[SQUEAKING]

[RUSTLING]

[CLICKING]

JUSTIN REICH: To participate in this next exercise, you will have to grab one of these index cards that are on the table that correspond to a particular technology. It looks like film, radio, and television are amongst the remaining ones, and you'll get in small groups and work on those. Here's what I'd like you to do. Find the other people who have the same card as you.

Discuss what you learned from the readings, anything that stands out to you, comes in your mind. But then I want you to make a chart, which you can do on the whiteboard or on our blue pieces of paper there, that capture three key ideas. First of all, who are all of the stakeholders who are involved in the implementation of this technology?

One of the things that I think Larry Cuban is particularly wonderful at is giving you a sense of all of the different hands that touch a technology making its way into a school, and all of the different hands that touch a technology when it's in the school. This is incredibly important for understanding how technologies actually get used.

So a lot of times in canonical design, I think this comes up in software engineering classes and things like this idea that there's a programmer and a user, and the user is one person who's sitting at a keyboard with their fingers on the keyboard and like, that's the person you need to pay attention to. And that two part model of designer and user totally breaks down in schools. There are lots of people who are very different who could be considered users of technology in schools.

Another thing that Larry Cuban does really well is he helps us pay attention to how these people have what I'll call different interests. By interests, I don't mean curiosities. I mean incentives, stakes, how a political scientist might use the word interest. All of these different stakeholders are rewarded for different kinds of things. They also have what we'll call interests or disincentives. They are also trying to avoid or will be punished for different kinds of things.

So for the technology that you picked a card of and are talking with your colleagues about, think of all of the different people who you think could be considered stakeholders in the implementation of this thing. And then for each of those stakeholders, come up with a couple of their interests and a couple of their interests or disincentives or things that punish them or those kinds of things. Does that, as a general exercise, make sense?

And the thing that we're trying to do together is we want to try to recreate the world around these technologies. That's what I think Larry Cuban is so fabulous at is saying, yep, a television set is going to roll into a-- it's going to roll into a classroom and into a school and into a community, and there's all these people who are part of that. That's what we really want to get at here.

The last thing I'll tell you before I cut you loose is Larry Cuban has a totally fascinating history himself. He was a social studies teacher in the '50s and '60s, then he was a school principal, then he was a superintendent. He was actually the superintendent in Arlington, Virginia, which is where my wife went to school.

So when my wife was an elementary school student, her superintendent at the time was Larry Cuban, an Arlington, Virginia resident-- Fairfax. Close enough. Yeah, yeah. And it was only after he had a pretty distinguished career as a teacher, a principal, a superintendent, that he went to Stanford, got his dissertation, became a historian of education, and then eventually a history of education professor out there.

So he's someone who's extremely well-read, as I'm sure you got a sense of and things like that. But he also just deeply understands the kinds of things that make schools tick and make the people inside schools tick. Does this exercise make sense? Find the people with your cards. Move yourselves around. Make this little chart, either on the board or on these blue pieces of paper. Ready? Go.

[INTERPOSING VOICES]

JUSTIN REICH: Those things are hugely important. Like, where does teaching actually happen? There's some human being who needs to go to the bathroom and needs to eat. I mean, he has that great quote in there. It's not about film, but television, that they found that they're more likely to use television in the afternoon than in the mornings. And it's all like biology and culture, our brains work better in the morning.

We're all a little flagging by the afternoon, those kinds of things. And so yeah, I think anybody who's building a technology has to think to themselves, what are-- yeah, yeah. What are the variations in a teacher's day? When do they have more energy or less energy? How does it fit into those kinds of cycles and things like that? Those are every bit as real as the test score goals that we have or anything else.

[INTERPOSING VOICES]

JUSTIN REICH: This is really good. This is really good. Take a few more minutes. Take a few more minutes.

AUDIENCE: We're trying to think about disinterest for schools and for producers.

JUSTIN REICH: Sure. So if you're a school, what would make you go, eh, I'm not sure I want to do anything with films. So it's 1913. Silent films started coming out in earnest around the turn of the century. There's a handful of people. The most prominent of them is Thomas Edison.

Guy invents the light bulb and he gets in front of Congress and he says-- first in 1913, he says-- I mean, I'll read the other quote, but he says, in a decade, textbooks will be replaced by filmstrips. That's how powerful this new technology is going to be. If you're a school principal, what would be some things that make you go, they're pretty smart, Thomas, but I'm not so sure about this one.

AUDIENCE: Maybe if they just put a bunch of money into textbooks.

JUSTIN REICH: Sure. So yeah, they have an entire infrastructure built around the existing technologies. They have shelves on the wall. They have libraries full of books. Every one of their teachers has been trained to teach with textbooks, and not a single one of their teachers, when these things are first introduced, has ever been in a class as a student learning from a film. So you have this huge inherent conservatism in the system. So that could be one. What would be what would be some others?

[INTERPOSING VOICES]

AUDIENCE: Yeah. I mean, I guess it's kind of adding on to that, but integrating it into a classroom setting. How would they even integrate it to-- even if they're completely on board, how would they even integrate it into a classroom?

JUSTIN REICH: For films, what would be some of the challenges of integration?

AUDIENCE: The technology that you would need to put into a classroom or to move into a school.

JUSTIN REICH: Tell me specifically for films what some of that technology might be.

AUDIENCE: I mean, this isn't-- I don't think the projectors back then could fit into a classroom.

JUSTIN REICH: Oh, so they could. I mean, they're portable enough. But they're big. They're these big lumbering machines for which the rooms are-- if you have a classroom, let's say you have a big population growth and so you built-- someone in the 1850s built a school and it was 12 kids per classroom, and now you're putting 18 kids per classroom in there.

Like, a totally legitimate reason. There is not space in this room to physically move this machine. What are some other sort of-- what else do you need for films as a technology to be able to be implemented? So you need a giant projector. You're going to put the thing on wheels. What else do you need?

AUDIENCE: A place to actually project it onto.

JUSTIN REICH: OK, good. You're going to have to go to all of your classrooms, and you're going to have to install screens at the front of the room. Not the hugest challenge, but also not free. Like, so who's going to do these things? Films also came on these huge reels. It wasn't just like pick your YouTube channel and play.

Where in your building are you going to keep a library of film reels? Who is going to organize those libraries of film reels? Like if you have four elementary schools-- or four elementary classrooms, let's say you have four first grades, are you going to buy four copies of this film so that everyone can watch it at the same time? If not, how are you going to physically organize and move this giant reel from one space to another?

You can imagine the principal being like, but how are we? But how are? But how are? But how are we? And all this stuff costs money. So those are all kinds of-- I mean, Thomas Edison is here telling you that you're going to get 100% efficient learning through this thing, which is the potential gains, which no one has any evidence for because it hasn't happened yet.

But you've got to think to yourself, what are all these costs? What are all these material changes? So think about how you can articulate some of those things. But good. When you really get into-- to do this exercise well, you have to, like, what exactly is this technology? Even physically, what does it require? How many of these things do you need to buy? How much do they cost? All that kind of stuff. How reusable are they?

[INTERPOSING VOICES]

JUSTIN REICH: OK, this is really good. Why don't we take a break here? Go ahead and you can sit back down to the seats that you were at. I think everyone's written kind of broadly enough that we'll be able to see from a distance. But yeah, really good. Really good. Now I need to find a little spot for me to--

AUDIENCE: Everyone's last minute notes.

JUSTIN REICH: Yeah, yeah. Now's your chance to put the final few things up there. Good. So what was the minimum number of stakeholders people came up with? These guys are the winners with the longest list. Let's just read it out loud. Oh, no. The state. Admin, parents, teachers, students, corporations, manufacturers, edtech investors, developers, policymakers. Great.

So just as a starting point-- I mean, there are some other ones that showed up around here. Studios, broadcasters, the FCC that different-- psychologists. Yeah. There are a lot of people who have something at stake in these decisions. They're complex, multi-human kinds of decisions. So that's a good start. Let me just read. So given how complex these things are, why are folks so enthusiastic about it?

Let's ask Thomas Edison. What does Thomas Edison think about this? I believe that the motion picture is destined to revolutionize our educational system, and that in a few years, it will supplant largely, if not entirely, the use of textbooks. I should say that on the average, we get about 2% efficiency out of school books as they are written today. You're laughing. Why are you laughing?

Thomas Edison is just here making shit up. Like, he doesn't-- 2%? That doesn't mean a thing. He was good at light bulbs. He wasn't maybe as good at this. The education of the future as I see it will be conducted through the medium of the motion picture, where it should be possible to obtain 100% efficiency. Thomas Edison, 1922. You'll read a couple of other quotes that I have from Thomas Edison.

One of them is in here, in "Failure to Disrupt" when you read that. But in 1913, he went in front of Congress and said, in 10 years, the textbook will be entirely replaced by filmstrips. And then he went back 10 years later in 1923 and he said, in 20 years, textbooks will be entirely replaced by filmstrips. I think you can find many similar kinds of arguments that are made today.

I think you will not have a hard time finding people who tell you that the old fashioned techniques are only 2% efficient, but the new ones will be 100% efficient. So that's the promise. The promise is that we could do substantially better than we're doing right now if we think about implementing all of these different kinds of technologies. So an intuition that you can develop is that this is a century old enterprise.

For the last 100, 110 years, people have thought, how can we take analog technologies and eventually digital technologies bring them into schools to improve learning? There are millions of people who work in education. Many of them are very, very smart. From the earliest-- you read a little bit about personal computers, the kind of from the '70s and '80s, the Apple II plus kind of the generation of computers that I grew up with. But that's actually, like, 20 years into the game.

From the moment people built computers the size of this room, computer scientists, educators, learning scientists partnered together to try to figure out if there's some way to use computers to teach people. So just compute, not even all these other radio, film, other things. Computing alone is like a 70 year enterprise of trying to improve schools.

There are lots of things that we've tried and learned in 70 years. So one intuition that I hope you will take away from this class is that when you're thinking about an education technology problem of any form or type, about a design problem, an implementation problem, a policy problem, you should think to yourself, we've probably have done something like this before.

There is nothing that is so new, so utterly different, that there aren't cognate examples that could help us think through whatever these challenges are. Let's think about a couple of these stakeholders-- which stakeholders seem to appear pretty much in all of them? Who seem to be universal stakeholders?

AUDIENCE: Teachers.

JUSTIN REICH: Teachers. Let's start with them, because they're the best. I love teachers. I mean, definitely one of the reasons why I do what I do is I just think teachers are great. What kinds of things get teachers excited? If you want to get a teacher using education technology, what are the felt needs that they have that are going to be really important to them? This is one that I think will be pretty consistent across a bunch of these, but we can see if there are differences too.

AUDIENCE: Reducing their workload.

JUSTIN REICH: OK, good I love it. Reducing workload. Why is that so important to teachers?

AUDIENCE: Just because they have so much.

JUSTIN REICH: They have so much to do. These are not people who spend a bunch of time sitting around waiting for the phone to ring or something like that. Teacher workload in the United States is actually, in certain ways, much higher than in other comparable OECD countries. So OECD is the Organization of Economic Cooperative Development, something like that. It's like rich countries, 30 or 40 rich countries.

American teachers, compared to our colleagues in other countries, spend more time in front of students actually directly teaching than in many other places. So many other countries in the world, a full time licensed teacher would have more collaborative planning time, more grading time, other kinds of things like that. So US teachers, compared to their colleagues around the world, are behind the ball on having time anyway. Reducing workload is something they care about. What else do they care about?

AUDIENCE: It has to spark the student's interest.

JUSTIN REICH: Good. So they don't want kids to be bored. One of their core interests is, how am I going to keep these folks motivated? How am I going to keep them learning? What else do they care about?

AUDIENCE: They care about it being actually good quality.

JUSTIN REICH: OK, good. So it's really important that learning goes up, that quality is high, that teachers take their professionalism very, very seriously and they're held accountable in various kinds of ways. And this could be different across different kinds of teachers. So in the United States, we primarily-- we test-- in certain kinds of ways, we test way more than every other country does. There's no country that tests all of their students every year, third to eighth grade, in both reading and math.

Most other countries are like, if you tested them in the third grade, you would probably wait a couple years to-- I mean, you give them-- but you give them assessments or exams or whatever, but you don't give them big national tests. And so if you are a teacher of reading or of math, your test scores are scrutinized in a way that a science teacher, art teacher, a health teacher, other kinds of teachers are not similarly scrutinized. So within, there can be different kinds of incentives.

One of the things I always enjoyed about being a history teacher is that there were never really tests that I were preparing my students for in the same way-- I taught in private school, but even my math teacher colleagues felt like they were preparing students for the SAT, for the APs, things like that. That was never really my concern.

As a result, I had to spend less time thinking to myself, this new thing I'm bringing into this classroom, is this going to prepare people for some kind of nearly universal testing experiences? Like my math teacher colleagues always had to be thinking about that. I could be like, well, Tibetan Buddhism isn't on the test, but it's awesome. Let's study it. So that's different. Good. Other kinds of things. Yeah, Tai and then Sabrina.

AUDIENCE: Accessibility and inclusion. So to make sure that no one's left out from your diverse group of learners from any technology.

JUSTIN REICH: Yeah. And that would not be a universal concern across these decades. It would have been considered much more common to say, certain people have totally unsolvable learning disabilities, and societies should tend to their welfare in some other kind of way in the '30s and '40s and '50s.

And then somewhere in the middle of the 20th century, we passed the Americans with Disabilities Act, which totally transformed our thoughts and in fact, created a federal right for people to have a way of-- a fair and appropriate public education. And I would also just say, as society has gotten more interested in values of inclusion generally, what people would have worried about with inclusion with personal computers in the 1980s is very different from what they would be worried about with the computers that are getting in front of their students right now. That's a great one.

AUDIENCE: I'm going to say being able to track student progress.

JUSTIN REICH: Track progress. Assessment. Good. Yeah. Actually, interesting. Over this century, some of the earliest technologies had nothing to do with that, radio and film. But one of the very earliest ones you read about, physical teaching machines-- and hopefully, I mean, you saw some pictures. I was just actually looking today.

Sidney Pressey is one of the people who Audrey Waters writes about, and there's somebody on YouTube who had posted this fabulous two minute clip of him demonstrating one of his teacher machines. And unfortunately, that account was deleted before this year's class. Maybe I'll send you a version of it later. The only version of the video still exists is one in which Anant Agarwal's voice is superimposed of it.

So somebody took an audio clip of Anant Agarwal talking about the capacities of edx and played the audio over Sidney Pressey demonstrating the teaching machine. And it's a little too close for comfort, even though it's a century apart. But teaching machines, they were kind of like typewriters. They had these four keys that were on them, and so they would display one question at a time. It was like pre-Scantron technology, and then there would be one of four possible answers.

It's one of the earliest versions. It had a little bank of mints in the back of them, and so when you press the right button, a little candy or something would roll out and give you a little behaviorist positive reinforcement kinds of things. But one of the main virtues of it was like, oh, man, if we could get enough people these things, then we could assess their progress almost constantly. We'd know exactly where they are.

So this idea of tracking-- tracking student progress is something that's like particularly urgently concerned in our data driven world but was still something that people were interested in a century ago. What are some of the-- I'll just put them under here. What are some of the would-be disincentives for teachers? What are some things that if you were trying to get teachers to adopt new technologies, would be the sorts of things that would be barriers for them?

AUDIENCE: Complexity.

JUSTIN REICH: Why complexity?

AUDIENCE: There's some teachers who are more able to adapt to new technologies, and some teachers who just cannot understand how certain technologies might work.

JUSTIN REICH: Yeah. So I think that aptitude is right. If you go into teaching, there are probably two things that really drive you. One is you love the content that you teach. That's more true for secondary educators than for early elementary educators, but probably true for them. And you probably love people. Very difficult to be a teacher if you don't find people, especially young people, pretty engaging.

The kinds of folks who find people engaging, they might just find-- it's not 100% overlap, but there's just technology is less engaging. They didn't want to spend their life sitting in front of a computer typing in stuff. They wanted to be interacting with people. But the other thing I would say is that there are many educators who spent a lot of time polishing their craft and are good at teaching the way they're teaching right now and have been teaching for the last decade.

And so when they see a new piece of technology come in, they're thinking to themselves, is this thing really going to be better than the thing that I've been doing and got good at for a while? I'm going to have to lose something when I integrate this new thing? Like any technology adoption involves loss. Any change involves loss. You got to give something up. That thing I'm giving up, it may be pretty good.

I think a lot of people think that older teachers are less likely to adopt technologies because they're not technology fluent. But having worked with many, many teachers, I'm really convinced that there's no relationship between age and technology adoption. There are young teachers that are super interested and there are young teachers who hate it, their old teachers who are like, I'm pretty good at what I do. And there are old teachers who are old teachers because they've spent the last 20 years going, it's really fun to try new things. It's really fun to try to get better. What was one of your disincentives, Sabrina?

AUDIENCE: Oh, student distraction.

JUSTIN REICH: Great. And obviously, some of these technologies are more akin to that than others. Like, if you're playing a film strip or something like that, you probably have kids' attention or things like that. But certainly as we get into computers, anything in which the attention is-- where each student is responsible for their own attention is something that can raise concerns for teachers, because kids like to be attend to all kinds of things. What other things would be disincentives?

AUDIENCE: Like, teacher displacement. Like they feel like they're being replaced.

JUSTIN REICH: Yep. So teachers are a profession that protects their job security with a license and things like that, like lots of other professions do. Like doctors and pharmacists and lawyers and all kinds of people. And yeah, most professionals are not super enthusiastic about technology that has the capacity to replace the functions that they're doing.

Good. Let's think about some of these other-- so this is a good one. So again, we can think about any time a new technology is being introduced, is it going to reduce workload? Is it going to spark interest? Will it spark interest in the first three weeks of this new technology being here? Will it spark interest two years after the technology has been introduced? Is it going to be of high quality? Do I have control over the quality?

Accessible, inclusion, is it going to improve learning? Will it be able to track assessment? Is it too complex? Will it distract my students? Is it going to displace essential functions that I perform? That is a good set of questions that you could ask, Cuban does ask in some ways in radio and film and television and teaching machines and computers.

And you could ask them of AI and Khan Academy and iCivics and anything else that comes along, like, these are all still good questions to ask. Let's try to hit now a bunch of these other stakeholders. Who are some of the stakeholders that surprised you? Who are the ones that you were like, whoa, I wouldn't have thought of this in terms of education technology? Weird ones or unique ones?

AUDIENCE: I mean, I thought-- my group was the teacher machines, and it was the psychologists that come up with the ideas that go into how these technologies are-- or what they're based on. I guess I just never really thought like, oh, it is the people who thought of constructivism and situated learning that has then sparked this interest in everything else. And so it's like people have ideas but all of that initially stems from these two thoughts of learning.

JUSTIN REICH: Good. Yeah. So people have ideas about what good teaching and learning should be like. Those ideas are in some ways they seem pretty universal because we can find them going back through history. But they're always being reinterpreted, updated, things like that. Sidney Pressey is in this moment where behaviorism is an incredibly prominent set of ideas.

Behaviorism, you're probably all familiar with of. You punish people when they do things wrong and you reward them when you do things right and you condition their behavior that way. And so he creates a physical machine that embodies those ideas. and then Seymour Papert will come along and be like, oh, man, why can't we learn math the way that kids who go to visit France learn French?

Why can't we make a thing which is mathland? I bet Logo could be like mathland. He has a set of ideas about what good teaching and learning looks like, and he incorporates those ideas and people become partisans of these ideas. Probably the most prominent partisan of education technology in the United States today is Sal Khan, who is someone who had a very particular idea, a clear vision of what personalized learning would look like.

I don't know if you know about his personal experience, but he was a hedge fund person or something like that and his niece was having trouble with math, and he started tutoring his niece in math. He did it over videos. And so he put the videos online and people started watching them and go, wow, what if every person could have this little like, personalized tutor? What if each person could study math at their own individual pace?

And then he built this whole enterprise and continues to-- he's incredibly enthusiastic about AI right now because, oh, man, instead of just having me record a tutor for each person, what if the GPT can generate personalized text related to each individual person or something like that? And those ideas, it's not like they're just dropped in the world. They're advocated for.

Did you all see the *New York Times*-- was it *New York Times* or *Washington Post?* Somebody wrote an op ed about Sal Khan and AI. It was either in the *Washington Post* and the *New York Times,* but it was basically something like, this is the first AI that your kid will love or something like that, and it's basically just celebratory piece of Khanmigo. Good. So that's an unusual group.

And those groups, I mean, today, Sal Khan goes on The Today Show and tells people what he thinks. He goes to investor conferences and tells people what he thinks. He goes to schools. Harvard and MIT bring him in every couple of years and things like that. So these folks advocate for their ideas. The ideas don't just fall from the sky. There's a stakeholder who is advancing those ideas. Who are some other stakeholders that seem important?

AUDIENCE: I thought it was weird that you could think about manufacturers and I mean, the people who produce transistors, which is like TSMC and ASML, because if a bunch of schools across America all of a sudden need thousands and thousands of iPads and you have this big backlog request on M2 chips or whatever is in them right now, and then someone like TSMC, the only people who really produce transistors, has this huge float and make a lot of money.

JUSTIN REICH: Yeah, yeah. That people become-- that those folks then organize themselves into trade groups and they go to-- how do they advance their interests? They do things like give some of their materials away for schools, demonstration. They create training programs for their materials and share them. They have sales and marketing people that go around and get people advanced about that. They sponsor conferences, maybe that they're not even directly advertising for.

They're just their presence to try to encourage teachers and other sorts of groups to be behind it. We spend an enormous amount of money on education every year in the United States, and the biggest chunk of that money goes to pay the salaries of the people who do stuff. And another big chunk of that money goes to heating and air conditioning, for which there are people who are selling those things.

But basically the third biggest bucket after those two is the stuff we buy in schools to help people learn. And so yeah, there are advocates who are-- the folks who are not neutral in these things. Apple computer has been particularly prominent over the last bunch of years in trying to craft a vision of itself as a company that has a particular role inside colleges, universities, schools, those kinds of things.

AUDIENCE: I think something that surprised me, but maybe it's not that surprising, was that governments as a whole and leaders in between governments, because in the class we took last semester intro to education, we talked a lot about Americanism and how it's so linked with education. And I know it's such a big thing to be like, oh, this country has the biggest-- or the highest SAT score on average or this many people use Khan Academy or something like that. So sometimes it really is just like governments competing against each other and trying to see who's the best of the best.

JUSTIN REICH: Great. And in the United States, when we talk about government actors, what are all the different possible government actors we might be thinking about? So there's a US Department of Education. Who else is there?

AUDIENCE: So local boards of education.

JUSTIN REICH: So there's local boards of education. So a very unusual thing about the United States Department of Education is it is-- or the United States education system is it's extremely decentralized. There are 130,000 schools and there are 13,000 school districts. The modal elected official in the United States is a school board member. If you're an elected official in the United States, the thing you're most likely to be is a school board member.

And school board members are interesting stakeholders. And they range from community to communities. In lots of communities, they're just a community member who's particularly interested in education, but they're also people who are looking to-- it's an entry point for people who are interested in political careers. Lots of people who are school board members go to be on state reps and other kinds of things like that.

This is a particularly fecund moment for people who are politically ambitious to pursue those ambitions through the school system, especially in the American right, where reform of schools has become a way to get kind of attention within the political party and things like that. And yeah, there's all kinds of towns across the country where-- and I think you get some of this is some school board is, you know what would be really great is film strips?

Like, let's go big on film strips. You know what would be really great is closed circuit television. Wouldn't that be a useful thing to have? Like, it's not the teachers, it's not the superintendents, it's not the people who are in the schools. It's like some community members who are like, let's do it.

In the United States today, there's probably two versions of that is there are definitely school boards whose identity is shaped around being a cutting edge school in a bunch of the affluent suburban towns around Boston, like Wellesley, Newton, they want to be thought of as having really great, cutting edge, forward thinking schools, you know? Newton spent $200 million or something like that on the last high school that they built. And so it can be a way to become a school board member is like, I'm going to help the school system modernize and embrace technology and things like that.

There can also be the opposite. There can also be people who come in. The most common is people who work for the technology industry, who are like, you have no idea how much surveillance is built into this technology. All the time when I talk to principals or superintendents who are being like, we're kind of having a hard time helping parents understand why these things would be useful. It's like someone who works for Google or Microsoft or something like that who knows the surveillance capacity of these tools and is concerned about it. Yeah?

AUDIENCE: I just kind of have an anecdote.

JUSTIN REICH: Yeah. Please.

AUDIENCE: I used to work in edtech and educational publishing. I worked on mostly products for the state of Florida and really showed how much power some of these districts have. Because the school board would make the decision, there were several times where one or two districts in Florida would suddenly say they need something, and that would change the entire roadmap for a product that's used nationally. So it's like you have a couple people in Florida who are like, we really need this thing. And then suddenly it's like, kids in Arkansas are also.

JUSTIN REICH: Are learning different. This is definitely still true. It's breaking down a little bit because of the capacity for a web publishing and custom publication. But for a big chunk of what you might-- I don't know, the latter third of the 20th century, the first 10 years of the 21st century, basically, publishers would publish a US history book. How do they decide what to make of a US history book? You say, well, what are the most important states to sell this history book in? Florida is one of them. What are the other ones? You can name them. California.

AUDIENCE: New York.

JUSTIN REICH: Texas, New York. California, Texas, New York, Florida. Those are four of the most important states just by population. So now you got to think about the standards of-- every state has standards. The history standards of those four states are more important than the history standards of Maine and North Dakota.

And as political things come up around-- history is where this happens pretty frequently, but it happens in math and reading and other things, too. Yeah, actually, I used to do consulting for publishers of history textbooks, and once I saw the matrix where it was like all the possible topics along the columns and all of the states along the rows and x's of where all the topics get taught.

I mean, the other thing is there'll be a huge group of Polish immigrants that come to some state and they won't see Polish people represented in their textbooks and so they'll be like, we're only going to adopt books that talk about the importance of Polish Americans in the history. And the publishing companies are like, all right, add the Polish to it. But then the Italians do it and the Cambodians do it, everybody else do it, and the textbooks-- that's why when you picked up your 800 pound history textbook, it was full of all these weird little bits and pieces and things like that.

So yeah, these state level-- I mean, here's another tiny feature of this, but it ends up being important. There are some states, mostly in the South, where material adoptions happen centrally or have some kind of centralized function. So Texas, Florida, they have state level boards that say you can only adopt books that pass these boards. Massachusetts is a huge local control state. The school districts in Massachusetts will go bonkers if the state tried to tell them which textbooks they could or could not use.

There would be like another revolution, would be one if by land, two if by C class Mercedes or whatever it is, and they just wouldn't allow it. But it means that those states that have of centralized function actually end up having more influence over the publishers because they say, look, you want to sell a book here? And now it's not just a book, now it's a web program or things like that.

Now the thing that is breaking away some of that monopoly, although also causing problems, is states can say, OK, we're going to pass all these laws that have the effect of way ramping down the teaching of Black history. And publishers can be like, all right, well, your web version of that, we'll delete this and this and this and this. But over in New York or California and liberal states, you can have all that kind of stuff in there. Yeah, Khalil?

AUDIENCE: Yeah. Kind of going off of that. The political platforms play a large role in most of these places. In the US, that's very much there. But as an example from my own country, at every public school, they have a speaker system at the start of the school, specifically because they want to play the National Anthem. That's something they did really early, the kids have to do it. To oh, there's so much like technology that's just one thing. Why is this the only piece of-- there is some kind of incentive they want to build with political motives.

JUSTIN REICH: And then does that broadcast system be used at other parts of the day as well, or?

AUDIENCE: Only gets used at the start of the school where the National Anthem and some kids-- every classroom does a session where they just do some religious stuff, some Arabic poems, some fun facts, and then just that. But that's mostly just--

JUSTIN REICH: I love that. I think that's a fabulous example. Whatever the state government is-- the state is in the nation. The nation state government says every school must broadcast the National Anthem every day. Every single school in the country then has to build a technology infrastructure that allows that to happen. And then once that technology infrastructure is there, it can be used in other kinds of ways as well or not used or other kinds of things like that.

You can find national examples of this in other kinds of ways. One of the most interesting countries right now for education policymakers to watch is Estonia. About every decade, some country that people aren't really paying attention to gets really good international test scores. So Singapore was it for a while. Finland was it for a while.

People were obsessed with Finland for a while. Estonia is kind of last. Who are you people and why-- like, why are you so good at reading? And Estonia is very famous for-- sometimes it's called E-stonia. Their government has really embraced the internet in a very centralized kind of way, and so people are looking at and thinking about how education technologies are adopted in Estonia and other kinds of ways.

But it wasn't a policy that was just for the schools. They were like, we're going to put Estonia on the map by having really good digital government services. And that national policy decision ends up affecting the learning experiences of kids in schools and all kinds of places. Yeah, that's a great example. Students. What are the interests and disincentives of students?

AUDIENCE: It's cool.

AUDIENCE: It's a new piece of technology.

JUSTIN REICH: So almost all of us like novelty. That is one of the advantages that technology has. Although an amazing thing about novelty is how shockingly quickly it wears off. Actually, I was reading this on Reddit the other day. A teacher was being like, I don't know, like I brought a Nintendo Switch into class so we could play these mathematical logic games. And my students were like, oh, please, Miss, can we just do worksheets?

And I was like, fine, do worksheets then. But they're like, oh, man, you want to play some online game? I don't want to play-- now, there would have been some moment that this class would be like, what? We can play a computer game in class? This is amazing. It's an interesting feature of education, technology adoption that novelty, can be extremely compelling for a short period of time and then wear off pretty quickly.

AUDIENCE: Do you have any comment on why students default is now back to that pen and paper? Because I mean, people are always like, education has been the same for decades. And why does it always look this way even after we've reformed it? Like, why is the default that pen and paper?

JUSTIN REICH: Good. So, well, let's just highlight an important thing that you observed, which we were talking about over here too, which is just schools are incredibly conservative institutions. Why would that-- small C conservative, not right wing. Some of them are, but. They're small C conservative. They do things the same way over and over again. What are some possible reasons for that?

One is, if you went and interviewed parents and said-- who are another stakeholder that a bunch of people brought up-- how much do you want us experimenting with your children? The answer to that is going to be pretty low. The enthusiasm that people have for experimenting on children is low. Second, everyone in the educational system who's an adult has what's been sometimes called the apprenticeship of observation.

You all have been in school somewhere between 13 and 18 years, and that shapes your experience. And so people who have roughly the same education level as you go into schools and become teachers, and they bring that 13, 18, 20 years of educational experience with them, and that shapes the way you think schools should unfold. Parents can bring those expectations in.

I will never forget this. I was once working-- I was conversing with a school in Utah that was trying to switch to openly licensed materials. It was, I don't know, 15 years ago, 18 years ago, or something like that. They were trying to get away from textbooks and to have people use digital materials, particularly digital materials that their teachers could edit so that they could make them tailored to their students and things like that.

But they still kept textbooks in classroom, and I can't tell you whether or not that's true. But he says the reason why we keep textbooks in classrooms is that there aren't textbooks in classrooms, parents will be upset. Parents, when they go into a classroom, expect to see textbooks there. Basically, it was cheaper to keep buying enough textbooks to be in all of the classrooms than it was to hire administrators to explain to parents why there weren't textbooks in the classroom anymore.

So all of these different stakeholders, this conservative vision of education is part of that. One possibility is that that's really bad, that there are actually way better ways of doing things that are out there. And it's a bummer that we're so conservative and that's really holding us back. Another possibility is that the practices that exist in schools have been refined over decades and centuries, and they are the way they are because they're pretty darn good.

That we keep doing certain kinds of things because they work. So you'll have to figure out for yourself, if you hear examples of students adopting old practices, are they adopting those practices because they work really well and because they like them, because they're comfortable and familiar? There's an argument that, particularly in our age, where students are fixated on grades and performance in a way that they might have not been in decades past because-- not because kids are more materialistic or something.

It's because of economic uncertainty, because as the gap between wealthy and poor people widens and the stakes of education become higher, people become more fixated on it. And so those kids who are adopting familiar matters, do they really like the familiarity? Or do they know how to do well in the familiarity and things like that? But again, keep tying all the things that we were talking about back to the decision of educators trying to implement new technologies.

Everyone in your system is going to have some kind of conservative impulse all the way down to students. That conservative impulse might be balanced by the novelty effect that we're talking about, but it's in there. So if you want a new technology to really be adopted in some kind of meaningful way, one strategy you can have is to have it align with existing practices. You could say, let's take technologies that do the kinds of things that are already happening in schools.

That will be less upsetting, that will require less training. That will require less upset. It probably also won't help that much. I mean, the people selling the technologies won't say that. But if you're just digitizing existing practices, how likely are you to have substantial gains from digitizing existing practices? Or maybe you're a big, ambitious reformer and you say, no, no, no, we could be doing so much better.

We could go from 2% to 100% efficiency in schools. We just have to make big changes in our practice. Well, making big changes in practice requires convincing people to change all of these things. I've read this book a zillion times now, but I was just revisiting a line in here that I loved. He said something towards the end there where settings have plans for their inhabitants. Anybody remember that?

He was talking about the physical layout of a classroom, but he was using a broader sociological principle. Settings have plans for their inhabitants. People interact in a space in a certain way because the physical space is laid out and built in that way. So I was talking with these guys about one of the problems that filmstrips have. To have a filmstrip in your classroom, you have to take a giant projector on wheels, and you have to roll it into the space.

There would have been some classrooms filled with early 20th century urban schools with tons of immigrants who are pouring in on America's shores that don't have room in their classroom for a big thing. The other thing that filmstrips had that was a huge pain is these giant film reels. The early film reels were really, really big. Where are you going to put these things?

Your town did not build a building that had an archival film studio storage unit attached to it. Let's say you have a big school and there are four first grade classes, and you want to buy a filmstrip for all four of those first-- like, are you going to build-- are you going to buy four copies of the same filmstrip? Is each classroom going to have its own film library?

If it has some centralized library, you have to have some way of tagging, archiving, maintaining those things, bringing it into classrooms. I mean, there are contemporary versions of all of these things. Oh, you want to give every kid a device? How is that kid's device going to get on the network? How is he going to be able to log in? Who's going to deal when they lose their password? What's going to happen when their devices break?

Are you going to make families pay for the devices they break? Your kids are super poor. They can't afford that. So you're going to contract with an insurance company. Who, on your staff, has experience contracting with insurance companies to insure computing devices? Like, you didn't learn that at your-- I mean, we'll talk with the education school deans on Wednesday, but I'm pretty sure they're not teaching their students how to manage insurance contracts and things like that.

All of those things become-- well, they have a combination of incentives and disincentives that are associated with them. Good. Any of these other people that it seems like it's important for us to touch on before we come to the conclusion? We talked about parents. I mean, I don't know how much we talked. Maybe there's one last thing that we could talk about. We talked a little bit about school administrators.

But a thing to be particularly attentive to in schools is just how many different kinds of adults with different roles there are. So we talked about teachers. There are people who are school principals. Like if you're a school principal, what are the most urgent concerns that you have on any given day? Like, what are the main incentives you have as a school principal?

AUDIENCE: Your budget.

JUSTIN REICH: Yep. You got to make sure you can pay for everything. A teacher is not worried about that. Teacher will buy as much-- if the school will pay paid for it, they'll take as much technology as they want. Some of them. But principals have to balance the budget. I mean, the weird thing is in the United States, it may not at all be a principal's role to balance a budget.

It may be entirely a district role. So there are some school districts where the district will make all the purchasing decisions. There are other districts where the districts will take big chunks of money, send it down to schools, and say, schools, make all the purchasing decisions. What else is super important for principals?

AUDIENCE: I was going to say just maintaining the school building itself for student safety.

JUSTIN REICH: Yeah. Yep. Student safety, maintaining the physical school building, making sure things are running and operating and stuff like that.

AUDIENCE: Are they also managing the relationships with the district and also parents? Like, all these outside--

JUSTIN REICH: Yep, yep. And principals are quintessential organizational behavior middle managers. They're empowered to do some things but not others. They're accountable to lots of different kinds of stakeholders. There's all kinds of complexity in what they're doing. A lot of them are pretty keyed-- or evaluated based on test scores, especially in places where students are at risk of not passing tests. Depending upon the policy infrastructure, test scores really matter to them.

Safety and the orderly operation of schools. Every person in the building wants schools to be orderly, but when schools are disorderly, the person who has to deal with it the most is an assistant principal or the principal. It's just more work for them. You let all the kids have phones and fights break out and all kinds of things happen. Teachers have to deal with it, but the principals really have to deal with it.

AUDIENCE: I was just like-- really short comment. Just, when you asked us, what does a principal do? I've been around them my entire life, and I was like, I can only think of like two or three things that I know a principal actually does. And I just think it's really strange that most people aren't sitting you down and being like, this is the person you go to for x, y, and z things--

JUSTIN REICH: Yeah.

AUDIENCE: --around these organizations.

JUSTIN REICH: Good. I think there are a few things that you can grasp from that insight. First of all, schools are just unbelievably complicated. I've spent the last 20 years basically doing nothing but thinking about schools, and I still don't understand all the things that are going on in there. Just as an ecosystem, they're unbelievably complex and fascinating.

The second is as you transition, if you decide to work, be involved in education, you have to relearn all this stuff going from a student to being someone who's working in education. There's all kinds of things that were hidden from you, masked from you, or just weren't important to you. The odds that any of you were real troublemakers is pretty low, given that you're at MIT.

But there's a classroom full of people sitting somewhere that knew principles pretty intimately because they spent too much time in their office because of things that they did and so forth. So good. Yeah. If part of what happens to you in this class is a lot of times in social science, we talk about making the familiar unfamiliar.

A thing that you've looked at your whole life and being like, whoa, look at all these things there that I wasn't paying attention to or wasn't made aware to me and those kinds of things. Maybe here's one very concrete thing. Let's think of something like a student information system or Canvas. Let's think of something like a learning management system. Who spends the most time using Canvas? Tell me about the people who use Canvas.

AUDIENCE: Students.

JUSTIN REICH: Students. Students spend a lot of hours logged in looking at stuff on Canvas. Who else looks at Canvas?

AUDIENCE: Teachers.

JUSTIN REICH: Teachers. Who buys Canvas?

AUDIENCE: Not the students.

JUSTIN REICH: Not students and teachers. In business school. I think they would call this a third party payer problem. So if you are a company that's making a learning management system, of your stakeholders, who has the most power to determine whether or not your thing gets purchased? Some director of education technology or something like that, some IT person.

So if you've ever wondered, why is this so terrible? It wasn't built for you. In some important ways, it was literally not built for you. It was built to solve the problems of some middle level information technology manager who's going to buy one of those things. So third party payer problems are rife across-- I mean, the problem with third party payer problems from a classical economics point of view is you just have misaligned incentives.

In some respects, you could say that improving the teaching and learning experience on Canvas is a cost. It's something that reduces your profit. Obviously, you have to make it good enough so that if enough teachers and stuff enrolled-- any of you ever have to use Blackboard?

AUDIENCE: Yes, I have.

JUSTIN REICH: OK, good. I once met the guy who made Blackboard, and I was just standing there in line behind him or something like that, being like, what would it be like to have made a piece of software that millions of people hate? Like, what would it have been like to introduce so much unhappiness in the world with what you've built? I think it would have been rude, I think, in the buffet line to ask him that question.

Here's another thing that I want to say about who buys these things. And this is really important too, especially to any of you who are interested in either in education-- starting an education startup or other kinds of things. Who in a school can buy technology? What are some possible titles of people who buy technology? We've mentioned a few of them.

AUDIENCE: Librarians.

JUSTIN REICH: A librarian could buy technology.

AUDIENCE: Department chair.

JUSTIN REICH: A department chair could buy technology.

AUDIENCE: Teacher.

JUSTIN REICH: A teacher. They are amongst the least likely. Actually, sometimes people have made the argument that a problem in the education system is it's very difficult to have a real bottom up marketplace kind of effect. In most places, teachers have very few discretionary dollars.

I mean, that's why they're holding bake sales and asking-- when you become parents, your teachers will ask you to bring in boxes of tissues and things like that, and you'll be like, what broken, failed country do we live in where you cannot simply buy all the tissues that you need for the children? Hm?

AUDIENCE: Or paper.

JUSTIN REICH: Paper.

AUDIENCE: Two reams.

JUSTIN REICH: Yeah. Yeah. Two reams of paper a semester for all your students. So the teachers don't have-- in some cases, they do, but in a lot of cases [INAUDIBLE]. Principals can buy things. Directors of instructional technology can buy things. Assistant superintendents can buy things. Superintendents can buy things. School boards in some places can directly authorize kinds of things, although that's probably more rare, but they can push for it.

But the point is, across the 13,000 school districts, in 130,000 schools in this country, the answer to the question, who can buy something is different in all of those contexts. That makes starting an education technology company very, very difficult. When you go somewhere, you don't even know who can buy the thing. You don't even know who you're selling it to.

Now, there are people who do know who buys all these things. The only people in the United States who know for every school and every district who has the power to buy stuff are giant publishers. Pearson, Houghton Mifflin-- what was the company you work for?

AUDIENCE: McGraw Hill.

JUSTIN REICH: McGraw Hill. Perfect. They have an army of salespeople. This army of salespeople have fanned out across the 13,000 school districts and once a month, once a quarter, all the people who I just listed who can actually buy things, they take them out to lunch. They bring them free supplies. They do all that stuff. They probably don't have a master list somewhere. Instead, they have all these salespeople who know the answer to these questions.

So if you're a Silicon Valley startup and you're like, oh, I've got this new AI thing I'm building. It's super cool. Da, da, da. You don't have this massive network of sales connections to help you figure this out. One of my favorite illustrations of this is at a bunch of education technology conferences-- how many of you ever been to a conference where you have a badge, right? And you can put stickers on your badges or other things like this.

Basically one of the stickers you can put on your badge-- you can put your pronouns, you can put some other things like that. You can put buyer. You can basically signal to people, I actually have the power to purchase things. When you walk through the exhibit hall, they will pay more attention to the people who have the little buyer things on them than they will to critical social science researcher badge is put on your thing or something like that.

So here are some things that you should take away. The systems are incredibly complicated. There are all kinds of stakeholders in them. But they are they're not so infinite, they're not so complex that we can't make a chart that manages and starts to understand all these things. But as we move forward and as we look at more-- a thing that you can do in any kind of education technology problem, any educational setting, and be like, all right, who are going to be the stakeholders for this problem, this thing, and what are they going to be their interests?

And again, not just their official interests, their official state policy interests is to raise test scores or something like that. But one of my favorite examples we're talking about is televisions were more likely to be used at the end of the day because people were tired. Like, your body's circadian rhythm indicates how technologies be used in classroom. That is just as real. It is just as real as the policy mandate to raise test scores or the school board's enthusiasm for technology or whatever it is.

And so in any kind of system, we can figure out who are the stakeholders in the system, what are the interests of those things, what are the disinterests. A thing is more likely to work if it attends to those real, meaningful, felt interests, and if it avoids those real, meaningful, felt disinterests. And of course, we're doing this in a very detailed way in education.

But if you were to leave education and you were to go into health care, if you were to go into legal technology, if you were going to retail, you can do the exact same exercise. The technology that you're building for a hospital, it has to work for a doctor, but it has to work for a nurse and an orderly and a patient and the patient's representative and the hospital's lawyers and all these different kinds of people.

And so on the one hand, especially when people are designers of software, we can have the sense of, oh, I'm building things for a user. I'm building things for this individual user who's got their fingers on their keyboard or their thumb on the screen or something like that. But I would encourage you, as we're thinking through all these things, to think about these networks of interests and stakeholders much more broadly.

OK. We'll talk to some education school deans on Wednesday. We'll learn a little bit about implementation, how you overcome some of these kinds of challenges. From me, we'll hear a little bit about the National Education Technology plan, and I will pair you up with each other to be able to do some peer editing of your essays. And that will get us through the week. Sound good? Bueno. Let me know if I can help you with anything. Otherwise, have a wonderful rest of your afternoon.