.

WINTHROP: Yes. Gave a shout-out to my book with my co-author Jenny Anderson *The Disengaged Teen*, and we found these kids arrive in these four kind of learner modes of how motivated they are, how engaged. Passenger mode, I'm coasting, doing the bare minimum. There we find that kids might like school to see their friends, but they're really not psyched and excited and motivated about the learning process, and they're trying to get through as quickly as possible. And they will absolutely use technology to just find the answers or, do the work for them, copy and paste.

And they see education as very transactional. You do these certain things. It's task-oriented. Do these little certain things, add that up, and boom you know, pass. And so they're like let me just get my tech

over here to do the things, and then I can go on just to do what I want." Kids in achiever mode are really trying to get really good grades. They're focused on the outcome, not the learning journey. They are motivated by school. They wanna do well. They think it's a gateway to a better life n- which is not bad. They're ambitious, they're organized, goal-oriented, and parents love them, so do teachers.

But in some ways they end up acting like the achiever, the passenger mode kids with technology, 'cause they are actually not that focused on learning journey. They're focused on getting a good grade by whatever means necessary. And, before ChatGPT, that was... there was a high incidence of cheating of, from friends and others and passing the, you know, tests around. And there certainly is a still a high incidence of cheating 'cause they're just trying to optimize the outcome. And then you've got kids in resistor mode who are just like, "I'm not having any of this." But kids in explorer mode, which is really a small fraction we found with our colleagues at Transcend.

Less than 4% of kids in the US spend time in e- regularly said they spend time in explorer mode in middle school and high school, which is where they are following their curiosity. They're interested in the learning journey. They're doing what Andrea said. They are becoming stronger learners by practicing learning. They are becoming stronger critical thinkers by practicing critical thinkers, which you need content knowledge for that in order to manipulate. And it's, and they're really invested. They end up getting really good grades. I always say this, because you don't actually have to sacrifice performance for exploration.

But they use technology as an unlocker, so for example, this is the kid who gets excited about tornadoes and then says, "Mom, I learned about tornadoes. Do you know about tornadoes?" And then goes on YouTube for following their curiosity about tornadoes. And so that is a, a, a way that tech can unlock their learning. But it's really hard for schools to you know, in our current model, to architect that sort of explorer mode all the time when they, when kids have access to the entire worldwide web. So like a kid in passenger mode, for example, might be interested in something, be like, "Oh, that's interesting."

Go on YouTube 'cause it's assigned in a class, might be interested. But then the infinite scroll pops up and it's on, something w- that MrBeast did, and they go on MrBeast, which might be interesting. And

then they're just on a TikTok, on a YouTube rabbit hole far from, what they might be curious about. So that's how we see it playing out.

HORN: So let's start to shift into AI. It's interesting you just said that, 'cause one of my reflections on all of this also is that Andreas used the word pedagogical intent versus sort of general AI tools. I wish we had single purpose tech tools as well, as opposed to a computer with everything at its, at its disposal. The Speak & Spell when I was, six or whatever might be better at this point. Let let's jump into AI though. You both have done pretty significant reports collecting, in, in your case, Rebecca, a pre-mortem. Andreas a digital outlook around AI. I'd love to hear what both of you found as we get into this. And so Andreas, maybe you start, and Rebecca, just jump in right after.

SCHLEICHER: Yeah, the one compelling finding, and this was actually already in our previous PISA assessment, was, when we looked at digital literacy. Now, which students are really good at, the kind of critical thinking and, you know, skills. We didn't find any relationship with AI or technology. Actually, the best predictor of digital literacy was the share of students who had read books over 100 pages, paper books. And we ask ourselves, how can this be? And then when you start to think about it, you understand if you read long books, you have to learn to build a mental representation of something that is really complicated.

You have to entertain all these different characters and how they interact, and you have to engage with the material in its complexity. And maybe that's a way that actually then builds those kinds of AI literacy skills that later on that, that we look at. But basically, on the digital outlook what we found is that there is a big distinction between general purpose AI tools that are just, put into the classroom and those where you have very clear pedagogical intent.

I give you a, an example that I f- think is really striking. You take, for example, you give students AI tool, ChatGPT or whatever, to write essays. And of course, they produce better essays. Task performance will always improve. But then afterwards when you ask them, "Hey, what did you actually write about?" 80% of students in the in, in that group could not remember. It's a classic example where, you improve task performance but not learning. Basically what AI has done, it has divorced task performance from learning. In the pre-AI age, learning was always about task performance. You

learn to learn a quadratic equation- solve a quadratic equation, you can do it, and then you have learned something.

Now with AI, that is no longer the case. No. At the same time, there, there was another, experiment where they gave students AI to, research a topic for an essay and, understand, different, viewpoints and angles about it, and then write the essay in a classical way. And then actually in that case, you did get better products. Students did learn actually more. So it was really the use of the tool and the design of the learning environments. Now, AI tools for, collaborative learning, an amazing kind of impact. Now getting students to, learn to collaborate, engage, and there are many examples, but the, the key really is, you need to understand that task performance and learning are no longer the same, and therefore design your AI strategy through learning not task performance.

No. And that also, of course it comes back to Rebecca's point about, achiever mode versus, explorer mode. If you are in achiever mode, you are focused on task performance. You use AI simply to get a better outcome, which is very easy to do, but not necessarily with learning. Second point, you need to learn to think before you learn to prompt. Now, that question of age-appropriateness is really important. Now, if you're not ahead of the AI tools, if you do not understand an algorithm, you're gonna be the slave of that algorithm. That is, I think very clear.

But actually again, most of the users of AI in, in education do not account for that. As if we confronted students with a lot of AI tools that are well above their kind of what we call AI literacy kind of skills. That's why I think that is a really important part. Putting teachers at the heart of the design of those tools. What you can actually systematically see in high-performing systems and systems that do this well, is that teachers are not users of AI tools. They're actually very actively involved in research and design of those kinds of tools. So they have a role in that. And Rebecca cited Estonia, they work with OpenAI. That's their kind of counterpart. But they have actually teachers who tell OpenAI what kind of environments they actually want to see in Estonian classrooms. So I think that's another really important, takeaway. Then, questions around digital safety are, very much on, on everybody's mind by now.

And again, there's a race between what you can do through consumer protection and what you can do through enabling and then you have kind of strategies. And I think those are really major findings. So overall, I must say the digital outlook has put up as many questions as, or as many doubts on the impact of AI technologies than showing really good examples of how to use them. But, it just brings out the different kind of scenarios. What is so interesting for us here at the OECD is that you see really sharp differences in countries' approaches, which really shows us we're not very good at knowledge diffusion on what really good users of AI are. Now, you have some systems that are actually very capable in doing this, and others that, that really struggle or just, focus on the easy consumptive path.

WINTHROP: So we have actually very similar conclusions. Our report and a shout-out to Andreas' colleague 'cause OECD was on our task force was taking a little bit of a different lens. We were looking at students' lives in and out of school, their development in and out of school, not just within the school system. And we were asking are we on the right track with generative AI tools and primary and secondary school students, K12 students, and their learning and development? And our ultimate conclusion was no, we are not on the right track. We were headed in the wrong direction because the potential risks, the current and potential future risks, are outweighing currently the benefits.

And it's not because there are no benefits, like Andreas said. And if I had to boil it down, I would say yes - we did find there's a lot of potential benefits from narrow AI use. The Center for Humane Technology talks about narrow versus wide AI use. So you do not need the entire power of the worldwide web for most of the good uses in education. Teachers do not need all the whole, everything that's digitized in the world to level reading materials to the reading levels of the kids in their classrooms, for example. So when AI is used very narrowly, it can have, a, a lot of potential benefits, both in terms of teachers' ability to do creative things and to meet kids where they're at.

Neurodivergent kids and supporting assistive technology to be more personalized with AI infused is a real area of potential benefit that I think merits a lot of investigation. When it comes to direct student-facing technology, we have to be really careful. And we do see again, some very narrow supports. There's some really good studies that show that a Gemini math tutor it can be incredibly effective. Highly rigorous study helping tutor kids for short periods of time. This isn't they're gonna

learn all their math from an LLM. It's a very narrowly designed math tutor with just good content knowledge in it.

So those are good examples of narrow AI use. The problem was, and the reason we said that the risks overshadow the benefits, is that's not how most kids are interfacing with gen AI. Gen AI colleagues say it's crashed the party. It has showed up. It's maybe the only ed tech that schools didn't have to intentionally procure. It just showed up on every single digital device 'cause it's sophomore. It showed up on kids' phones and social media. And in the US, 85% of students say they use AI to do, help do their work. And some of the things that, that we're really quite worried about are really from wide AI use.

This idea of kids having direct interface and long-form discussions with general purpose large language models, chatbots, or AI companions that are tell, not teach machines, and possibly emotional manipulation machines. We're really worried about s- something I call, I'm now calling cognitive stunting. There's a very broad conversation around cognitive offloading, and there's many other terms used, but the general idea is, AI, like a calculator or other, or, Google Maps offloads a key dimension of human sort of effort, cognitive effort and it all- you know, in theory allows us to free up our time for other things.

I think that's true for a lot of technology. For general purpose chatbots and children, I think kids aren't even developing the skills in the first place to offload. It's more akin to physical stunting for children, which is a problem where you don't get enough nutrients in order to grow physically. And we don't know how many sort of moments of effortful deep learning do young people need to really wire their brain to be able to think independently and critically. And so that, along with the real risks around AI friends and companions that are very sycophantic, agreeing with whatever kids say or feel.

And, it's very difficult to see both for kids' mental health and their development, how that will be helpful. But also, if young people are gonna be socialized to always be agreed with, how are they gonna take feedback from a teacher in the classroom? How are they gonna have a give and take in a group project at school? So we have to worry about the in and outside of school use in terms of the

implications for student learning and development, and that is r- really why we say the risks overshadow the benefits, 'cause they're really of a different nature than the benefits.

HORN: Makes total sense. I want to jump into questions in a moment. One of the things I'm consistently hearing though also in both of your comments is like the false dichotomies, right? So it started Rebecca, before AI, content versus skills. These are not false dichotomies. They're actually important to each other, right? And then it bleeds into sort of Andreas your point about building mental models and representations so that you can use these tools effectively.

And before we even get to I prefer the term cognitive automation, but it's like the same idea, right? That you were talking about Rebecca of I don't even build these knowledge and skills so that I can do the, the things because as we said at the very beginning, the person that does the work does the learning ultimately. And that's I think the fear, right? But also we see the opportunities in narrow uses. A- Andreas, w- last question before we go to the wider Q&A, which is there are a lot of headlines that we see out of China's gone all AI on education, et cetera. Europe different stance, US different stance. Can you level set us on how at that level China versus the US versus the U- versus Europe is approaching AI in educations? Are there big countrywide differences or is there more variability inside the countries? How are you thinking about that?

SCHLEICHER: Yeah, there is variability between countries. Some of these are really clear policy choices. If you look at a system like China, their slogan is, make AI present but not visible. So basically it's not student facing, it's not very much in inter- interaction between students. It's really about learning analytics. They have very powerful tools. They have AI based classroom observation that they offer to teachers. You as a teacher can get actually pretty good readout of the quality of your interactions with the students from which you can learn and become a better teacher. So that's the kind of approach. It's basically a tool to super empower learners, super empower teachers, but it's not very much in interaction directly with the students as a kind of cons- consumptive tool, no?

That's, I think, their approach. I think Korea is actually quite similar with their digital textbooks. They ... The Koreans have gone, one step further in basically, giving students a lot of, ownership over the learning out of the classroom at home. This kind of flipped classroom idea, the Korean digital

textbook, you know. You get your digital homework, you can do it on your mobile phone, it comes back into the system. That's something that I haven't seen in China nor in Europe. In Europe, I don't think you have much strategy. You have basically, individual procurement decisions by schools matter a lot more than the whatever is done through public policy. So I think apart from, regulatory interventions, again, ban on AI or ban on smartphones or ban on social media, those are kind of system level interventions. But when you actually go into school within those constraints, schools are pretty much, on their own. The Estonian case is an exception where you have, a government that is working very closely with the tech sector to design something that works. I think a big difference is also educator capacity. To what extent are educators seeing themselves as delivering instruction or, designing learning environments, no?

And that makes a huge difference in this world whether, teachers are actively, embracing this, using this Or simply just deploying tools on this. So yeah, you do see big differences across countries, but you see also a huge varia-- I think in the Western world, most variation is between, classrooms, between schools whereas system policies are far behind the evolution of technology. And I think that's actually one of the, challenges that I do see that actually we are far behind the curve of what's technologically possible, no? And many teachers would say that. When you ask teachers to what extent they feel, they are ahead of this, they are well prepared, well supported on our teacher survey, large. On the one hand, it was actually positive that teachers often say, I think this is a positive development. I wanna use it." At the same time, teachers also feel that, this is overwhelming, and they are not really feel that well prepared for that, no.

HORN: You unintentionally or intentionally answered a couple of questions also in your answer there that we've gotten from the audience including the impact on teacher education and how they get to know their students better. Let let's jump into it. One of the questions, we got a few actually about this question of AI literacy and how we impart that to students methodically. Ryan Finley is one out of Colorado who asked that. I'm curious how you both think of this. There's a little bit of the sort of keyboarding if you will, of 20, 30 years ago. And but I'd love to hear your thoughts on how do we think about AI literacy in a responsible way. Rebecca, you wanna jump in first and then.

WINTHROP: Sure. I'll frame broadly and pass it to Andreas, who I know has a lot to say on this. So my perspective is that if we're going to make the s- same mistakes we did of the, in the past where we did a lot of tool teaching "This is this tool. This is how to use this tool," that is not the way to go. Be- A, because the tools are moving incredibly quickly, so if you're gonna teach y- a seventh grader or an eighth grader now "This is how to, prompt ChatGPT. These are the different functions of this tool," by the time they get to the workforce, it is gonna look radically different.

Instead what we need to do is really think about how kids understand what AI is, and we ... I know at least aga- again in the US from spending lots of time talking to schools and parents and teachers and districts that kids are hungry for this conversation. I've had talked to fifth grade classrooms. These are 10-year-olds, and I said, are y- you, are you in, are you excited about anything about AI? Are you worried about anything?" And they just come out. They're like, "What job am I gonna have in the future?" What are the ... what about artists? How are artists gonna work? What ... they have concerns.

These are 10-year-olds. So we need to begin h- having conversations. You can ... AI literacy I think should start early, and it does not need screens. What is AI? How does it work? What do we think about it? What are the ethical implications? And then I think progressively as young people get older, and I want to pass to Andreas 'cause I, a, a huge shout-out to the AI Lit framework that, the OECD, EU, and code.org helped with. I think that's the right sort of framework to go through, so which really builds young people's critical thinking competencies around using a new technology but doesn't stop at just consumption. Really focuses on creation and how they can use it to solve the problems they care about. So anyways, Andreas, I'll hand it over to you rather than talking about your framework, which I think is one of the better ones out there.

SCHLEICHER: Yeah. Actually my thoughts are very similar to what you just expressed Rebecca. At for a start, AI literacy in our framework is actually not really about technology. It's very much about human skills. Can you think for yourself? Can live with people who are different from you? Can you make ethical decisions? Can you navigate ambiguity, manage complexity? Those, those kind of human skills is what we regard at the center of AI literacy. And then of course comes the knowledge

of AI. If you do not understand, the functioning of AI, then very likely you're gonna be just, the kind of consumer of those kinds of things.

But really at the center of AI literacy is our capacity to manage ourselves, manage others, and or work with others and, have our thinking process. In fact, I think the interesting part of AI is that it just pushes us to think much harder about what makes us human, no? And to figure out those kinds of skills and support them. And I think where we do succeed we will have, students who become autonomous learners, and who will use AI to augment their capacities. Now, where you do not do that, you'll end up with students who, just, replace their own capacities.

Because the, the one thing that is really troubling in this, maybe the one design flaw that we have as humans is that our brain has been made to save energy. So we will always trade autonomy for convenience. Now, and I think that if we do not have the human skills to support ourselves in, in, in ways, that is, I think something that, I think it's at the heart of AI literacy, at least in the way we have framed it.

HORN: Yeah. And that, that's not a fear-based way of thinking about it, right? That's a, that, that's a how do we take control? It's a tool of ours, not- ... we're not the master of us stance. Elizabeth from The Village School in Arlington, Virginia asks AI exposes a gap that we've never taught students to know themselves perhaps and would love your thoughts a- against that framework both of you.

WINTHROP: I think it's a very profound insight. I think in many ways what we're seeing is a transformational technology layered over a system that needs transforming. And AI has exposed what for many decades many of us in, in the education community have said are the weaknesses of the, of sort of the traditional schooling model that is very task completion oriented and sort of knowledge acquisition. But knowledge acquisition, repetition, and then you can forget it and it doesn't matter later on 'cause you don't have to use the knowledge for anything. And it has exposed this idea that what we need education to do is not just knowledge acquisition. I do really worry that we're gonna throw the baby out with the bathwater and not have kids learn content, which is so highly correlated with critical thinking and creative thinking.

You need to think critically about something. But we need to make sure young people are using that knowledge to try to solve problems in their school, in their neighborhoods, in their life, use it in some way. And a piece of that is young people trying to figure out what problems they wanna solve. What matters to them? What is their voice? And so I think this question gets to that, and we need to do that a lot more. In many ways we're gonna need to raise the kids and explorers who ask really good questions, not just achievers who know how to find the right answer. Andreas.

SCHLEICHER: No, very much the point. I think in the industrial age, our education system's divorced learning from assessment. And I think that is still very much what haunts us now. If you go back far enough in history, we all learned through apprenticeship. We always learned from and with people through interaction. Learning and, assessment were always two sides of the same coin. When we separated it, we created exactly what Rebecca describes, we ask students to accumulate knowledge over 10, 12 years, and then one day we call them back and say, "Tell me everything that you have learned," in a very contrived, constrained setting, and we call that an exam.

And that has created, what makes us now redundant in this world of AI. Now, that is ... It's something that, you know, in, in a way I think it's a positive thing that AI, pushes us to rethink that model, to bring us back to, what is, human agency? What is learning, and how can we foster those kinds of human capabilities? And I think if we do AI is gonna be an amazing kind of tool that will super empower in almost anything that, that we can do. If we don't, I think again, our current systems have come to their limits, and in a way, AI does the wonderful job of exposing those limits now.

HORN: I think that's exactly right. And Rebecca's probably knew at some point I would say this, that to me, the question is rarely the tech. It's do we have the right model of learning itself that prioritizes mastery and coherence and application and frankly, reflection opportunities to build agency and metacognition and a sense of what your own purpose will be when, as, as we develop. And we aren't ... most systems are not like that, so layered on top of it, it sort of exacerbates the current tendencies and resources and processes of the existing system. It ties directly, I think, into a question we got in a variety of forms around cheating in the age of AI. You certainly both mentioned it.

I would love both of your takes. I'll give my quick plug, which I actually think cheating ... I'll provocatively say I think cheating is this is the solution, not the problem at the moment. And it reveals that the challenges with the zero sum education system as opposed to one in which your teachers are actually trying to help you master these crafts much more like the apprenticeship system, Andreas, that you said, where it's in my interest to make sure every one of my apprentices, if you will, is in fact reaching master status, not to judge them, and therefore it's in their interest to do, actually do the work of learning and not skirt it, because in that sense they're cheating themselves. Whereas Rebecca, as you've written, in achievement mode right now, that's actually ... you get credit for that, if you will, in the current system. So I ... But I'd love to hear both your reflections, because you probably have something more profound than that.

WINTHROP: No I, excuse me. I totally agree. I think I would say three things about the idea, which is a big conversation in education publicly around cheating and AI and kids learning. One, I do not think that we should put the burden of responsible AI use on students' shoulders. I think that we should have responsible products. That's what I think. I think we should have technology that is guard railed so that it ... kids access it in ways that are helpful. It is a big burden to say, "Here's all this crazy technology. Some of it may hurt you, some of it may cognitively stunt you, some of it may unleash your learning capacity. You, student, are the one who has to sort out how to do it and by the way, you're a bad student and a bad person if you don't sort it out right." So I actually want to abolish this idea of responsible AI use.

So that's number one. Number two, I think that if ... W- we talked, our the task force and my co-authors and I talked about pedagogy that is AI aware, AI assisted, and AI resistant. That is the move we need to go to. And when we say AI aware, it means do not, if you're an educator, assign an assignment that can be hacked by AI. AI assisted is figure out where AI can be incredibly helpful. I think feedback, real-time feedback, the calligraphy example is a great example. I hear from teachers all over the place that, real-time feedback I- is really helping their kids learn. Often it's teacher-led. And AI resistant is we do need at this moment in time young people to be spending face-to-face, eye-to-eyeball, shoulder-to-shoulder, in-person time with other people because that friction of human interaction is how you learn, grow, develop social competence that leads to cognitive development.

And in a world awash of technology, schools have a role to play to protect that a- and make it a good space. So that would be my second thing. And the third thing I would say is that the dialogue around cheating has transformed teachers into policemen or policewomen, and this is not what teachers want. And we did see in our report a huge problem with the fraying of student-teacher trust and relationships. In the US, half the teachers say they don't trust that their students' work is actually their work. And half of teach- and half of students say they don't trust that their teachers are actually preparing their lessons and grading them and teaching them. And so I think the entire conversation around cheating and banning and catching and AI plagiarism checkers is the wrong direction altogether.

SCHLEICHER: Yeah. I very much agree. If students write their work with ChatGPT and teachers assess the work with ChatGPT, we haven't ga-gained very much. And I think there's a sort of several dimensions here. First of all, where learning is largely transactional and not relational, you're gonna result in cheating. I think that is basically an outcome. If all the emphasis on, you produce these results, of course everyone will t-take the shortest route to those results, and that shortest route is cheating.

It's, by the way, not a new invention. If you want to actually learn some-something about cheating, you can go to the universe- to the museum of exams in Nanjing, which was the ancient capital of China, where they invented exams. And, thousand years ago you had the same kind of phenomenon with different technologies. People didn't understand why they were doing this. They were asked to produce all of that, and what did they do? They cheated the system. And I think that's something I think we have to just take away from this. Cheating is a symptom of poor education. It's not, the cause of that. The ... and related to this is simply, we just need to find ways to make the learning process in itself interesting.

Now, why do I want to do this? Where you focus on the what, you get compliance. People will produce what you ask them to produce. Where you engage people in the why, you're gonna get that ownership in the learning process, that sense of growth, that sense of, even failure is an opportunity for growth. And I think that's really important in the learning environments. And where you do that, you do not see cheating. There are certain learning environments where cheating is not an issue, not

because we control for it, but because the students have an inherent interest actually for, of personal growth in there.

And I think once again, AI exposes a weakness in education, that focus on answers rather than that process of iterating to better questions. And I think ... And where we, design our learning environments purposefully I think we do- this, this problem will not recur and occur. And then I think AI, I must say, and of course I work a lot, on, on the assessment front, and I am, we're doing a lot of open book exams, where we actually ask students or give students whatever tools they like to use to find, problems. And then our task is to design assessment tasks that are actually conducive to that. I'm still also in favor of, closed book exams. I do think there are certain things that you want students to learn and not to use shortcuts, absolutely. But I think this is what we're asked to do in a, in, in this century, to design learning environments where AI, is a friend and not something that we have to constantly, see as a, as a source of cheating

HORN: Yep. All right, 30 seconds each for both of you as we wrap up here. Some of the questions are asking for a little hope on the horizon. I actually think we've given it because Andreas, you've repeatedly said it exposes where, you know, the challenges with the existing and the breaking points, and that a- forces us to ask bigger questions. Maybe assessments specifically on AI, opportunities where it actually could help us leapfrog where we've been to look at this more relational deep mastery as opposed to transactional, I memorized it for the thing, and then I'm done with it. I- I'd love to hear both of your quick reflections as we wrap up here. Andreas, why don't you go first, and then Rebecca, bring us home.

SCHLEICHER: I think the, the she- short point is that AI is not a magic power. It's an amazing accelerator and an incredible amplifier. It's gonna am- amplify and accelerate good pedagogical practice in the same way it can amplify, poor ideas and bad practice. And I think that, in the end, makes the role of educators even more important than it used to be,

WINTHROP: where I'm hopeful is thinking about a direction that s- sees a lot of small, narrow language models, or a lot of small, narrow deployments. Your Speak & Spell example is a great example. I think this is the future. Little, small models that are very tailored, very designed by

educators and students together to make learning better and make learning experiences more exciting and more engaging. I can't wait for the day when things like virtual reality headsets costs come down, and AI is, seamlessly infused. And you can learn chemistry, and you can manipulate an, a molecule for 10 minutes in your chemistry class and really bring learning to life in ways that it's never been able to do before. I think that has huge potential and is really exciting for the future of learning for kids.

HORN: Narrowly defined, though, once again, clear purpose pedagogical practice. Rebecca, Andreas, huge thanks for shepherding us through this incredibly consequential conversation. And for all of you incredibly active sets of questions and curiosity, really appreciate it, and it's been a pleasure hosting this webinar with Brookings. Thank you so much.