

Technically Optimistic

An Emerson Collective Podcast

Can we use AI as a tool that enriches learning, rather than replacing it? We're seeing AI rapidly revolutionize the classroom and it's poised to completely transform both education and learning itself. But, how can we also ensure that everyone has access to the basics of tech and AI literacy so that we can all, every one of us, reap the benefits of AI and understand its nuances?

RAFFI VO:

I'm Raffi Krikorian, and this is Technically Optimistic. It's Episode 4 of our miniseries on artificial intelligence.

MUSIC...

ChatGPT from OpenAI is a tool, based on a large language model, that can respond to a text prompt with an answer. Type in a prompt like "Summarize the plot of William Shakespeare's *Hamlet*"... or "Write a lesson plan introducing the concept of slope for middle school math students"... and ChatGPT can spit out a readable, coherent response.

And from basically the moment it arrived on the scene, it has been seen both as a powerful tool for teachers and students...

CLIP:

SPEAKER: I created this morning, in fact, a lesson plan for eighth grade math students to learn about slope. I was very surprised that it gave me very detailed information."

SPEAKER: I think teachers should embrace the fact that technology is always going to change, and I think embracing artificial intelligence in the classroom is going to give everybody an advantage

RAFFI VO:

... and as a potential threat to traditional education.

CLIP:

SPEAKER: It's concerning if I don't know exactly if someone is coming up with original content or not.

SPEAKER: I feel like the robots are turning us into robots.

SPEAKER: So I think it opens the door for a lot of possibilities, but we don't know if

those possibilities are going to be good or bad.

RAFFI VO:

In this episode we're going to look at how AI is poised to transform education.

We're gonna hear from some of the people behind the scenes who are building the most innovative AI teaching tools. And we'll consider exactly... what an AI-centric education might look like.

How does this technology impact students? Is AI a new way to learn, or is it simply a new way to skirt the rules?

And... we'll look at how AI itself is being taught...

If AI is going to shape the future of society... We don't want this knowledge to be confined to the ivory tower... or only to engineers.

If AI is really going to be as big of a deal for humans as, say, like fire was... then it seems really important that we teach people about AI... like we teach kids fire safety.

Can AI be a tool that enriches learning, rather than replaces it? What is the role of teachers in an AI-enhanced classroom? And is there a way to teach, use, and learn from AI that is both effective and ethical?

The future is unclear... but we are technically optimistic.

MUSIC...

RAFFI VO:

Let's start with how we're teaching people about AI, and why that's important.

Pat Yongpadit is the director of education at Code dot org, a nonprofit dedicated to expanding access to computer science in schools.

Pat Yongpradit:

Code.org is a non-profit organization that promotes computer science education. Our mission is that every student in every school should have the opportunity to learn computer science and we do that with a focus on underrepresented groups. We also create curriculum K through 12 or primary and secondary which is absolutely free. And by curriculum, I mean the lesson plans, the teacher and student resources, the coding environment, and even the learning management platform. But then there's our teacher training work, and we have hundreds of partners, both in the US and internationally, that do this work. And just in the US, over the last 10 years, we've provided in-person professional development for over 130,000 teachers. And, lastly, we do a lot of policy and government affairs work. And so that means influencing the influencers, building

the capacity of state and national education agency staff. promoting policies, it means even lobbying for bills to pass to support computer science.

RAFFI:

How did you end up at code.org? Like what were you doing and why was code.org that place you wanted to go to?

Pat Yongpradit:

Yeah. So I've done basically two things in my life. I taught for 13 years, middle school and high school, and I've been at Code.org for 10 years, since the beginning. And so I started my career as a special education assistant, teacher assistant, and then became a middle school science teacher, and then became a high school computer science teacher. And during the time of teaching computer science, I really obviously developed a passion for computer science education and the mission of most of us in the computer science education space at that time, which was to broaden participation in computer science. And, you know, code.org now has over 85 million student accounts and 2.5 million teacher accounts. And we're in... almost every country in the world, including countries that you would never expect having lots of interest in computer science.

Code.org is called code.org. So you might think that we're just about coding or programming or software engineering, but actually we're about computer science as a whole. And so that computer science includes things like cybersecurity, data science, and obviously AI. We have a whole five-week unit in a middle school course that we have that's all about AI. So that's like middle school kids learning about AI, the ethics of AI and even how to create AI apps. It's absolutely amazing with real data sets. You know there's this particular project where kids train an AI model to differentiate between fruits and vegetables. There's an AI app that a kid created that helps identify whether what someone's wearing violates a dress code or not. Some really cool things that kids are creating.

MUSIC...

RAFFI VO:

Code dot org recently launched TeachAI, which aims to integrate AI education into primary and secondary schools worldwide.

RAFFI:

What was the impetus for creating TeachAI, and what are you hoping people get out of it, both in the big picture and for individual students?

Pat Yongpradit:

Yeah, so Teach AI is a partnership between Code.org, ETS, which is Educational Testing Services. They're the largest assessment company in the world, a non-profit. And we all believe that governments and education leaders should be given guidance around how to modernize their education systems in particularly two areas: teaching with AI and teaching about AI. Where

teaching with AI cuts across any subject and it's just about AI use in the classroom for whatever subject as well as AI use for like school leadership and school management and other things. And then teaching about AI, which really comes down to AI literacy, but also AI competency, where AI literacy is more general for anyone, just knowing what it's about. And then AI competency, which is more technical and talks through the knowledge and skills that someone needs to have to be AI competent. Not necessarily the next data engineer or AI engineer, but just a little more competent than the general person.

CLIP:

INTERVIEWER: ... Hadi, how much already is AI teaching kids, instead of teachers?

RAFFI VO:

Here's Hadi Partovi, the co-founder of code.org...

CLIP:

PARTOVI: I don't know about AI teaching kids instead of teachers. But what every parent, every school, student and teacher recognizes that since the moment that ChatGPT and these chatbots came out, kids are wondering, 'can I use this for homework?' Teachers are wondering: 'how do I need to adjust my classroom? Now that this technology is out there?' And, you know, one of the best questions, when I show this to my kids... (fades out)

RAFFI:

How much do you bump into people having adverse fear about AI, especially if you're doing this work?

Pat Yongpradit:

Um, you know what's interesting? I... I have not encountered... many detractors to AI in education.

RAFFI:

Fascinating.

Pat Yongpradit:

The most negative along a spectrum are arguments around just, hey, let's just slow down, let's consider this thoroughly, the risks and opportunities, we need regulation. You know, we got to make sure that AI doesn't replace teachers, like concerns like that. But all those people aren't about like doing nothing and banning it or anything. So that's what I encountered the most. And I totally understand their concerns. The funny thing is that teachers who use ai to to save them time and to decrease their burden can actually become be more human in their teaching right? Of all the teachers can use these days that go beyond, you know, the projector, the smart board, or other gadgets that have been thrown on them, AI has the most potential for saving them time and energy and allowing them to do the most fun and most human aspects of teaching, just

encouraging kids, building real relationships with them, things that AI will never be able to do. So even in that camp, I feel like AI can help those people as well.

MUSIC...

RAFFI VO:

Teemu Roos is a professor at the University of Helsinki in Finland.

Teemu Roos:

I'd been teaching, of course, as all professors do, teaching AI and machine learning courses for quite some time. And then there became this idea which kind of came from the government of Finland to some extent, or to quite a large extent.

RAFFI VO:

He led a bold experiment in teaching the Finnish people about AI.

Teemu Roos:

The Finnish government was in a way an early adopter, you could say, of AI.

CLIP:

VOICE: Artificial intelligence is like electricity: it will shape our world in ways we cannot imagine. Its masters will control how we live. AI is power. In Finland we believe it belongs to everyone.

RAFFI VO:

Teemu led the development of Elements of AI, an online course on the basics of artificial intelligence. It launched in 2018, and it's free and available across the globe.

CLIP:

VOICE: "And it's taken our country by storm..."

Teemu Roos:

What I have to say upfront is that I didn't really have the thinking tools to approach such a project that is aimed to build AI literacy among the general public, be accessible and become massively popular with over 1 million users.

RAFFI:

Mm-hmm.

Teemu Roos:

I didn't have a systematic mindset how to go about with that. It was kind of just like based on my experience on teaching the CS students. And what was great about the project when we were building the course is that the team... We had such complementary talent in the team. So the they really brought to the table their own expertise. So let's say there was a time, I remember

having this discussion, probably like multiple meetings on how the layout of the page should be designed. And I mean, the course has no video in it, so it's all about the text and the interactive elements and these illustrations, the visuals. We debated a lot about what should the look and feel be? And me coming from an academic background, I think like, now that I think back to it, I was thinking more of it as a book, as a bookish style. There's a lot of relatively dense text, longer paragraphs compared to what they ended up being. What I said at some point is that I don't wanna be scrolling back and forth, like all the time. I'd like to have more text on the screen so that I can read it and maybe reread it and you know, skim back and forth without having to scroll the page. And then there were some people who were actually, professional web designers, graphical designers, interaction designers. And then they explained to me very kindly and respectfully that they know how people read text online. And that was one example how I think the trust in the team and our kind of alignment. So we had sort of this long stage in the beginning to build the concept and think about what is the target audience and so on. That we were so much aligned in all those things that it was kind of easy to trust one another in these kind of difficult decisions.

RAFFI:

I wonder if there's an analogy here. I mean, one of the things that I've been talking to people about is the reason we need to educate more people about AI is to help have diversity of input when designing these systems. And I wonder, I mean, you just basically described having a diverse team allowed you to create a better class. And I wonder if there's an analogy here.

Teemu Roos:

No, I think that there is, and I like that. I had thought about it that way, but definitely I see the analogy there, that there were people with complementary expertise or experience, ways of looking at things, ways of seeing different perspectives, and I think that definitely enriched the project in a way that I wish. was the case in many other projects,

RAFFI:

Hmm.

Teemu Roos:

The way it's designed, first of all- We didn't have a particular type of person in mind when we designed it. It's kind of weird the way we built the concept so that we targeted the audience defined by everybody but computer science students. Or everybody who is perhaps not yet, who hasn't yet realized that AI is important and that they should form an opinion about it. One thing that we get critical feedback about, which I knew was a kind of a calculated risk, is the fact that we challenge the user from the very beginning to be... to be kind of a critical thinker. Let's say there's an exercise in the very first chapter where we put forth a couple of potential or proposed definitions of AI. Like one of them being cool things that cannot be done by a computer. That's a kind of a tongue in cheek definition about AI. And then we ask the user to criticize those definitions that are given there. And to formalize their own definition that improves over the ones that are given there. And a lot of users, they feel uneasy about in the very first chapter, trying to improve on something that others who have definitely., compared to most of

our users, thought about AI much more and who are considered perhaps experts. We want them to become those critical thinkers again, who form their own opinion, form their own idea about AI. So again, your analogy, I think it works here. in the sense that I don't want to be the kind of oracle that comes from the high, you know, professor academic, you know, background and lectures to them. "This is AI and this is what you should think about it." But we'd rather want to say, okay, this is what we know about AI. These are some of the sort of fundamental facts and underlying things. And now from your own perspective, look at it and form an opinion. from your own, combining your own expertise. Like let's say there's an artist, there's a teacher, there's a medical doctor, there's a journalist, and they're experts in their own field. And now if they can have the basics of AI, they can form a very interesting perspective, I'm sure, into the topic and its societal impact.

RAFFI:

This idea of teaching people to see AI through their own lens sort of like opens up different perspectives there. So I'm curious, do you think that framing has worked?

Teemu Roos:

I do certainly hope so. And I would think it works well with the European Union's approach to regulating AI and ethical AI in general, where AI is not a thing that is different from everything else, that is completely new, that cannot be dealt with within the existing frameworks. So in the European Union forthcoming and existing AI regulation and obviously Finland being a member of the EU, our own national legislation as well, AI is thought... of being always in some context

RAFFI:

Mm-hmm.

Teemu Roos:

And being a kind of a part of a long continuum of automation and digitalization. And I think that's a very helpful thing to keep in mind. Just thinking about the ethical considerations, even if you're not going all the way to the regulatory nitty-gritty. So if you just think of the broad issues, it's easier to do that if you think about a context. So let's say we think about a context of schools or education. Since we're talking about the education, just a big one. The use of AI in student admission, in evaluation at schools or other whatever other applications there are. It's easier to think about that. It's much more manageable to think it about it because you can think about what you know about education in schools, what are the issues that you should keep in mind when you ensure that school admissions are not... discriminating against anyone or that evaluation in schools is directed at the things that you'd like to improve. People can think about those things and they can have a pretty self-confident... feeling, approaching the problems from the context specific kind of framing, rather than being told, okay, here is AI, here is like some pretty hard to understand algorithms, and then, you know, ask them how to think about it. You can grab something, it's more tangible if it's thought about in context. And

RAFFI:

Mm-hmm.

Teemu Roos:

That is the way the course also likes to portray AI. Always sort of material in a given context and then thinking about how that should come up in our ethical considerations.

RAFFI VO:

But is this just Finland? Could something like this work in the United States?

I definitely feel that Finland is kind of in a good position to be a leader in the way we indeed approach AI as a really multifaceted phenomenon that has... not only the technological, but also societal, political and other ways to look at it. And that we should be able to get to know one another's thoughts and perspectives and then have the trust to again make decisions where... where we'd really listen and appreciate other people's perspectives. And this is something that I've only realized recently is a thing where the Finnish culture, the Finnish society, makes it very natural to think about that kind of a way to deal with things. Somebody said that Finland is not a country, it's a club.

RAFFI:

Hehehehehehe

Teemu Roos:

So we're so few that we kind of know each other. We're members in the same club. So if there's a, let's say there's a, you know, there's somebody with some technological expertise or there's some people with some politics expertise, it's not difficult to get hold of that person and have a chat with them over a cup of coffee, no matter who it is basically in this country. So that makes it feasible that you could build the type of trust that is really an asset when you're facing with different perspectives and you're kind of shining light to something from various directions. And some people see it better from one perspective and some from another.. Once again, I kind of go back to the issue of trust. That is really hard to benefit from those various perspectives. If you don't have the type of trust where you can say, okay, now you know about that perspective and that point of view better than I do, so I'll just like, I'll trust that will go with your decision. So again, your analogy about how we created the course works beautifully here.

RAFFI VO:

What will it take for every kid in the Us to become AI literate? According to Pat Yongpradit, the most important thing is... political will.

Pat Yongpradit:

So I do a lot of my work globally these days, and I was just in the UAE. In the UAE, they've been teaching computer science. They made it mandatory in 2015 for both, for two grades, ninth and 10th grade. And then they made it mandatory for all kids in 2019, like every single grade, learning computer science.

RAFFI:

That's amazing.

Pat Yongpradit:

Thailand did the same thing in 2017 actually. And there are a bunch of other countries that have done this too. The US, when you say the US, you're talking about 50 different departments of education. Not only that, you're talking about thousands and thousands of districts. And so what will it take? In the end it will take 50 different departments of education requiring computer science as a graduation requirement. So right now I think they're like just a handful of states, like five to seven states that require computer science as a graduation requirement. Um, and Code.org is actively working to promote that idea at a policy level.

RAFFI:

How do we challenge and inspire the country to pull this off?

Pat Yongpradit:

It's a lot of hustle. And when I say hustle, I mean like hard work and follow-up, honestly. It's not rocket science. It's just a mix of government affairs. It's a mix of working with teachers. It's a mix of building awareness. It's a mix of providing engaging resources, changing people's minds, et cetera. That's what code.org is doing. That's why we do so many different things because it requires a full vertical of action.

RAFFI:

As you talk about introducing computer science, do you minors use their education, think of it as a trade-off? Like if we're going to do computer science, we have to not do something else, or do they always think about this as additive?

Pat Yongpradit:

Uh, most of them will think about it in the first sense.

RAFFI:

Interesting.

Pat Yongpradit:

I mean, anyone who understands, like, the packed nature of school will immediately think, okay, so if we're adding this, what do we have to take away? Now, interestingly, many, many, many countries already have subjects that just need, uh, just need updating. Like they have like what we call ICT, information communication technologies, which is a vestige of like the first computing and typing courses. So they've evolved over time to like how to use the internet and things like that, but they haven't evolved to like including like actual creation of technologies versus use of technologies. And so there's already a place in the school schedule that can be filled with computer science. And then for other folks, they figure out a way. When, you know, like you and me as adults, we always say, oh, I don't have time for this, I don't have time for that.

No, you totally do have time. You're just making decisions with your time, right? So you just have to make different decisions and you can make the space. And if you think it's important enough, you make it happen.

RAFFI VO:

So that's how we're teaching people about AI.

But what about using AI in the classroom?

That's coming up, after a short break.

MUSIC...

RAFFI VO:

Welcome back to Technically Optimistic, I'm Raffi Krikorian, and we're talking all about AI and education.

Sneha Revanur is the founder of Encode Justice, an organization she started when she was just 16. ...

Sneha Revanur:

I had a lot of early exposure to the world of computer science, and began to learn about artificial intelligence when I was in middle school, dabbling in my own personal projects...

RAFFI VO:

Politico calls her "the Greta Thunberg of AI"... She's just finished her freshman year at Williams College.

Sneha Revanur:

Technology is not as neutral or objective as I might have grown up perceiving it to be, and in many cases it reinforces the worst of human society because machine learning models and artificial intelligence as we know it... It's almost like a baby absorbing what it learns from the society around it. And we can't expect that it's going to somehow break free from historical patterns of injustice or from historical patterns of wrongdoing.

RAFFI:

Sneha, how do you define your generation's relationship to AI? And how do you see that relationship evolving?

Yeah that's a great question. So I think that we were the generation that was raised by AI, and we are also the next generation of advocates, of developers, regulators, consumers, voters. We really are the people who are going to inherit the impacts of AI today, and we are living those

impacts tomorrow. And so I think it's critical that we have a seat at the table to demand effective regulation, to ensure that we're setting AI back on the right course, and to ensure that we are unlocking all of the powerful and positive potential of AI while mitigating the harms. So I think that it's really important that we have that role in particular because not only do we have lived experience, having grown up, experiencing algorithms that have nudged our peers towards suicidal ideation that have created a crisis of youth online radicalization that we're seeing surveillance cameras encircling school campuses and sending youth to... dean's offices for disciplinary infractions using facial recognition, misidentification. That there really are a range of ways in which our generation in particular is being impacted. And that's why it's so important to me that we have a seat at the table and are creating a brighter future for our own, for our peers and ourselves.

RAFFI:

Where do you draw the line personally, if you don't mind me asking, like, are you using the Genitive AI tools yourself? Are your friend groups using them? Like, how do you then reconcile, like using these tools yourself as part of a daily workflow and sort of like these broader things going on?

Sneha Revanur:

Yeah, so I myself have obviously used ChatGPT and have used similar generative AI technologies. I think that it's pretty widespread among my peers as well. I don't know of a friend of mine who hasn't at some point used ChatPBT. So I think it definitely is pretty pervasive and it's something that, you know, my generation is interfacing with quite a bit. And, you know, as for how I reconcile that with my personal views on regulation and on sort of improving this conversation around innovation, I think that there definitely are some, again, positive impacts from these technologies. For example, people have talked about how generative AI can help us unleash productivity, can really help us access information. And I think there are so many ways in which generative AI could be useful in that regard. But at the same time, I think that we're seeing that GPT-5 could be even more advanced than GPT-4 is. And I think as these large language models progress over time, my worry is that the impacts could sort of grow less sort of innocuous and positive and could potentially become more dangerous to society and humanity as a whole. So I think that we're at a point right now where generative AI doesn't currently have the capacity to be particularly nefarious. But I do think that, you know, as large language models and their sophistication those harms will continue to abound. So I think that generative AI in its current state oftentimes can be used in positive ways, but I think that over time, those impacts are going to potentially tilt towards harm and that's what concerns me.

RAFFI:

What do you tell your generation if they want to get involved or they're curious about getting involved? Like what's, what's the activating line? Like what's the thing you tell them to go do?

Sneha Revanur:

Well, the activating line is to join EncodeJustice, of course, get involved in our chapter program and, you know, start to directly make an impact in their communities. You know, for example, we

have chapters organizing workshops on high school campuses. So that's one example of a way in which, you know, we're actually making an impact on the ground. Maybe you can sort of explore ways to learn more about computer science. And if you are in a computer science class, you make sure that you're talking to your teacher about ensuring that, you know, there are discussions of ethics in the classroom and that that is integrated and embedded into the coursework.

RAFFI:

I mean, you're surrounded by other students at university who are, some of them

Sneha Revanur:

Yeah.

RAFFI:

are probably studying computer science. Like some of them are probably looking to go build some of these systems.

Sneha Revanur:

Yep.

RAFFI:

What do you see potentially going wrong or going right with what just your peer group is up to?

Sneha Revanur:

Yeah, so I think that what I see could be going wrong and could be going right. And what I think I have sort of noticed within this world of computer science, as I've known it over the past decade or so, is that for some reason, people seem to view ethical or social considerations as entirely removed from the process of development. That seems to be almost an afterthought or some sort of extraneous subject, as opposed to something that should be baked into development from the first step. And so I think that's one thing that's been concerning to me because, you know, oftentimes I've seen AI for social good hackathons, or I've seen these discussions of, you know, building tech products for social good. But I feel like that almost is treated as something that isn't already naturally part of what AI should be and can be. And so I think that's one thing that I found concerning. And that's a mindset that I see among my peers as well, although I definitely think that it has been improving with my generation. I think that mindset of you know trying to Deploy technology as a solution for every problem. And all of these unique challenges that we're facing across healthcare and criminal justice and employment and so much more, I think really fails us. And it's the reason why we keep getting it wrong.

MUSIC...

RAFFI VO:

Tom Mitchell is the founder and former chair of the Machine Learning department at Carnegie Mellon University in Pittsburgh Pennsylvania. Among several other titles, he's the past president of the Association for the Advancement of Artificial Intelligence, or the Triple AI.

Tom Mitchell:

My experience is that there are two groups of people.

RAFFI VO:

He's done extensive research on the impact of AI on society. And as a lifelong teacher, he has a lot to say about education.

Tom Mitchell:

There's a relatively huge group of teachers who point out that they don't necessarily want computers in their classroom and then there's a small group of teachers who embrace this idea as something that could be very helpful. In a way, I kind of feel like both teachers are right in the sense that we're not going to replace teachers by computers in teaching our six-year-old kids because so much of education really has to do with motivation and coaching and hugging when they're six years old and just being a human. A big factor in people learning is motivation and incentives and feedback from other people. So teachers are not going to go away. But I'm very, very optimistic that not only that AI will make a difference, but that this is the decade where we're going to see a huge impact of AI in education. They will have a room full of 24 kids and they will also have 24 teaching assistants that will be computer teaching assistants, one per kid. And, during the day in class there will be things for that teaching assistant to do to help out but maybe most importantly when the kid goes home to do their homework that teaching assistant will be with them. And I think this is the way that the technology is actually going to make its way into the educational system given the resistance of most of many teachers to having computers in the classroom. And so I think the way it will evolve is that we'll see more and more teachers, already there are many, who use these educational websites like Khan Academy, CK12, that offer materials the kids can access at home. But once the AI technology gets a little bit further, we will notice, oh, we don't have to have homework assignments like the kind you and I had, where here are the 10 problems. You take them home and you do your best. Instead, after we answer the first question, if you get it right, you'll get a different question than I get, because I got the first question wrong. And furthermore, before I get the second question, I'm going to have a little chat with my AI coach about remediating what I got wrong. And then that'll branch into a different trajectory for the homework assignment than the one you're getting because you're getting these one's right, these one's wrong, I'm getting those wrong and these right. We can really literally customize the homework to each kid, then the floodgates I think will open. I think one of the interesting questions is will that agent, the teaching assistant that accompanies you, will that be the same agent as the one we were talking about before that helps you balance your checkbook and manage your chronic diseases and so forth? Probably yes, because one of the things we know from education is that people are more motivated to learn if you can contextualize the problem. And so, if I'm learning and it's balancing my checkbook, and it can use my checkbook as an example of a problem for learning my mathematics, it can use my health care problems for motivating. examples to help me learn more about biology. And so I

think whether they're one agent or two and whether it even matters, whether that's even a meaningful distinction, kind of remains to be seen.

MUSIC...

RAFFI VO:

A lot of times, when I talk to people about this... they seem to bring up this one analogy: the calculator.

Tom Mitchell:

The instant reaction for many schools was, oh, we can't allow our students access to this because it will let them cheat. But that was kind of like when calculators appeared. And there was a little kerfuffle. But after a decade of that, we all realized calculators are good. We should teach people to use them, not keep them away.

RAFFI VO:

It's something that James Manyika, Google's Senior Vice President of Research, Technology & Society, mentioned also.

James Manyika:

I think the history of what has happened when powerfully assistive tools come in reminds me of how we used to think you know it's not too long ago I'm old enough to have experienced this when you know teachers thought oh it's amazingly terrible that we now have kids of calculators. Are they going to be able to do math? And remember there was a time when people used to think unless you can do the math in your head you're not very smart, right? At least we got past that, right?

RAFFI VO:

Now when the calculator was first brought into schools as a teaching tool, there were protests and people were angry. There's a Washington Post article from April 4th 1986 with the headline: Math Teachers Stage a Calculated Protest. We learn about a group that was protesting a policy recommending the integration of the calculator into the school math program at all grade levels. They even held up signs that read "Premature Calculator Usage May Be Harmful to Your Child's Education." One retired math teacher said, quote, "We've got to make the use of a calculator in elementary school a no no."

But is the use of the calculator in the classroom actually a good analogy to AI in the classroom? If what you're learning is basic arithmetic... then the calculator is simply a machine that gives you the answers. Say, if a question on your math test reads "What's 200 divided by 4?"... clearly using the calculator is something a student would do *instead* of learning how to divide. But if the language capabilities of classroom AI offer something different – a chance to learn through conversation – that could mean students are processing information, not just receiving answers.

And though it's tempting to see something like ChatGPT as a kind of calculator for information... it doesn't always work like that.

MUSIC...

RAFFI VO:

Sal Khan, founder of the non-profit educational platform Khan Academy, is really enthusiastic about the potential of that kind of learning in the classroom.

Sal Khan:

Well, for a very long time, even arguably before Khan Academy, I've always been fascinated by the idea of using technology to emulate what a tutor would do.

RAFFI VO:

Sal posted his first tutoring lessons to YouTube in 2006. Since then, millions of viewers have used Khan Academy's free online resources to learn at their own pace.

CLIP:

VOICE: *Sign of theta would be opposite over hypotenuse... (fades out)*

RAFFI VO:

Now, he sees the potential to support both teachers and students with a new tool called Khanmigo, an AI-powered learning guide.

CLIP:

VOICE: *I want to introduce you to Khanmigo. Khanmigo is an empathetic tutor that can help your students along their learning journey. It can prompt them to ask questions. It can answer and help them through steps in problem solving, and lead them to their own aha moments!*

VOICE: *It's been a while since I've taught Romeo and Juliet, so Khanmigo can you please help me come up with a creative lesson hook for act three of Romeo and Juliet for my 9th grade English class? Of course you can! So who better to help them than Mr William Shakespeare himself. That was super helpful. In just a few minutes Khanmigo – my new teaching assistant – just saved me hours of planning time by helping me create quality lesson plans for my students. An Khanmigo isn't just for English... (fades out)*

RAFFI:

Sal, when did it click for you that AI could really change the way we think about education?

Sal Khan:

I think for me, the moment honestly was when I had that first demo with Greg Brockman and Sam Altman in July of 2022, where... they put a biology question from Khan Academy up. And then we asked that first run GPT-4 at that time was obviously it hadn't been public yet. And it was even for Greg and Sam, they were discovering that I think they had just finished training. It had been a day or two since they had finished training it and asked what the right answer was and it answered. And they asked me, 'Sal, is that the right answer?' I'm like, yeah, I think that's

the right answer. And then we asked it to explain why it was the answer, et cetera. That's when I started to get the chills. And it was really over that weekend when they gave myself and the chief learning officer at Khan Academy access. And they showed us how to do system prompting where you can really make the AI act in conversation as opposed to just being a call and response type of thing and drive a conversation and do it in very subtle and thoughtful ways. And I'm like, okay, this is. This, we're here. I think all folks like to learn through conversation. Just think about how much time all of us tried to stay awake while we sat in a lecture hall and didn't find it pleasant. But then if you're in a study group with friends, or you just ask a friend how to approach this, both parties enjoy that. They enjoy a conversation about the actual topic. And so when it was clear that the idea of being able to have a real conversation with something that I think in certain ways passes the Turing test as a tutor. Yeah, it would make it dramatically more engaging for students. I think about my own children where it's different for them when they're using Khan Academy by themselves versus when they're using it either with peers or when they're using it with say, myself, or a teacher supporting them. When there's peers or an adult supporting them, they're able to get unblocked in certain ways. They're able to answer their questions. They're able to get some motivation. and just the idea that artificial intelligence could be used to do a lot of that in a very scalable, accessible way, yeah, this is the Holy Grail.

So our True North, and as I said, this was even before Khanmigo, this is our True North as Khan Academy is can we provide world-class, personalized, mastery-based education to every student out there? We were already doing that pre-Khanmigo, now with GPT-4 powered Khanmigo, we can go a lot further.

CLIP:

VOICE: I got access to Khan Academy's Khanmigo, and it is like having a tutor in your back pocket. It helps you learn anything you can imagine. And it doesn't just help you learn, it helps you understand things, if you got something wrong, and how to fix it.

Sal Khan:

They're watching a video, they're doing an exercise. Khanmigo is right there to provide hints, to provide explanations, to help answer some age-old questions like, why do I need to learn this? Or how does this concept connect with that concept? Or, hey, in that video, Sal just said the following word. What does he mean? Or what other resources on Khan Academy can help explain that? So it's really right there in the thick of things to help unblock, but then it can do a whole series of activities that would have seemed like science fiction prior to generative AI, where students can have conversations with it where it will simulate a literary character or a historical figure. They can write things together.

I actually do view ourselves as a tech company of sorts, where We are a not-for-profit, so our mission, free world-class education for anyone anywhere is our true bottom line. But I think what makes Khan Academy a little bit unique and maybe singularly unique is, of our roughly 250 folks on our team, it's much more than me now, about 120 to 150 folks are product-facing.

So in some ways, the convergence of this very technically sophisticated domain of artificial intelligence and how do you leverage it properly, plus doing it right, the ethics, how do you make it safe, especially in education. I don't wanna be too self-aggrandizing of our organization, but I think we are well set up to tackle it.

RAFFI VO:

So, a really important part of this conversation is safety... and so is accuracy. How does your team think about “AI hallucinations” – you know, the falsehoods that are sometimes generated by AI? There’s an argument out there that... those hallucinations would be, like, a crucial stumbling block to us really relying on AI in the classroom. Do you see it that way?

Sal Khan:

I think you do start with just a digital literacy aspect of it for people to know what these generative models are, what they can do well, but what they can sometimes do not so well. So when you use Khanmigo, there's a little message at the bottom that Khanmigo sometimes makes mistakes and here's why. And if you click on here's why you get educated. And that actually is very important digital literacy. Now obviously we've had issues with math and hallucinations and things like that, but in a lot of areas where less math and fact-driven, it was already very very strong. And it was just very clear that there are other ways, even if the AI doesn't fully solve the math or the hallucination problem, there's other ways to augment the AI or engineer around the AI that can solve those things. The other dimension, which I didn't fully appreciate when we got started was, how powerful this was going to be for teachers, both for the traditional teacher work of lesson planning, creating rubrics, grading papers, which we think will save teachers a lot of time, but also when teachers need to act as students, when teachers need to refresh their own knowledge, when they have an edge case question that they're afraid that they don't know the answer to, this can help with those things as well.

There's stats that teachers are already using, 40% of teachers are already using chat GPT. And so just from the teacher lens, for us to be able to give something that is more powerful and more special purpose to... where they spend 15, 20 hours a week grading papers, writing lesson plans, creating rubrics, refreshing their own knowledge. They're loving that. And then they love the idea. You know, if I offered every teacher, what if every student in your classroom had one-on-one tutoring whenever they wanted? I think any teacher would say, I would love that. No teacher would say that threatens my job. And if you told a teacher like, hey, and by the way, I'm gonna get four interns for your classroom that can help you answer questions when you can't get to every question that can help you in multiple ways that can report back to you how they've been helping the students. I think every teacher on the planet would say, sign me up and can I get five or six or 10 of those? And so that really is the frame of what Khanmigo does.

RAFFI:

I'm curious about the humanity aspect of it, which is, you know, a lot of ways, I want my kid to

have lots of human contact with their teacher. I'm a big fan of Khanmigo, so I don't want you to say that I'm denigrating Khanmigo. So I'm curious: how do you think about that?

Sal Khan:

I would venture, and we're seeing this with Khanmigo, I'm sure people are seeing this with ChatGPT, that people are willing to ask more questions now. Things that they were afraid or insecure about asking openly with an AI, there's less fear of judgment there. So I think that's a positive. More questions are being answered. In terms of the... social aspect, we've got feedback from high schoolers at Khan Lab School, which is a school we run where we test things out at, where she was able to have debates with Khanmigo around, you know, we have a debate, the AI activity. And she said, I was sitting next to her when she gave us this feedback. She said, this makes me so much more confident to participate in class. We wanna offload and make more efficient a lot of the stuff that needs to happen in someone's education, but it does not replace the human interaction. So in a traditional classroom, a teacher's lecturing, kids are kind of passively listening. Even when there's group work or Socratic dialogue, a lot of the kids are kind of disengaged. Even pre-Khanmigo that we always advocated, Khan Academy, yes, students are learning at their own time and pace, but they're encouraged to talk to each other. Teachers get data. They can do focused interventions with students. You know, one teacher with 30 students, that's not a personal connection for anyone. But when you have 30 students who are working on different things, maybe they're able to answer some of their questions with Khanmigo, and then the teacher's able to go and have a one-on-one session, even for 30 seconds, that is a much deeper personal connection.

RAFFI:

Is the ideal place that we should just hire more teachers? And is this the stop gap there, or is this actually better than that?

Sal Khan:

In an ideal world, if we had no scarcity in our society, I would say, yes, both.

RAFFI:

Fair.

If you could have more resources and more human beings helping to support students, that is great. And, you know, my biggest problem with the economics of education today is when you do the back of the envelope math, very little of the money actually ends up going to the- the human beings who are actually facing the students, going to the teachers. But what I would say is yes, more humans better in that world, but also yes, AI in a world where we do have scarcity and it is very expensive to have more humans in many cases, it can become a very powerful tool to increase capacity.

RAFFI:

There's been a lot of talk around AI and mental health, especially with teenagers. And so I'm curious, like in these systems, especially as you're thinking about kids spending a lot of time in

them, are kids gonna be disclosing information to Khanmigo that they shouldn't? Like how do you think through student privacy as part of all this?

Sal Khan:

There's privacy in terms of what data goes to say, third party vendors and what do they use with it. Khanmigo right now, none of the interactions are being used by OpenAI for training. So OpenAI does not store that information. We are storing it on our end and that's from a safety point of view. This is so that parents and teachers can look at the conversations, utilize it. I will say, I do suspect people will share things with AI systems of a sensitive nature. What we're doing right now, I have mixed feelings about, what we're doing right now is we have our prompts and we have this moderation AI. If the conversation gets to a weird, maybe let's call it an inappropriate place, then it will essentially not allow the student to continue with that thread of the conversation and it will actively notify the parents or teachers. Now, I don't think that's necessarily wrong, but it's kind of like, let's say you're feeling down, you're depressed, you wanna hurt yourself. If you talk to a friend, I think a good friend wouldn't say, 'hey, I don't wanna talk about this. That's a friend who wants to kind of cover their backside. That's kind of what we're doing right now. I think a lot of folks, because it's getting into a sensitive space, they just don't wanna go there at all. And I'm like, well, is that really what's best for students? I think what's really best for students is you support them in that moment, but you make sure that they don't think more of what this experience is than it is.

MUSIC...

RAFFI VO:

So – what's next? How do we ensure that AI learning tools are being built with safety, integrity, and students' best interests in mind? And, how do younger generations feel about it? Here's Sneha Revanur again.

Sneha Revanur:

I don't mean to offer a disheartening assessment. I definitely think that, my generation is, you know, in many ways, a purveyor of hope. And there's a lot that, my generation can accomplish when it comes to getting it right on AI. I do think that change is happening. I do think that that cultural shift and how we view tech development is happening. But, you know, it's happening slowly. And I think that, we still are on the cusp of that. And so, you know, while I'm seeing sort of some attitudinal shifts among youth my age when it comes to tech, I still think that there's this widespread feeling of almost apathy that I think is very concerning to me because I feel like people think about AI, they think about the harms of AI, and they view it as this, you know, abstract technical phenomenon that's entirely removed from their lived reality, when in fact, you know, as we're seeing, algorithms are beginning to reshape every zone of public life. When you are trying to apply for a kidney transplant, there could be algorithms that are matching you to a donor. When you're seeking a job there could be algorithms that are, not only screening your resume, but are actually showing you ads in the first place and are actually gatekeeping what jobs you can even apply for. When you're standing trial, there are algorithms that could be

evaluating the risk that you pose to public safety when you're operating in a public space. You know, there could be facial recognition technology tools that are being used to kind of monitor you. And that information could be exchanged with law enforcement. And so I think that it really is inescapable. And the reason why I haven't seen the kind of consciousness that I think we really need to take action on this among my generation yet is because there still is that feeling of apathy, because people don't see the connection between this and their lived reality. But do I think that things are getting better?

And do I think that it's our generation that has the tools to really make an impact? Definitely. We have grown up, where we've been raised by AI, we've grown up in the most hyper-connected generation yet. Social media has defined every area of our existence. And I think that it's really been integral part of our childhoods. And so do I think that we have that credential of lived experience? Do I think that we have that capacity to really wake up and take action? definitely.

Sal Khan:

I mean it's ridiculous how much of young people are talking about depression, anxiety, suicidal thoughts...

RAFFI VO:

Here's Sal Khan again.

Sal Khan:

And you're seeing... 60, 70%. We should not pretend like this is a natural state for society to be in. This is a very, very bad state for society to be in. We've talked about being able to have therapeutic conversations with the AI, being able to have mindful conversations with the AI. What's interesting about generative AI is yes, they can hallucinate, but they're not the wild west like the internet where everyone's incentive is to grab your eyeballs and keep your eyeballs, even if it messes with overstimulating you, making you into an extremist, making you feel horrible about yourself. We've got your eyeballs, I can monetize you. Generative AI does not, at least so far, work that way. Generative AI is much more of like having a conversation with a reasonable person. You don't have that weird fog you have after spending an hour on TikTok. That, you know, an hour on generative AI, it feels more like you read a book or you've read a magazine versus you just spent an hour on TikTok or you spent an hour on Instagram. So I think it actually has a little bit of hope of being less distracting, less overstimulating, making people more mindful. And proactively, there could be activities that actually improve health and wellbeing as opposed to undermining it.

RAFFI VO:

Although.... Sneha is perhaps less... sunny about things.

Sneha Revanur:

It's become impossible to ignore that the reports of harm are only mounting and it's not only sort of the concerns around bias and misinformation and disinformation and discrimination that I've

highlighted. But there's also an emerging community of AI researchers that are now talking about the possibility of existential risk from AI. They're talking about as AI models become more and more advanced, we're seeing with large language models could the impacts be civilization changing? And if so, how do we manage the consequences and ensure that we're actually future proofing our institutions for what could be potential democratic collapse? For what could be a widespread disinformation campaign powered by AI, and for what could be very dangerous existential harms. And so we're seeing a whole sort of different range of threats here. And I think it's really important that we are cognizant of all of that.

RAFFI VO:

So... can technology reform the way knowledge is transmitted? Will the outcome be greater depth or merely glossier packaging? Will educators, preferably classroom teachers rather than outsiders, determine content? In other words, who will be in control?

And if those questions I just asked feel.... kind of timeless to you... they are. They were all direct quotes from another newspaper article from almost 40 years ago. This one's from the New York Times, and it ran in 1986 with the simple headline... Debating Classroom Technology.

And you know... kind of like how we learned things when we were in school... some questions are just worth asking over and over and over again... until we can get things right.

RAFFI VO:

On the next episode of Technically Optimistic...

We're gonna be talking about the impacts of AI... on the economy...

CLIP: Brynjolfsson: *I don't see mass unemployment or net job loss. It will be more of a turn and restructuring and turnover.*

Creativity...

CLIP: Ari Melenciano: *This form of technology is not that different from our current way of being creative in that it's really synthesizing a bunch of different people's understanding.*

...and culture.

CLIP: Keolu Fox: *If we want to move toward personalized medicine and precision medicine, you can actually gain new novel mechanisms and insights from engaging indigenous communities.*

That's coming up... in episode five.

[CREDITS]

