

REIMAGINE AMERICA'S SCHOOLS PRESENTS

# EDUCATION AT THE INTERSECTION OF TECHNOLOGY AND DESIGN, AN EXTENDED CONVERSATION

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*Virtual reality promises new immersive learning experiences.*

The existing school model is anachronistic. Schools were designed for a time when students had to be at the same place, at the same time, to hear the same message. Today's technologies have liberated us from that restriction. Some of the questions then become: what do schools look like? How do we create schools that maximize the opportunity for blending in-person learning and remote learning? How can technology and design work together more seamlessly to create outcomes that, working separately, they can't achieve?

Following Reimagine America's Schools' successful forum about learning at the intersection of design and technology ([link here](#)), Ron Bogle moderated an informal conversation to drill down further on the provocative questions raised about school design, and the role that technology might play.

Participants included:

- **Ron Bogle**, Co-Moderator, National Design Alliance, Reimagine America's Schools
- **Joshua Elder**, Co-Moderator, Director of Grants Management, Siegel Family Endowment
- **Ashley Arhart**, Built Experience Innovator & Principal, BCG Platinion & MAYA Studio
- **Satya Basu**, Architect, Digital Innovation Strategist Associate, Perkins and Will
- **Dan Foreman**, Associate Director of Professional Learning at Digital Promise
- **Judith Hoskens**, Architect, Director PK-12 Education: National and Minnesota, Cuningham Group Architecture, Inc.
- **Kerry Leonard**, Architect, Director of Architecture, Reimagine America's Schools

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**Ron Bogle:** To the panelists, today's conversation is a deeper dive following the visit we had last week. Today we want to look more closely at the ways technology and design can work together more effectively to create learning environments.

At this moment, Education leaders are dealing with a serious crisis and we can assume that this crisis fills their days, every day. But, there's a point in the near future when they will once again be able to think about the future, but, will they be so exhausted and so frustrated, that there'll be a tendency for them to fall back, and go back to the ways they've always done it. So, what we want to do is say, "Look, while you've been dealing with this crisis, we've been thinking of some things. And we want to share that with you, to help you lean into change, lean into the future, rather than fall back to the way we've always done it."

And you all know this, it's pretty deep in our DNA, that we tend to want to fall back to the way we've done it, anyway. So, we're trying to create some stretch and some excitement around new ideas. So, these conversations we're having are interesting. The feedback we got on the tech conference last week was super positive. But then, it's not just about the ideas. It's not just about writing articles and putting them on the shelf. Then, we're going to take these ideas and push them into our work, when we're back in communities, working directly with superintendents, foundation executives, mayors, on ideas that they can use to help support change. So, it's a one-two punch, and right now we're in the idea phase. So, thanks for being a part of it. Josh, any things you want to open up the conversation with?

**Joshua Elder:** I completely agree with you. And I was just on a few calls, earlier this morning, both with a domestic lens and an international lens. And I think that point of the people that are in the trenches, in the K-12 system, are like, “I can’t even think about tomorrow. I can only focus on today.” And we’ve been thinking, internally at the foundation, about this duality of that. How do we think about being innovative in the time of a crisis, in a pandemic? Those of us that can and do have the capacity to have these thought exercises and this opportunity to really think big, to rethink and reimagine.

How do you do that? And then, be able to present it to the people in the education space, so they can then decide, “Okay, what’s the best?” Because I completely echo the sentiments. My biggest worry, and I know I experienced this when I was in the education system, is that you automatically default to what was your normal, and what’s easiest. So how do we capitalize on this window of opportunity, to be able to provide solutions that are going to move them forward, and not allow them to just default back to what they know, and what feels comfortable?

And so, I think that’s what’s really exciting, especially to bridge and have the design side of it, which normally everyone works in silos. Speaking from the foundation side, and my interests, it’s really exciting to have the other side be a part of this conversation, and have that capacity to really drive, and be innovative, and think about what this could look like, and what this intersection can really provide, in terms of possibilities and potential for education and learning, moving forward.

**Ron Bogle:** This is important. We’ve got four tracks that we’re working on. One, we’re looking at the whole equity issue. We did a forum on community schools last week. We were looking at how technology is driving change. We’re also looking at crisis preparedness and resiliency, that the school has community support during emergencies. And we’re also looking at active and inquiry-based learning. We think these are four essential drivers, right now. And so, all of this comes together at the end of the year; we’re doing a big project on what we’re calling the “Moonshot,” the school of the future. If you were to design a school today, what would it look like? And we’re taking all of this content, from all of these different working sessions, and merging it together in this final project.

This group is curated; it’s not random. So, I think it would be very helpful for each of you to understand the point of view that each of you is bringing. So, Dan, why don’t we start off with a little bit of detail on your background, so that folks understand what you’re bringing to the conversation.

**Dan Foreman:** Absolutely. I’ve been working in educational technology for about 13 years now, and in all levels, both in a classroom setting all the way up through district administration. And now, I work for Digital Promise, for the Verizon Innovative Learning Schools program. And what I’m doing is providing an entire ecosystem of technology to high needs middle schools, across the country. That includes every kid getting a device, every kid getting an internet connection, every teacher getting the same device and internet connection, and we provide full time training.

So, they’re with us for two years, and then an extension for two more years. So, a total of four years that they’re with us, to be able to just answer a couple of questions. What if we kill the digital equity divide? What if we provide instructional technology support in every school? What does this look like? And what we’re seeing is some really great and amazing things. Right now, we’re in 253 schools, and 255,000 students. We are growing by another a hundred schools this year, and providing other variances of the programs. So, it’s not just going to be middle schools, moving forward. There are other programs that we are currently developing. But it is big, and it is growing bigger, and all of the schools, when COVID hit, they went home, and already had the ecosystem that they needed to be successful. What we’ve seen is, our schools are now the leaders in their districts, to do it.

**Ashley Arhart:** Morning, everybody. I have a very nonlinear backstory. It's been fun. I grew up in architecture, actually worked at a multidisciplinary architectural firm, focused primarily on retail design. Spent some time on the retail side of the fence as well, where I became increasingly, as you might imagine in retail, interested in deploying digital technologies in the service of customer experience. And a few years ago, I had a significant pivot to my career. I joined Amazon and was the Creative Director of Amazon Go, where I had dabbled quite a bit in sensor fusion, and computer vision, and really moved into what, I guess, is probably best described as Tsimshian space, artificial intelligence in the built environment, with true spatial awareness. Did that for a few years, and then moved to Microsoft where we expanded the charter beyond retail proper, and began to look at many other industry applications for a similar places platform, integrated physical digital approach.

In all of these, I think I gained a deep understanding that those of us who come from a more traditional physical architecture background, and those of us that might come from a more digital architecture background, don't speak the same language. And typically, don't come together to create products.

If you think of places as products, I think it's a new way to begin to approach a human centered design product, that is a place with a specific purpose. So, I'm at Boston Consulting Group now, part of their design practice, it's called Platiniion Human Centered Design Practice, I'm part of the smart environment group there. I'm delighted to be here with you all, today.

**Satya Basu:** Thanks. I'm glad to be here, also. I also am a nonlinear individual. To date, my longest stint is still as a broker, on Wall Street. So, I've tried a lot of different things, and came into design, even though it's always been part of my DNA, I came into the field and the professional scale of practice, late. As a result, I was looking to get up to speed fast, and technology was the way I got up to speed fast, and was able to blend my technology background, my professional background, into a fusion practice, where a lot of my work has been in data, analytics, and developing design with technology. Not just in the traditional architectural space, but I've worked on projects as large as doing the design for a project called Array of Things, which was embedding open source environmental sensors in the urban environment at scale, down to obviously very small interface design projects.

I think that's where, for me, as we think about smart technology, similarly have dabbled a bit in the various kinds of fields that Ashley was mentioning, like computer vision, embedded sensors, developing sensors. Education space, for me, I've always thought about embedding that same curiosity and fusion of technology, with other domains, into teaching, which is one of the things we've done as part of the Array of Things, which is, for the last five years, last year excluded, we were teaching upwards of 600 students how to, basically, build devices to answer their own questions and explore their own environment, using microcontrollers, and things like that.

We've been looking to scale that curriculum up. I think one of the things we really focus on is the interface, right? So, thinking about how technological interfaces have changed, basically since the smartphone, but now we're looking for other ways to extend that, the Go Store being a perfect example. I often use that as a reference, to talk about, beyond just what changed in the Go Store. What can change beyond that, if we have those extended to other kinds of spaces? But even within the idea of the Go Store, itself, right? And so, that's the fusion of my backgrounds and interests, into this technology idea.

**Judith Hoskens:** Hi everybody. I'm Judy Hoskens, and I head up the national K-12, and Minnesota K-12, work for Cunningham Group Architecture. I've been here 30 years, and I think that what I've loved most about this firm is its culture of insatiable curiosity, and never being satisfied, but

continually asking ourselves how best to design learning experiences that engage each and every type of learner. As well as, how do we bring out the best in the instructors as well? And really understand that our schools are community resources, although the definition of them is changing. I am honored and thrilled to be with all of you here, today, too, and really look forward to the conversation.

**Kerry Leonard:** I've been watching the forums that we've been doing, and I'm looking forward to this one, where we're learning a lot of great information from the conversations you all are having. So, really appreciate your thoughtfulness, and hopefully we're able to take your wise words, and help spread it to everybody else out there.

**Ron Bogle:** How's life in remote learning Dan? How many of your schools are continuing remote? How many are in and out?

**Dan Foreman:** Currently, all of them are remote, and they are continuing to be remote for the foreseeable future. Most of them are going to evaluate the first week of October, as to what happens next, and whether or not they are going to go back to in person, or whatever. The answer's very different everywhere, because it's a very different issue, everywhere you go. So, some of our rural schools don't have a choice, they really have to go back, because they have some kids that have no internet at home. We'll see what happens. So, who knows?

**Ron Bogle:** Dan, you and I have talked about this. Going into the pandemic, we had one set of images and ideas about school. In the pandemic, we're being introduced to a whole new raft of possibilities of what school might be. Given your unique perch with a national perspective, dealing every day with districts across the country, what do you begin to see as the way we might want to think about how technology and environment work differently than they might have before the pandemic?

**Dan Foreman:** Great question. I really think that there's a couple of things that I think need to be pulled apart within that. One is that, traditionally, we've been trying to do a reformation of the school system itself, right? If we can make the school system better, then we'll automatically meet the needs of every kid. Let's try and do that in the traditional sense.

What we've definitely seen since COVID is, the system itself is what's holding a lot of kids back, and is really in many ways subdividing and dividing us as a society because it is the baseline of everything. Let's now really take a look at what the structure of school is. Let's really examine how and why we educate, and what is the purpose of education. All of those inequities that we know have been in the background have been laid completely bare and we cannot ignore anymore.

The reality is that there were some districts that were prepared with an ecosystem for a reaction to this, even though they didn't know that they were preparing an ecosystem for a reaction to this, and there are those that aren't, and that divide is massive. There were some districts that were able to say, "Okay, everybody's going home. We've already got the structure. We've got the ecosystem. We're going to keep learning. Learning's going to continue." In some cases, engagement went up, achievement went up, attendance went up because they already had all of these things prepared. In other places it was, "Well, here's your packet. Good luck." That's the difference. That was really the divide that we're seeing. Those divides are racial socioeconomic lines that we are seeing pretty much across the board, and this is for our public education system.

Now we have to talk about some of these very basic structures around how we are building our educational system and what this ecosystem looks like, and if we are now separating place and time from learning, which technically it's always been separated, but now we're having that real

conversation. Now let's really have it, and talk about what is the purpose of that in-person learning? Why and how can we make that more valuable? Because if kids were just coming to school before, so I could watch you do a worksheet, what are we really getting at?

Well, now we have to have these conversations around engagement, around challenge-based learning, around many of these different ideas around how we can provide students the opportunity to crawl into content and peel it apart and bring themselves to it. We have to stop creating our school systems around this idea of students as an empty vessel, because now I can go to Google and find most of the answers to the test. That means we're asking the wrong questions. How do we get to the point where we're starting to ask the right questions? I think we're starting to. I think we're really having that discussion now around what is curriculum and what all of these things look like?

All of it still comes back to this question of space, and how do we use space and what does it look like? Well, when you look at it, historically, there have been other pandemics that have changed the way we design schools. I was reading the history of steam heat in schools and all of this as to how it came about in the 1918, 1919, 1920s, and going to school when I was a kid and it was so hot that we couldn't even function to be able to learn. Those things affect learning, but they did that in reaction to the pandemics so that you can learn in the winter and have the windows open. These are the types of things that we now really need to have these types of conversations about. Because even at a baseline, if a classroom is too hot or too cold, that also affects learning and that's before we even get to the pandemic. All of those things are coming to play, and we have to have those discussions.

Then, when you add in the technology ecosystem over top of that, what does that look like? If we don't all have to be in the same space, now that in-person learning becomes valuable because it is less. It's always been there, but how do we make it more effective? How do we have that real discussion around engagement? Are we actually creating products that students want to use to learn, and are they equitable? These are the real big questions that are happening for the first time across the board. It was happening in pockets, and now everybody's having that discussion.

**Joshua Elder:** In some ways, hasn't that always been kind of a struggle that has emerged with public education in particular? Even when you could put 30 students into a class, and lock them into a grade, you're first grade, you're second grade, third grade. Which is a departure from the early system of multiple grades, one-room schoolhouse, one teacher. Which was going back another hundred years, but then it became kind of like, "Oh, well, are you in the fast track or the slow track?", or, "Do you need extra help? Do you don't need help?" Learning is a very individual process, and what you're describing in terms of devices and infrastructure is also very personal. Now my computer or my iPad or my device is kind of personal-driven.

If you want to get really extreme about it, everyone learns at a different pace. We see this not only in schools, but everywhere. You think, "Oh, we have the smart thermostat now, and we have 30 sensors embedded all over the place," that's infrastructure. I can tell you degree differences across the floor plate, and I didn't tune the system in real time. I can add AI. I can do all of those things. But what it doesn't get at is if I have a hundred people in that space, whether it's workplace, a school, et cetera. I like it hot and my wife likes it cold.

How do you tune into that piece of it? It's not enough. Right now, everyone is super decentralized. Now, as long as you have the equity, the ability, the means, you are totally capable, my nephew he'll be upside down, hanging off the bed with an iPad. If that's his definition of comfort, and he can do that for two hours and he's engaged, then that's great! How do we even come back to bringing people into the same room where it's going to be, "Yeah, actually, I like working with my

headphones on” or, “I like sitting upside down.”

**Dan Foreman:** Why do we force kids to sit in certain ways? Why do we do these types of things? Well, it’s technically so that we can get the broom in between the desks to be able to clean it up afterwards. Really, a kid could be sitting there, upside down with their device, and be more attuned to remembering what they’re working on because they are in a more comfortable position. They’ll remember, “Oh, I was upside down over there when I learned that” as opposed to sitting in the same seat that I hate sitting in everyday next to the same people.

**Judith Hoskens:** It really does reinforce that one size fits no one. Some learners excel with virtual learning, and others do not. Others really regress. I think you’re all going to think I’m talking myself out of a job today as we work through these different issues, but the physical definition of school is changing. How do we make it easily accessible for everyone? Do we need a school building as we know it, or is it a myriad of places where learners can gather in a variety of groups scattered all around town, or is it some combination thereof?

As we also think about the emphasis on soft skills, and how technology can sometimes harm that communication aspect of face-to-face and being able to read one another’s expressions, it’s a lot easier to say something hurtful over technology. I think that if there’s one thing that we can all agree on is that the pandemic has really heightened our awareness of the social-emotional aspects of learning and the connections that we all crave between each other, between the coaches and the learners. The bottom line is: do those always need to happen in a school building as we know it? It’s exciting and scary all at the same time.

**Dan Foreman:** Ashley, I would love to hear what you have to say.

**Ashley Arhart:** I don’t know if any of you had a chance to look at the little deck that Ron forwarded to everyone. I typically find myself in conversations like these sort of staking out the super future leaning end of the conversation. I’m sensitive to the fact that, I think a few of you have heard me say something like this before, given the complexity and the disparity and inequality of experiences that we know are all kind of present. When we’re talking about education, it can feel superficial. It can feel untethered from reality at that forward-leaning edge.

Part of what I’ve been personally struggling with is, “Okay, how do you even begin to eat this whale?” How can you start to wade into this conversation intelligently in a scalable way? I’ve been trying to figure out what the durable buckets are that are meaningful, whether we’re talking about getting an iPad in a kid’s hand, or whether we’re talking about, “Where do I go this morning?” That can also be relevant for when technology becomes more easily implementable in this science-fictionary way, what remains durable in all of the conversation. I’ve tried to kind of craft what I think might be some helpful organizing structures to begin to rationalize the role of technology and physical space.

Again, I can’t speak from a point of curriculum. I know that that is a critical piece of it as well, but that was the last slide in the little deck that I presented, which was this issue of access. I’m thinking of my kids’ school. I’ve got a fifth grader and a seventh grader. It was built in the 1950s. It’s fascinating to look at. If you guys remember the old factory model with the slanted roofs, it looks like that. It is literally an educational factory. You start at one end when you’re little, you leave at the other end when you’re in eighth grade. It is this assembly line factory aesthetic. I presume they’ve got some level of connectivity. It frankly has never been an issue because my suspicion is they haven’t actually deployed a whole lot of tech in the classes.

How might we take Katherine Blaine Elementary School and bring that up to some level of digital

efficacy, as well as, breaking ground on new school buildings next year? How do we begin to both introduce new ideas and be mindful of the fact that we are potentially institutionalizing an inequity as we make them more advanced? Access as a general bucket, that again, if we think of the spectrum of application that we're faced with, how might we ensure access is an issue.

Satya, I think you said something in our last conversation about why do I have to go to the place? Why can't the place be closer to me? I think thinking about school as an asynchronous distributed idea, of which architecture is a part, of which technology is a part, rallying around this issue of access with the right heads could really result in some very interesting pieces.

The second bucket was that of engagement. Again, how can we ensure that everybody's tracking? That everybody's getting engaged appropriately? I think this isn't just for learners. The other big piece of this is the educators themselves, and making sure that they have the skills they need to be really pivotal and supportive of these new processes. I know, again, just reflecting on my kids' teachers, we had some folks that were obviously very comfortable with this. We had some we didn't hear from for three months, and it's perfectly obvious and completely appropriate to understand that they're going to need special attention as we're imagining this too, engagement, not just for the learners, but for the educators and the staff as well, who are going to help enable all of these systems.

Then, the last piece was that of enhancement. Let's presume for a moment, again, that across this access, engagement, enhancement, there are some table stakes things that need to happen. Then again, if we could create a roadmap from table stakes to future-leaning and be very thoughtful as these ecosystems become more mature, what might that begin to look like? I think we could create charters for each one of those things from a multidisciplinary perspective.

**Joshua Elder:** Ashley, I actually have a question based on your background that I'm curious about with Amazon Go, in particular. I think in the early days it felt very much like a demonstration project, like many of these things do. Sensor fusion, which was built, I assume, very heavily on AWS and everything else AWS was doing, putting it all together. One of the things that I always use when I reference it is this idea of transaction. The nature of everything in our digital world is becoming very transactional. Everything from making a post, buying things, et cetera. Those are all transactions.

If you expand the concept of the transaction beyond the obvious one, what is learning? A series of transactions where things change. Curiosity is replaced with understanding, or rules are enforced to make society better. These are all these small transactions. Then, the interesting thing about the Go Store is that for all of that technology, the main thing that changed was you eliminated checkout. That's the main thing that changes when you go to the Go Store. You pick up what you want and you leave and you just get charged. I think the thing that was always so appealing about that concept is it's so portable.

Which now, obviously, Amazon is doing. They're not selling more Go Stores. They're not building more Go Stores. They're selling the sensor fusion technology so that anyone even up to Walmart, presumably, could have the Go Store experience in a Walmart. It's identifying the transaction that's the most scalable transaction that the technology can be brought to bear effectively seems like one way to handle that kind of scaling issue.

Even as we wrestle with what should a school be, what does need to be in the building? What doesn't? What are the transactions of education that can apply globally? Ideally, hopefully, maybe be using technology to leap those restrictions of place, speed equity, access to infrastructure, et cetera, that you can start to develop something that, not on Day One, but on Day a Thousand,



when it's ready, can be flipped as a switch that is accessible to every single school in a day.

**Ashley Arhart:** I think that's so interesting to think about. I'll add a couple of other nuances to your excellent example. Within Amazon's warehouses, they had the precursors to the technology that happened inside the Go Store. What the Go Store actually allowed us to do, and by the way, this comes with a lot of ethical challenges, by the way. We haven't talked about that whole piece of this. That's a thing.

The thing that the retail application of this technology allowed Amazon to do was to pressure test it in a way that a warehouse would not allow them to do. A warehouse is full of the same workers every day. Those quickly become known entities. They do not challenge or educate the algorithms fast enough. Opening a retail store to the variables that are individual shoppers, who may or may not be previously known or understood, is a way to accelerate kind of the intelligence of the environment.

If we were trying to create a lab situation that might begin to allow us to pressure test and productize some very specific scenario-driven technology systems, choosing something hard and choosing something that actually probably is going to take a fair amount of time in order to bake such that it is sufficiently resilient to begin to roll, is a really interesting approach.

That's a little bit in conflict with what I was originally thinking, which was let's get the big pillars down, and let's start at the base. Start at the base, but could you do some of those moonshots that are still anchored in those pillars? Could you begin to pressure test, and create a proof of concept, that like you said, as soon as they were appropriate for deployment, could be very easily rolled into the existing system. That's a fascinating way to think about it. I really liked that.

**Joshua Elder:** I think one of the things we could talk about for that school of the future run is what might one of those transactions be that can enable that to happen.

**Ashley Arhart:** The way that I would historically identify, for lack of a better description, those high value use cases would be to have a human-centered design workshop with all of the right heads in the room, and actually beginning to, again with some light structure, whether it be the three buckets that I proposed or another one, where we really land on the thing that we think would be the highest and best use of investment, whether it be time or talent or dollars. I'm curious to know if that might be an opportunity to really land on this idea.

If we were to say that safety and situational awareness across a distributed asynchronous learning landscape was important. Are people where they say they planned to be? Are they actually doing that? Is it going okay for them? Do they have what they need? If that were a use case, we could begin to prototype against that and figure out what kind of systems could actually support and simultaneously deal with all the equitable or excuse me, not equitable, though, that's a thing, too, the ethical implications of what we do with that data.

I'm camping out in stuff that is so fraught. People are scrambling to figure out legislation to keep it honest. The somewhat challenging thing with all of this, as soon as you take a baby step, you basically get the ocean of ethical implications and challenges that are associated with the moonshot. Whether you want it or not, you have to take that stuff on at the same time. To Satya's point, I think getting really crisp about what we want to solve for, and how might we begin to get deliberate about tackling a very distinct territory. It feels like a smart first step.

**Dan Foreman:** I would agree with that because educational reform has littered with the fact that as soon as we start getting into really changing what the thought process is, all of those ethical

dilemmas come up and then people just kind of back away very quickly because there are so many of them littered across the floor around, “Okay, well, what if we do this? What does that mean? If we do that, what does that mean?” Right? There’s all of the policy work that comes with it. How do we make sure that this is equitable, and this is ethical to be able to meet the needs of students? What we don’t want to be able to do is create a system that is removing relationships from the conversation, that is removing that ever important teacher-student conversation and relationship and that interpersonal relationship, all of that.

Without having those moonshot ideas, we always go back to the same thing of let’s just build the same thing that we’ve always done because that’s what we’re comfortable with. We recreate the system that we all did, which was not the best. It was a trial of errors, and it’s something that we had to all go through to become a part of society, but many of us get lost within that system.

Now we have to really have some of these discussions, too. It’s even bigger than just the building itself, it’s also what we do to build that building? All school systems are run off of property taxes. Well, you have your property based off of where you work, you send your kids based off of where you work and where you live. Well, all of those things are now separate. I can work anywhere. I can live anywhere. I can send my kids to school, technically, anywhere. What does that mean for the basic function of how we fund our schools? That as a system is changing. That also means that how we fund our schools is also a method of how we have subdivided and segregated our schools. If that goes away, and if we’re not tackling that policy as well, then we’re not necessarily even getting to the core of what we could potentially do with our schools and education. Those, I think, are also a part of that ethical conversation.

**Joshua Elder:** Do you even think about it as a school? Pausing, leaving aside the school concept for a moment, or just think about it as a student. Because as you said, it’s so decent and, again, Facebook can connect a billion people. Let’s at least keep it national for the moment, but if you look domestically, nationally, if you just look at it as 50 million students, that technology means that you can give up to potentially all 50 million of them, the exact same experience at the exact same time, or near synchronous. That’s such a huge shift. It’s like a sea change in the way we might think about students and education.

If we can identify what that 50 million school children experience, transaction, whatever you want to call it, then back into kind of, “Okay, what would need to change in the school to make that transaction happen at scale?”

**Judith Hoskens:** Focusing on the activities so that whatever physical environment is created is in support of those learning activities and thinking, perhaps taking nouns out of the conversation, so that building, classroom, all those things are off to the side. Instead talking only in verbs, so we focus on the activities that we want to be able to house and support might help guide that conversation.

**Ashley Arhart:** I don’t know how involved in persona development or experience archetypes might anyone on the call be? I’m wondering if it’s a pretty reliable way to get consensus around who we are serving and what are the high value use cases and what are the archetypal experiences that any solution might need to address?

I’m curious. Has anyone kind of got a canonical set of personas or experience archetypes developed to date? It could be a way to nicely organize the various constituencies here to make sure that we’re all focused. Do we see the landscape and do we understand sufficiently from a human perspective who we’re intended to serve? I imagine that would be very useful.

**Dan Foreman:** Weeding out attempts is a pretty big, broad book of personas is the best way that I could describe it, of being able to provide some level of user base to test ideas against. How would this persona navigate through this system and what does that look like? And what's interesting when you start to develop that for education, is all of the other variables that come along with some of those personas and then how one piece becomes very different from one persona to the next. Especially for example, within the idea of remote learning and those different personas. So how does a person from a different culture react to the public education system? Some cultures will do whatever is told, others will not, and it's based on culture and what that looks like. This persona will just automatically do what everybody needs to do and this other persona will not, and it has nothing to do with race or socioeconomic, it has everything to do with culture and how you perceive school and perceive education. Even when we remove those nouns, how do you perceive learning and what does that look like? It's a fun exercise and a fun discussion to be able to even say, "Let's test this and let's pressure plate against it and see what comes out on the other end," because some of those personas do really well in some instances and some don't. And that's the fascinating part of education and that's also why I got into it.

**Joshua Elder:** That's the concept of personas too. I think it's pretty important, based on my observations over the last years of high school students in particular. Once the kids have reached an age, and it feels like that age is getting younger and younger, I have a three year old so I wonder what it will be for her, that they have their own personal device, there's a major shift that happens. When that major shift happens, you're competing against video games that are designed to hook you and bring you into focusing minutely on crazy amounts of detail. Thousands of developers work to develop these. What is Facebook if not a psychological machine designed to understand you better than you know yourself and push content towards you. This is what we're up against there.

The way I prefer to approach it is thinking about, what do they do that we can import into education? How do you make education that compelling, that kind of sticky? And making it that sticky in part is really understanding your users at that incredibly deep level. To Ashley's point, the way all these companies do that is by a huge invasion of privacy. They basically harvest your data, feed it indiscriminately to algorithms often, and then use that to build those models that enable it to be sticky. And sure, we can say we should ban those practices or should we adapt it? I think one of the things about this data stream of the school of tomorrow needs to really be this tailored, ideally secure, encrypted, digital model of a student's learning, their focus and engagement with screens, their focus and engagement with curriculum and their focus and engagement with the space.

**Ron Bogle:** For years, we've worked with a fellow named Joel Rose. And when he was with the New York City public schools, he created a middle school math program at that time called School of One, he's now gone non-profit and he has his programs all over the country, but it's very much like what Facebook does. The technology monitors every student, that technology understands how the students learn, how they learn different topics better or worse in different ways. They're not only learning about how the students learn, but it also is a monitoring tool to see how the students are doing. And so I'm interviewing Joel next week on this topic.

I want to bring my colleague, Kerry Leonard, onto the call to go back a few minutes to what you were talking about. And Kerry, talk a bit about what HKS is doing and how that might get folded into our "if you were to reinvent schools today" project.

**Kerry Leonard:** The persona development is something that I understand they've been doing a bit of, more so in their healthcare practice than the education practice, but we are trying to bring that into the moonshot project. What's interesting about where we're at in the moonshot project

right now has been said, people's heads are not in their game now. So to work with an actual school district in that regard is really tough. So the systematic level that you guys were talking about earlier, that's really where the moonshot project is now, with the hope that we are building the framework that we will then be able to apply to a specific school district in a couple of months time. But I think that some of these ways, the persona development idea, breaking down some of the systematic educational system ideas into its components as to what's necessary, what's needed, what is learning, what's education, that's really our goal in the moonshot project. But it's two phases, first to deal with this on a more abstract level and then secondly to apply it in a specific school district. So we have some great opportunities, but it's a challenge, as you know from what you're talking about.

**Ron Bogle:** I have a question, Judy. It's been explained to me that technology is no longer stuff, technology is now environment, or it should be. Environment creation is your stock and trade. How integrated is the design of the learning space with technology as you're approaching your projects in today's, not the pandemic, but in today's practice?

**Judith Hoskens:** I think the two work hand in hand, Ron. What's important is what the technology can do to support the learning within those spaces and to engage the, we don't like to call them teachers anymore because their role has changed, but the coaches or the learning guides in the conversation in order to understand what it is they're trying to do to figure out what is the best technology that will enable them to do that. And then how can the physical environment work with the technology to increase its effectiveness as opposed to competing against it or working against it and diminishing its ability to be as effective as possible. So we always said that technology is no different than a pencil, it's a tool. And the bottom line is, it supports the learning activities within our spaces. And we need to understand how best that technology can support those learning activities and aspirations.

**Ashley Arhart:** Judith, I completely agree with you. And there is another area of investigation that I'd be curious from your perspective to see if you've seen much progress in. There is the implementation of the tool and making sure that you've got the right tool for the job. What becomes really challenging though is, the speed of technology evolves so rapidly. If any of you are familiar with Stuart Brand, who did the Whole Earth Catalog, he's got this really nicely articulated concept of the durability of physical architecture and then the rapidity of evolution in technology. And when you're trying to put those two things together, there's inherent conflict. I mentioned this last time, and it's just an example of the unknown unknowns that you bump into as you're trying to incorporate technology. So yes, does it do what we want it to do, or is it capable of doing what we want it to do? And then can we create the right environment that will allow it to do what it's capable of doing?

Cameras are not especially novel technology, they've been around for a really long time. You can't put cameras in certain places in physical space and expect them to work. There's a reason sunlight does not penetrate the original Amazon Go floor plate. We had to run sunlight models to make sure that... This is celestial mechanics, right? We're running Google Earth models to understand where the sunlight is actually penetrating into the floor plate, because wherever it happened during those certain moments of the day, that space could not be tracked, because whoever walked through it would disappear. And it's the reality of bringing together these two different disciplines that don't have the same language, don't appreciate each other's difficulties, have remarkable domain expertise and occasionally the egos that go with that, and trying to bring them together to actually reinvent each other's worldviews can be a really challenging thing.

And then of course, with Amazon Go, we're trying to sell yogurt. We're trying to sell sandwiches.

Because it's all pretty innocuous in terms of the cultural impact of its failure or success. When you're dealing with education, it's obviously significantly more challenged and we have many more constituencies. So my question for you is, if you were to truly imagine for a moment that the way we design buildings isn't conducive to the possibilities that technology can unlock for us, what kind of structure or what kind of approach might allow us to, in some ways, set aside everything we think we know about what right looks like and actually truly get to this moonshot territory, inviting different people in and pressure testing what we believe we understand?

**Judith Hoskens:** Ashley, I think you hit the nail on the head with that last sentence, especially when you said, "Let's make sure that we have the right voices at the table looking at those questions," because I don't think we've had necessarily the right breadth of folks participating, who can contribute to those answers. Initially when we were talking with your questions that you mentioned, I was thinking more along the lines of making sure that we have the right capacity and infrastructure, because we know with the speed with which technology is changing, whatever we even design before it even gets constructed is often obsolete by the time it actually gets put into use. So making sure that we've got the ability to adapt as our understanding and needs continue to evolve.

But to your point, it's a much broader question, in making sure that we bring really those from the outside who typically have not been involved in that conversation to the table to make sure that we explore all the possibilities so that we can be as agile as we need to be moving forward, given the speed that things are changing.

**Kerry Leonard:** In the designing of spaces for learning, we get very precious about that space. And if you think about a strip mall, which is going to have the facade ripped down and replaced every five or six years, or you think about, I worked in a hundred year old building designed by Daniel Burnham and the interior had been remodeled four or five times, but it had good bones. It had a center courtyard that let in natural light and ventilation, it had a centralized core so that the open floor plate could be divided differently. This is an office space that used to have the crinkly glass doors and the transom glass. You can just imagine it from some Damon Runyon movie, but now all of a sudden, they just ripped out all the walls and it was an open plan work site. Now it's probably going to be changed for something different today.

So we get very precious about the design of schools and we get locked into these physical models and we don't realize that if you're always learning something new, then the space has to adapt and change. And that may be tearing out a wall. It may be moving a doorway here or there and being willing to build those into the structure and build them into how the building's designed and the cost of the building. Ashley, you've talked about the physical interaction of the environment with technology, which is something that as an architect never even kind of came to my mind, and I've designed a lot of buildings. So that's something really important. We're dealing right now with buildings that were designed with a permeable vapor barrier that now should be impermeable because of climate change and we're moving where the humidity level changes across the country. If you're not smart about this stuff and understanding the basic physical principles, and the same goes to education, it goes to technology, it goes to the environment, we all have to get a lot smarter.

**Joshua Elder:** Well, we have a lot of architects on this call. Just by chance, or ex-architects. You have people that have an architecture background. I think that means that there's a keen appreciation for how expensive architecture is. Buildings are expensive. And then running buildings is becoming increasingly expensive. Ashley, one of the things you put in your presentation was wearables, and I think a lot of people in education have been dealing with screens.

But if you are an Apple proponent, one of the things that Apple feels like it's clearly doing is deconstructing the experience. Even right now, I'm wearing these AirPods. They connect to my watch. The whole thing can be driven by extreme intelligence by a super computer that's in my pocket, which is my iPhone. And they're tracking fast to words like the glasses, the eye. What happens when students are wearing prescription lenses and you can't say, "Take off your glasses when you walk in the room," but you can also pipe virtual content in front of them. And finally, when you really wrap all that stuff together, that kit of parts is \$2,000, which sounds crazy. It's like, "We can't outfit students with \$2,000 equipment," but then when you think about buildings and how expensive buildings are and how costly making mistakes in buildings are, and technology is going so fast.

The smartphone or the iPhone didn't exist since 2007. Now it's 2020 and I have a sensor embedded device in my ears. I basically have a walking EKG machine on my wrist, that's just in 13 years. So how are we even supposed to design a building for 50 years or a hundred years without taking into context, but also rethinking where we put the value in education? Because this technology is also really disposable. You can buy it. A number of students could still use it the same way, a number of students go through that investment in a school building. And then, five years later when you need to change it, you're just changing a series of discrete parts and elements, which seems costly on a per case basis. But when you weigh that against millions of dollars spent on new school buildings, it probably starts to balance out a little bit more.

**Ashley Arhart:** I think one of the places that the architecture community could be solely responsible for leadership would be this idea of demountable, repartitionable, flexible. If we could figure out what those good bones really are, the ones that are worth preserving and conserving independent of the speed of change, then we figure out how to accommodate the rapidity of change and make that as lightweight a process as possible.

I will point to some systems that I'm aware of that I think are good templates for this, but at the same time, if we said that all we need is a different style of acoustical tile drop ceiling, I don't think that's where I'm headed. And that system of being completely flexible, you can get to it easily and it can be tweaked and enhanced and removed and adjusted over time. If you extended that beyond just the idea of the smart ceiling, what about smart walls, then smart floors? As soon as you start operationalizing all of the surfaces, and as soon as you give them more fundamental flexibility, then whatever's new and whatever's next can be very easily accommodated.

I think the other pressure is, all of this stuff is getting smaller. All of this stuff is getting more transparent. All of this stuff is becoming less tangible in terms of its infrastructure. I don't necessarily know what people are imagining. What are the implications of the neural implant that Musk came out with a few weeks ago? What happens if you're inside physical space? What are the limitations to that signal delivery? This would be interesting to know. And I'll share just a funny little corollary. RFID was a big deal, a few years ago. And I remember when Walmart said, "We're going to put RFID chips on everything and it's going to revolutionize." And I was like, "This is it." And then nothing happened, it was too expensive, but the practical challenges of the fact that, guess what? RFID signals really don't go through liquids especially well, so as soon as you stick it on a jug of detergent, it doesn't work. All of those little unknown unknowns about the intersection of signal and physicality, that's an engineering conversation.

There are all those sorts of implications. So wonderful, we've created an environment that allows us to be flexible and nimble with our digital technology. What is it actually doing to the human? And to your point from an attention perspective, from a cultural perspective, from just a human relational perspective, not to mention a biological perspective, what is it doing? This is a pretty fascinating,

multidisciplinary kind of technology and sociology conversation and putting those sorts of people together in a room and actually building a room that took all of those things into consideration and figured out what the new patterns of both architecture, human interaction and social implications are. Again, because I carry the banner for the ethical challenges of all of this, because I would be irresponsible if I didn't, given what I like to talk about, how do we make sure that that's okay to the people that are occupying all of those spaces? Just delivering a classroom that was thoughtful in all of those dimensions would be its own kind of crazy moonshot.

**Dan Foreman:** Throughout human history, the three most important things in education have not changed, it's relationships, relationships, relationships. How do you build a school system that enables more and better relationships between kids and parents, between kids and kids, between kids and adults, all of those different questions are there. And it's really a question of, how can we create a more conducive environment that enables that social aspect to be there? Because even with neural links and everything, you can put in all of this knowledge, but it lacks context. It lacks all of that reality.

Those spaces in education haven't changed in human history either. It is the watering hole, the campfire and the cave. And those are all still the reality, whether it's digital or in person, or in ancient history and in sitting around the campfire and telling stories. All of that is still the same. So how can we recreate those systems in a way that is more reactive and more proactive to build upon those relationships that are paramount within education? We can put in those sensors to know what students know and do not know, we can put in content to make sure that they are accessing it in the way that they know that they need to have and know this knowledge, but what we can't do is necessarily create a system that removes relationships. Because that's what we have right now. We have a system that's removed it and we have to put it back in.

**Joshua Elder:** One of the things that could start to change around this idea of the classroom of the future is, regardless of what these discrete pieces of technology do when you're elsewhere, what if the orchestration of them can only be activated in certain physical spaces too? So then it becomes, "Oh yeah, it's a screen when you're at home and you can still connect virtually and you can talk to your teacher." But as this distributed technology comes together, is there the same coming together into the room that used to be about 30 students having to look at a blackboard, but now it's completely technology enabled, where it's the learning suit, and you put on the learning suit and it's tailored to you. And if you're a physical, kinesthetic kind of learner, it tingles and does stuff. And if you're a visual learner, it's just all about AR. And then the room activates the experience around that. That's where it can come together with an architectural lens.

For other people, it might be a totally different experience. It might be like sensory deprivation, where for them, they're zoomed in only on one thing and they're actually being deadened elsewhere. Technology can enable multiple people to have the same experience in the same physical space.

**Judith Hoskens:** In a way that's uniquely tailored to how they would internalize it best.

**Kerry Leonard:** You have the ability to do that, but there has to be the desire to do that. There has to be the desire to recognize that each individual learner learns in different ways, and then needs to be treated as an individual. You have to want to do that. And we have a system that says they want to do that, but doesn't do that. And the classroom is the antithesis of that. Until we actually believe, or truly are committed to trying to create a learning environment for each individual, we're doomed to failure unless we get the beginning part right.

**Joshua Elder:** If we're going to recreate what we were talking about, there has to be more people

at the table to have that discussion and really say, “Well okay, let’s get to those deep philosophical questions of what is learning? Why do we do it? Why is it important? What does it look like for us as a society to educate not only our children, but also ourselves, because that is what creates society and humanity?” Those are really big, deep ethical questions, which goes back to Ashley’s point, it’s a very different thing than trying to sell yogurt. We’re creating something new and different in terms of what society is and where we’re going and for me, it’s exciting.

If we shift education, we’re shifting society and the trajectory of humanity by having that discussion around how we educate in place and time and what that content is on how to get there. But it also changes the idea of work. If we’re creating an augmented reality, virtual reality space where anybody can come in, we could recreate what that looks like. Well, that also enables us as experts to go into that space with students and be talking about what it is that we are interested in and what we were experts in, to be able to show that presentation in a new and different way to help them have a better understanding. Now I as a professional need to also have the time to be able to go and do that. So it changes our relationship with work and it changes our relationship with school, which again, we should’ve done a long time ago, but now we’re actually getting a chance to do, and I think that’s really important.

**Ashley Arhart:** Ron, you and I talked about the role of technology and education actually preparing students for the inclusion of technology in the rest of their lives. I guess the easy way to think about it is we need maker spaces. I will tell you one of the things that I found most exciting. My almost 13 year old son has pretty much officially taken the mantle of chief IT officer in my home, simply because he’s gotten access to stuff that frankly I didn’t imagine I was going to have to provide to him for a few years, and the remarkable education that he has given himself about how to leverage all of these things, part of me is thinking, “This is so awesome, I’m going to get him Unity and he’s going to be a 3D artist by the time he’s 17.”

The opportunity to begin to think of exposure to technology, involvement in technology as a continuum into professional life and making sure when we were confronted by things like job loss and watching increased automation challenges... Elimination of cash registers, only the number one job in the country. So as we watch everything impacted by technology, if these learners don’t get exposure to it, comfort with it, begin to orient to it, they’re going to be at a remarkable disadvantage not just while they’re being educated, but perennially. So that’s the other piece and this idea of blurring work, like the future of work and the future of education as a continuum, there is so much going on right now in the world of work around this exact same issue what does it mean to be asynchronous and distributed when we try to collaborate in a professional capacity?

Very extensible thinking I think and to what’s going on with children and educators, it’s all the same, it’s collaboration, and it’s knowledge transfer, and that doesn’t change independent of your age that’s still absolutely a requirement, so I wonder if there might be some interesting partnerships and industry where we look at some of the more innovative, distributed businesses to understand where they’re functioning. These issues of cultural acclimation, isolation, and again knowledge transfer, I don’t know how well they’re doing it. It’s obviously early, but there’s got to be some interesting learnings there to begin to imagine what would be fantastic for someone the day they graduate to move seamlessly into the professional continuation of these same patterns.

**Joshua Elder:** And it doesn’t need to be the day they graduate. We have even the students, like freshmen, like 13, 14 year olds posting things into Hexter. Which is basically putting them into a community where people are learning from each other, building things, learning how to use that technology and of course the technology is going to change, but what doesn’t change is problem solving bits and bites, understanding the kind of foundational elements and to a certain extent



having the freedom and the flexibility to say, “Hey, this piece of technology that someone put in my hands for a lot of money came together by a lot of engineering by a lot of people that were inventing it as they went off it.” If you understand the core pieces, you could invent yourself and be able to compete in the next generation of jobs.

It’s like a very freeing concept, because now you’re not constrained by, “I can only get the job that someone else has created for me.” Shouldn’t one of the things in education be creating people who can make their own jobs?

**Ron Bogle:** This has been a really exciting conversation. We will continue having engagements like this and I think you could go on for the rest of the day probably. We see you as a part of our knowledge resource and as we’ve already done with each of you, we hope to engage you in different kinds of ways, and I know that Josh is still listening and we hope that we’ll be formalizing some kind of a project with his foundation around these topics.

Between now and the end of the year, we’ll have a number of continuing engagements just to continue to peel the onion. I have a question I would like to ask you and that is, as an advisor, what do you think our next step should be? What other points of view should we be engaging? One of the parts of our DNA is diversity of opinion, diversity of points of view, we think that’s important. Number two is, people with passion and not just the people with power and passion, but also the people who don’t have power, but passion. Because they’re the users, they’re the folks in the field, and we need to understand from their point of view.

I talk about our program being in the “ideas” phase and then the “implementation” phase, but I haven’t really talked about what our ultimate aim is. Unless our economy totally collapses, we will be spending billions of dollars on school buildings over the next decade. My guess is that will be an important investment for the future of communities. We’re not just trying to leverage those investments, we’re really trying to create a national movement where we begin to create demand from local communities, where mayors, philanthropic leaders, education leaders, parents are saying, “I really like what they did in Pittsburgh, can we do that in Omaha? I really liked what they did in Tulsa, can we do that in Waco?”

This national movement is at the core of what our intentions are and so we create excitement and new ideas, then we find early adopters that will say, “Come into our community, work with us, we like the way that you’re thinking, we’d like to see if we could implement some of that in our town.” It’s a multiyear effort and we’re building it brick by brick. Dan, if we were to have a number of different kinds of convenings over the next three or four months, what would you advise our next steps that we ought to be looking at and additional points of view that we ought to be including?

**Dan Foreman:** I think that we have to talk to the kids. We have to get their point of view, we have to get their discussion, their ideas, and their reality around where their thoughts are. Bring them to the table to talk about it and have that discussion. I think the other piece of this is that we have to go to the communities that aren’t necessarily looking at building schools, right? We have to go to those communities that have been traditionally forgotten about or downtrodden by the school system itself and talk to them about what their needs are and what they need moving forward. To include them within that conversation so that the system itself is no longer de facto or segregating them out of society, they have to be a part of this conversation. I think that’s really the key to it because at the end of the day, what do school systems struggle with most?

Students from varied socioeconomic backgrounds, varied racial backgrounds, all of these different things and we have to meet their needs for the “lowest common denominator”, we have to meet their point of need and I think that’s really the reality of who we need to design for, to ensure their

success.

**Ron Bogle:** We had a great exodus from urban centers in the seventies that changed the nature of urban public schools forever. I haven't heard anybody talking about this too much, but I know we're about to face another exodus from cities as millennials can't afford a three bedroom apartment, they've discovered that the schools really aren't what they want them to be, so second tier cities and suburbs are likely going to be growing, but what does that mean for urban public education especially, and how does that leave them in terms of their resources and their support? I hope that I'm wrong about it, but I fear that we have another mass exodus underway already, regardless of the pandemic.

**Judith Hoskens:** I was even going to suggest, there was mention upon graduation and we need to include the high school students. We're actually pushing these questions down now to the elementary school students as well in order to get their insights, because sometimes they're the most liberated and creative folks that can contribute some meaningful fringe ideas that always spark something that takes us into the next door, which is always pretty exciting.

One other group is our policymakers. If we could get them in earlier into the conversation so they don't always fall back on their traditional rhetoric, but maybe they could understand the why, what we're trying to accomplish, perhaps we might gain a little more traction.

**Ron Bogle:** What level of policymakers are you talking about?

**Judith Hoskens:** We have our commissioner of education, folks who have a direct conduit to the governors. I'm not sure I'd limit it because they all talk about education, but they all talk in expressions that are so antiquated in faith and we need to get them to think a little bit more creatively as well.

**Ron Bogle:** Ashley, next steps?

**Ashley Arhart:** Selfishly, I would love to clearly articulate these personas and really crack the nut on what those high value scenarios are. So whether it's research that needs to be done or research that's already done that we could ingest as an organization to begin to solidify the problem space for lack of a better description. At least with my personal involvement, I feel like I'm getting to the point where it's like, "Okay, I really want a framework to begin to operate with them." And to Judith's point, I think you've got to anchor that on the insights of the individuals that we're serving. So crystallizing that and holding the rest of the conversations accountable to that, I know that the personas and archetypes are a way to structure those conversations. Then the diversity of opinions piece so it's so hard and COVID, I know this is possible remotely, it's just cumbersome.

But to have a human centered design workshop where we actually work through some of these things to try to again, put a finer point on the themes that we know we want to begin to action. The last thing that I might suggest, I'm wondering if a data science perspective would be valuable in this conversation or someone who can help us navigate the fundamental complexity and help us understand this is right now, this is five years, I think that would be a very interesting perspective to add. Then ethics, ideally with a technological bend, I think could be a very valuable voice to add to the conversation to. Just so that we're being thoughtful of the implications of all of our moonshot ideas.

**Ron Bogle:** So Ashley, the idea of a design charrette of some kind, have you or have any of you view identified platforms that you think are especially well designed to help support that kind of interactive engagement?

**Joshua Elder:** I think MURAL comes to mind. That seems to be one that most closely recreates the digital white boarding experience where you can scribble, draw, put Post-its and things like that. That's the one that seems the most baked at the moment.

I've used MURAL, we had it for a company wide discussion around things to be able to do it. You have to do some organization for it first, but it works out really well to be able to do a design charrette virtually and have that discussion, but it takes some training for those folks to be able to do it. So whoever sets it up has to really set it up well, but it does enable an entire organization to come together to have a design discussion around, "Okay, where are we going? What do we want to do? How do we want to get there? And what's the reality?" But I also wanted to drop two things into the chat. One is our learner variability process, to talk about how you can look at learner variability and provide opportunities to meet the students at their point of need and then the other was our research map, which is taking an attempt to glean through all of the research, education, and actually make it quote, unquote edible.

Those are two things that you can have fun with in terms of trying to get to a persona and you could see how big and broad those things get and we've only got the learner variability built out for a couple of spaces, but it's really getting to that core of how do we meet kids at their point of need when their need is so broad? And in terms of what you talked about for a platform, a lot of what we talk about in education is app smashing. There isn't one singular platform, it's really like smashing these things together to create and hack together what you need to do because we're educators, that's what we do.

**Ron Bogle:** Ideally by next spring, we'd like to be back on the ground in communities. But if we're not able to do that, we want to begin to take these ideas to the field virtually, one way or the other. So this will be helpful for us to continue to explore this idea of online engagement. Satya, what are your suggestions for next steps and points of view?

**Joshua Elder:** One of the things that's the hardest for us as builders of experience, builders of space, is leaving behind the project mentality and adopting the product. It tends to be a very human driven process so expert driven, human driven, and it's difficult to scale. Because sure you can say, "Oh, well everyone wants that team to design their school." But that team can only design so many schools in a given year. What you're describing in terms of the marketplace. The billions of dollars that need to be spent and will be spent it's like, what is a scalable response to that? That's the biggest challenge.

One of the things that Tesla as a company does really well is they promise these crazy ideas, but they deliver something that is really quite accessible at the end of the day. And they're not new ideas. Tesla's a battery company at the end of the day. They just made really good batteries and threw them into a car with neural links they shot SpaceX, the boring company, all of his other companies it's the same exact kind of thing where there's nothing particularly new about them, it's just that they're delivered and packaged with something that's really compelling and it's not vaporware.

I get there's the ethics, are we transforming the world in a good place? Has it done anything? All those things continue to remain, but I think that's an interesting approach. There's multiple streams, but one stream definitely feels like the classroom of tomorrow, the classroom of tomorrow with the building of tomorrow, the specific learning space, even if it's just for one type of learning of tomorrow, but really built out, demonstrable, and built on an underpinning where it can scale. It doesn't need to scale on day one, but knowing that, "Hey, nothing that's going into this thinking this demonstration, is not going to get better or have more possibility or adapt to the current near term trends in technology so that it can continue to be approachable and believable."

Then that becomes a selling mechanism even before you think, I want the school of tomorrow. Obviously it can be retrofitted which is nice, because then it means it can touch more schools. Even if you have to build a room inside a room to get something like that going, it becomes something that could also be prototyped and developed with the right group of people mixing design and technology together.

**Ron Bogle:** So Kerry, thanks for joining us. Any response to the conversation today?

**Kerry Leonard:** This has absolutely been great. As we looked at each of those groups, the students, the teachers, the community, and trying to create advocacy within each of those groups for the change that we're talking about, I think that it really is hammering home how this is a multipronged front that we have to continually be aware of and deal with and what this conversation and these other technology conversations that just made me so much more aware of is it's just another piece that as a designer of space, it's another area of expertise that I just don't know, and when you don't know something, you have to be aware of it because then you've got to bring in people who do know something about it.

So I think that one of the things that's happened over the last couple of conversations when we talk about the internet, technology as a utility, adding it to the space, and the things that has to go into certain low-voltage or other transmissions through the space, it's just another piece we've got to know, we've got to just be that much smarter about something that integrates into it, because when you get right down to when you're talking about buildings, there's two things: What are the buildings being built for? What's the human experience of what's going on inside? But then you have to physically build the space and both are pieces that need to be attacked in this issue.

**Ron Bogle:** Thank you all for joining in, I'm most intrigued by the idea of having a design engagement and I would look to the three of you to help us think about that as we move through that. Thank you all, have a great day, stay well.

