**ALICE STEINGLASS:** (Voiceover) It was an 8086.At the time, 8086wasalready out of date,but I had one.It wasn't untilabout senior year inhigh school when I realizedwhat I could do with it.I have a little brother, and so Imade it so that when he triedto log into the computer,it would just beep really loudly.And then it would put upthis huge ASCIIwarning error thatwas like "Intruder, intruder."

**ROBOT VOICE:** "Intruder alert.Intruder alert."

**ALICE STEINGLASS:** (Voiceover)"This intrusionhas been logged."It wasn't actually logged,but it looks scary.

**[MUSIC]**

**KEVIN SCOTT:** Hi, everyone. Welcometo Behind the Tech.I'm your host, Kevin Scott,Chief TechnologyOfficer for Microsoft.In this podcast, we're goingto get behind the tech.We'll talk withsome of the peoplewho made our modern tech worldpossible and understand whatmotivated them tocreate what they did.So, join me tomaybe learn a little bitabout the history ofcomputing and get a fewbehind-the-scenes insightsinto what's happeningtoday. Stick around.Today, I'm joined bymy colleague, Christina Warren.Christina is SeniorCloud Developer Advocateat Microsoft. Welcome, Christina.

**CHRISTINA WARREN:** Thank you so much. I'mhappy to be here and I'mexcited to learn moreabout today's guest.

**KEVIN SCOTT:** Yes. So, we're havingAlice Steinglasson the show today.Alice is the Presidentof Code.org, which isan organizationdoing stuff that'ssuper near and dear to my heart.So they are trying to teachevery child how to program,and they partner with teachersin K through 12acrossthe country andincreasingly acrossthe globe to try to helpmake computer science a partof the K through 12curriculum.

**CHRISTINA WARREN:** You have a lot ofsimilarities with Alice becauseyou also have an organizationthat has a similar mission?

**KEVIN SCOTT:** Yeah, I do. So, one ofthe things that I'vebeen trying to do,and like this podcastis a little bitof a reflection of that,is to show the truly diverse setof faces and tellthe diverse set ofstories that leadpeople into computing andwhat their careers look like.Because when I lookaround me and like Isee all of the amazing people whoare helping to buildthe technology thatwe all depend on,it's not this monolithic thing.

There are just somany different folks,genders, and ethnicities,and folks who came fromlike their parents werecollege professors to folks likeme who no one in their familywent to college,and it was an interesting quirkthat they ever foundtheir way into computing.One of the thingsthat we know bothfrom my work, theBehind the Tech, andmy family foundation is thatthe earlier that you setthe spark of interest ina child and themore of the barriers youget out of their wayto pursuing that isan interest and maybeultimately as a career,like the happier, moresuccessful they'll be.

**CHRISTINA WARREN:** Definitely. Ithink a lot of peoplehave an orthodox pathinto getting to tech.I got into it because I hadthat sheer force of will.

**KEVIN SCOTT:** Yeah.

**CHRISTINA WARREN:** But I think about kids thatI went to school withand if they'd hadthose opportunities thatwere accessible to themlike the way that code.org ismaking things accessible now,how different things might be.

**KEVIN SCOTT:** Yeah. Sometimesyour journey canbe sensitive, so to speak.So, like one thing cancompletely change your path.Like with me, I waslucky enough to get intoa science and technologyhigh school when I was a senior.If I hadn't had that experience,I don't know what my careerwould have looked like,whether or not Iwould have chosencomputer science as a majorwhen I went to college or maybeeven whether I wentto college at all.

So I think what that tellsme is let's do everythinghumanly possible to exposekids to as many ofthese opportunities as possible.It's not that I thinkeverybody shouldbe a computer scientist,but you should at leasthave the opportunity.

**CHRISTINA WARREN:** Definitely.

**KEVIN SCOTT:** Thanks forchatting, Christina.We'll reconnect laterat the end of the show.Coming up next, Alice Steinglass.

Alice is the presidentof Code.org.Her teams build curriculumtools and software to supportintroductory computerscience classesfor students from kindergartenthrough high school.They also partner witheducation and softwarecompanies acrossthe industry to runthe Hour of Code,a global movement reachingtens of millions of studentsin over 180 countries.

**[MUSIC]**

**KEVIN SCOTT:** Alice, welcome to the show.

**ALICE STEINGLASS:** Thank you.

**KEVIN SCOTT:** So, one of thethings that I wouldlove to start withis your journey.So, how did you getinto computing?

**ALICE STEINGLASS:** I'm so lucky to behere, but my journeywas not the journey thata lot of people had.I didn't play with computersfrom the time I was little.I didn't take them apart for fun.I actually got intocomputer science becausemy school taught it and-

**KEVIN SCOTT:** This is your high school?

**ALICE STEINGLASS:** Yeah, my high school.I didn't really know whatI was signing up for.I was into math, I wasinto other things.I said, "Okay, I'll try this.I hear you can makethings with it."I took a class and I loved it.I had a final project, whereI built a game called Snake,which similar to Tronwhat everybodybuilt it back then.But I finished it, it was fun.

I tested it, I tested it,and then my teacher ended upstaying up like all nighttesting it and found outthat the high scorecould go even higher.It broke if you had more thanlike five digits inthe high score and I said,"How did you find that?"He said, "We wereplaying it all night."What other class do you get tomake something where yourteacher plays it all night?

**KEVIN SCOTT:** Yeah. So, was itthe whole thing,was it the technical challengeof writing the code,was it the fact thatyou made something thatsomeone was a little bitaddicted to?

**ALICE STEINGLASS:** I think it's all of that.I think for me it's like thebest of Math andArt and English, and allof that put together.I always liked Math, but Math,most of the problems havean answer. There's no creativity.Here's a challenge, canyou figure out how tofind the tip-top ofthis curve or something?

In computer science, it hadthat same logical backbone,but the problems were open-ended.You're never done with aproject, and even in real world.When we're building software,we're never done with it.So, we're alwaysmaking it better,you can always improve it,and there's thisblank slate aspectwhere you can create something.I loved art, I love creating,and I think computer scienceis like creating both logic,and then it gets to moveat the end, which is cool.

**KEVIN SCOTT:** Yeah. It's super cool.So, when did you getyour first computer?

**ALICE STEINGLASS:** When did I getmy first computer?I had a computer when Iwas younger. I was lucky.My father's officewas selling offcheap computers, older computers.So they sold them tothe employees for I think it waslike $50. He got mean old computer.

**KEVIN SCOTT:** Wow.

**ALICE STEINGLASS:** It was an 8086.At the time, 8086wasalready out of date,but I had one and itjust sat in my room.I didn't code it. Ididn't program it.I used it. I'vewrote papers on it.It wasn't untilabout senior year inhigh school when I realizedwhat I could do with it.Once I figured outcomputer science,I did go back and code it,but I'll have to tell you.So, one of the first programsI wrote for it,I had a little brotherand I made itso that when he tried tolog into the computer,it would just beep reallyloudly. And it wouldput up this hugeASCII warning errorthat was like,"Intruder, intruder."Then, of course, it namedhim because there'sno other possible intruder inmy house other than my brother.So it would say, "Seth,you were trying to breakinto this computer.This intrusion has been logged."It wasn't actually logged,but it looked scary.

**KEVIN SCOTT:** Yeah. This is the thing thatreally amazes and interestsme about computing.There's this notion I thinkin the minds of a lot ofpeople that there isone stereotypical paththat you're likea nerdy teenage white boyand you get your machine whenyou're 13 years old, andyou start writingyour first code.This notion that you have to bea prodigy to get in to compute.But when I actuallytalk to people,everybody's storyis so different.

Anders Hejlsberg,who we interviewedin a previous episode,he didn't start codinguntil he was in college.So, some people early,some people late, andthe motivations areall over the map.Some people just lovethe creative aspect,some people love the factthat they can makethe machine do something.My kids love that. It's like,"Okay, I can tellthe machine what to do.I can't tell momand dad what to do,but the machinewill listen to me."

**ALICE STEINGLASS:** Yeah, absolutely.I think it was a littleintimidating for a whilebecause there's this languagethat goes around computers,and there's this barrier whereyou feel like if you don't speakthe language then youprobably can't learncomputer science.But the truth is youabsolutely can learn it,and the language isjust a false barrier.

I went to college.I heard all these guystalking about things likebulletin board systemsin the '90s, and it waslike a thing then.They were all on it,and I have never been ona BBS in my entire life.You think, "Okay, BBSis some technical world,and I can't possibly code ifI don't know what a BBS is."It turns out that a BBS isjust like Reddit,but in the '90s.

**KEVIN SCOTT:** Yeah.

**ALICE STEINGLASS:** You absolutely don't need touse Reddit to docomputer science.I mean, I love computerscience. I love the logic.I love the challenges.I love building.But to this day, I still have notdone BBSs, and it's okay.

**KEVIN SCOTT:** It's super okay.

**ALICE STEINGLASS:** Right, and it'sthis language thing.It's this languagebarrier that just,it makes you feel like youcan't but you absolutely can.

**KEVIN SCOTT:** Yeah. So, fromyour senior year where youtook your first computerscience course, what was next?

**ALICE STEINGLASS:** So, I went to collegeand at that point,I was already into it.Actually, that's not justme, that's really common.What you see is thatwomen who take APComputer Science inhigh school are times morelikely to take it in college.That's one of the reasonswe're fightingso hard to get computer scienceoffered in high school is becauseit helps dispel these notions.It helps make you feellike you can do it.So, I went to college and I knewI wanted to takeComputer Science.I majored in ComputerScience in college.I did the typicalstartup on the side.

**KEVIN SCOTT:** What was your startup?

**ALICE STEINGLASS:** It was dynamicfeedback.com.Yeah. We partnered witha professor who isdoing managementconsulting and workedon how do you help people take360-degree surveys tolearn how to be betterin the workplace.It was interesting, it was fun.

Like everybody's first startup,we totally underestimatedthe amount of codethat we need to getwritten to do what we thought wewould need it to do,we worked all night.Part of it for me wasthe experience oflearning that a companyis more than just code.We had to figure out things likecustomer support and lawyers,and I had to finda space.

**KEVIN SCOTT:** Really unsexy stuff.

**ALICE STEINGLASS:** Yeah. Where weactually go to sit.So, that was interesting.I ended up coming out toMicrosoft after thatand I worked on.

**KEVIN SCOTT:** How did you decide onMicrosoft? What year was this?

**ALICE STEINGLASS:** This was 2001.

**KEVIN SCOTT:** Okay.

**ALICE STEINGLASS:** I was working onthe first version of Xbox.

**KEVIN SCOTT:** So, super exciting.

**ALICE STEINGLASS:** It was super exciting,and then I got to workon the first versionof Xbox Live.What's weird is I'mnot a hardcore gamer,but it was still a reallyinteresting set of problems.I think, sometimes notbeing a hardcore gameractually helped.I was working onthe high score system for Xbox.I kept talking topeople and everybodyhad a way we shoulddo high scores.They have to worklike this becausethey work like this ismy favorite racing game.They have to work likethis because they workthis way in my favoriteshooting game.

Coming in as a neutralperson I said, "No,I'm going to look atall the games andunderstand how high scoreswork across everything."I went and played 50 games and learned abouthow high scores worked inevery game and talkedto a lot of people,and then, designeda system to allowany game on Xbox to usethe Xbox high-score system.So, it was interesting.

**KEVIN SCOTT:** Yeah.

**ALICE STEINGLASS:** Interesting work.

**KEVIN SCOTT:** Did you havea course charted as youwere going one thing to next?The reason I ask is, I think,everybody hassuch a different paththrough their careerin computing,and they're all goodand interesting.

**ALICE STEINGLASS:** I think in retrospect, I couldprobably tell you a story.But the reality of it isthat I think a lot ofit is happenstance,a lot of it is you don't know.

**KEVIN SCOTT:** Yeah.

**ALICE STEINGLASS:** You try something and you findout you like it or you don't.The one thing thatI would recommendto young people who are startingtheir career is to trysome different things.I think you can get stuckin one thing prettyeasily and not evenhave a plan thatthat's what you're going todo you just end up doing it.

The easiest time to switch andtry some new thingsis in your 20s,when you're not an expertyet in one particular field.So, one of the things I did dowas I tried different technologies.So, I worked in Xbox,I worked on Live, Iworked on Services.I was in charge ofall of the APIs forXbox Live across the board,which is really interesting.

I went from that to lookingat the Toolchain thatdevelopers use and workingon XNA before it was XNA.Then I went from there, I said,"What's the opposite ofeverything I've ever done?"Right. I've been workingon more the APIs,I haven't touchedenterprise software andenterprise services and I justwant to know whatthe other side looks like.

**KEVIN SCOTT:** Yeah.

**ALICE STEINGLASS:** So, I went toOffice, I went over toMicrosoft Projectpartially becauseit was just a verydifferent space.I figured this was a good time tolearn about a different space.I had a lot of peoplewho thought itwas the most insanething they'd ever heard.Right. Why wouldanybody leave Xbox onpurpose to go work on Project?

But I actually found itreally fascinatingand interesting.Understanding about how docompanies make purchases,and what does it mean to selland to enterprise sales,and how do we makeworkplaces more efficient,and what is businesssoftware look like.I thought it wasa really fascinating space.

**KEVIN SCOTT:** It sounds like one ofthe things that has drivena lot of your journeyis just curiosity.You've explored a bunchdifferent things, startups.

**ALICE STEINGLASS:** Yeah.

**KEVIN SCOTT:** Ton of different thingsat Microsoft.Were you the kid that wastaking all your mom's stuffapart, or askingfive million questions?

**ALICE STEINGLASS:** I mean, yes, butI think we all are.

**KEVIN SCOTT:** Yeah, you think so?

**ALICE STEINGLASS:** Yeah, I think kidsare naturally curious.I think we all want to learn.I think we all want to do that.I think there are barriersthat hold us back, and some ofthose barriers can feel morereal than they are,especially in tech.It's a booming space.There's a million jobs right now.Everybody's looking to hire.When I'm mentoring people I feellike talking toyoung people in tech.Sometimes they're afraidto make the choice,to try somethingnew or to change.But, it's a false barrierthey've put on themselves.

**KEVIN SCOTT:** One of the things that reallystrikes me aboutthe industry over the past,let's just say, 10 or 15 years is, I think, in some wayswe've gotten more complex.The number ofprogramming languages,the number of frameworks,the whole ecosystemis just bigger.But, in a very real senseit's easier than it ever hasbeen to go make somethingwith code or with technology.

When I was in college,folks had this notionlike, "Oh, my God.Coding is so hard,you have to go get this degree,you have to practice."To get really great atanything, all that's true,but my kids can gomake interesting thingsright now withouta Computer Science degree becausethe tools that theyhave are so powerful.Is that something thatyou're seeing helpingstudents get into computing?

**ALICE STEINGLASS:** Absolutely. There'sa level of relevance, right?

**KEVIN SCOTT:** Yeah.

**ALICE STEINGLASS:** When I was a kid,I made a game from my calculatorthat was [inaudible].I made a game and I also made itformula solver cheatsheet kind of thing.

**KEVIN SCOTT:** Right.

**ALICE STEINGLASS:** But helped you withyour physics formulas.This wasn't going to be thething that took over America.

**KEVIN SCOTT:** Right.

**ALICE STEINGLASS:** But it was popular,among all the studentsin my class. Right?I think there'sthe same thing today.We see kids making games.There are some ofthose things are justnot that complicated, right?

**KEVIN SCOTT:** Yeah.

**ALICE STEINGLASS:** So, students havethe potential to makethings that are definitely cool.They're not as complex asan Xbox game, but they're cool.But, you also seethat there's a lot ofspace for things thatare locally relevant.Some of these kids' apps,there's one withtheir teacher's face,you could feedthe teacher ice cream,but the teacher gota kick out of it,and it's fun, and it's cute,and it's relevantin that classroom.It's relevant in that school,your friends are allgoing to try it out.I think it gives you a tasteof something withouthaving to be an amazing artist,just like anything else,there will be steps.

**KEVIN SCOTT:** Also, talk a little bitabout what you do right now.So, you're the Presidentof Code.org.So, tell us a little bitabout what Code.org does.

**ALICE STEINGLASS:** So, we buildcurriculum, we doprofessional developmentfor teachers,we do advocacy work,but our goal is thatevery child should havethe opportunity to take acomputer science class in K12.I was shocked, especiallyfrom the tech industry.I was shocked to hear thatmost schools today don'tteach computer science,and it's not even thatmost kids don't take it,it's their schooldoesn't teach it at all.So, even if they wantto take it, they can't.This disproportionatelyaffects studentsin high need schools.It disproportionately affectsunderrepresented minoritiesand women who are discouragedfrom taking these classes.And the result is thatbecause they never getthis introduction in K12,it's really hard tostart after that.It's really hard tostart in college.So they may nevergo into the field.And even if they gointo another field,they don't have that backgroundin computer science.So, our goal is thatevery school shouldoffer this course,so that every child hasan opportunity to take it.At this point, we'rethe most popular computerscience platform curriculumin K12in the country.About 25 percent of studentsactually havean account on Code.org.So, we're reachinga lot of studentsbut there's a long way to go.

**KEVIN SCOTT:** Yeah. So, how early shouldwe be teaching kidscomputer science?

**ALICE STEINGLASS:** So, this is totallydifferent from how I started,but our recommendationis actually tostart in elementary school,and there's some good reasonsfor doing this.Let me start bytalking about how weteach about biology today,because I think it'sa really good analogy forhow I think about computerscience education.

So, every child when they go toelementary school gets tolearn that they have bones,they have a digestive system,just the basics of howdoes my body work.We don't do that becausethey're all going to bedoctors or nurses or EMTs.We do that because they're goingto live with that body forthe rest of their lives andthey should know how it works.When they go tomiddle school maybe theylearn more about it.In high school, a kid cantake Biology or AP Biology.Even after they takeall of those courses,all the way through K12,they're still not qualified.I don't trust a highschool student who'staken AP Bio to doanything to me.So, there's stillmore work if theywant to be a professionalin the field,whether it's a nurse ora technician or anything.

Computer science is the same way.Every kid is going to besurrounded by technologytheir whole lives.We have our phonesin our pockets,who knows where they're goingto be when they grow up.The same way we get toknow that we havea digestive system,they should understand,what is the Internet?What is the Cloud? What is data?How does this phone work?It's not a magic boxthat does magic magic.It's a computer, and whatis a computer, right?These are just basics that shouldbe part of our education system.

**KEVIN SCOTT:** Right.

**ALICE STEINGLASS:** So, I think of it ina very analogous way.In K5, we get toteach the students,what are these things?What is technology?Then, when they getto middle school,maybe they take more.If they're interested,they can takean AP Computer Science classin high school,and at the end of that, they'restill not a programmer.They're going to go on andtake a two-year degree.They could takea four-year degree.They can become a lifelongcomputer scientist.But, no matter whatthey do in life,it's useful to knowhow computers work.

**KEVIN SCOTT:** Yeah.

**ALICE STEINGLASS:** So, the same way we teachour kids how the body works,that's how we think aboutteaching it in elementary school.There's another reasonto start so young,and that has to dowith supportingdiversity in computer science.What we see is that womentend to become lessinterested in the STEM fieldsaround the middle school,early high school.In computer science, it's betweenabout 12 and 14 whenthey lose interest.So, what we want to do isreach them before that year,so that while they'restill interested inlearning these things,we can show them what it is,so that if they're interested,they can keep going.

So, there's a bunch ofpieces here, part of it isencouraging them,thinking that they'llbe good at it, gettingthat encouragement.If they're very confidentin their ability to do it,they're four timesmore likely to go intocomputer science or takecomputer science classesthan if they aren't.Girls, right now, oftentimes,they don't get this opportunityin elementary school,and so what happens is,when they're thinkingabout taking itin high school or middle school,they do it just basedon the zeitgeistof what people tellthem that they'regoing to be good at.

**KEVIN SCOTT:** Right.

**ALICE STEINGLASS:** Right? Unfortunately, what wesee is that they'reoften told theywon't be good atcomputer science.Teachers are two and a halftimes more likely to tella boy that he'll be good atcomputer science than a girl.And it's not becausethey're against it.These teachers aresupportive, they care,it's just these cultural normsare embedded in our society.

**KEVIN SCOTT:** Well, and kids are alsopretty good pattern matchers.One of the thingsthat I've noticeddisturbingly with my own kids,I've got a eight-year oldand a 10-yearold right now, and very,very early when they werethree, four years old,they would look aroundat the world and startmaking theseclassification decisions.It's okay, this is a boy thingand this is a girl thing,and this is without anythingin their household tellingthem that thing A and thingB has a genderassociation with it.

It's just themsorting things out.One of the things I loveabout what you all aredoing is there'sthis bootstrappingproblem that I thinkyou have to solvewhere we just need more three andfour-year-old seeingseven and eight-year-oldsbeing successful in acomputer science curriculum,so it helps themdecide to do that whenthey're just a fewyears older and upthe entire stack.

**ALICE STEINGLASS:** That's absolutely true,and you see it when yougo into the classroom.So, you take a bunchof second graders.They don't have a stereotypeyet that computerscience is a boy thing.

**KEVIN SCOTT:** Yeah.

**ALICE STEINGLASS:** Right? They'retoo young to thinkcomputer science is a boy thing.

**KEVIN SCOTT:** Yeah. They probably don't evenknow what computerscience is, right?

**ALICE STEINGLASS:** Right. They see like,"Hey we're going tomake some stuff today,"and they're so excited about it.Our classes, when you look atthose elementary school classes,they're half female,the kids are all excited,they're super into it.We have a little tool at the end,what we call our funnel meter.They can give it a thumbs up,thumbs down at the endof every activity,and the girls actuallygive it higherfunnel meter ratingsthan the boys do.

The girls are into thisand they're into it young,and so when we can get thembefore they've gotthose stereotypes,they can make a huge differencein terms of givingthem the momentum tokeep going afterward.I see the same thing yousee with my own daughter.But, she's also excited aboutcomputer science because shedoesn't see it as a boy thing.

**KEVIN SCOTT:** Yeah.

**ALICE STEINGLASS:** Even if you lookback in history,computer science usedto be a female thing.

**KEVIN SCOTT:** Yes.

**ALICE STEINGLASS:** It's just flipped, right?

**KEVIN SCOTT:** It's about fromthe very beginning,the first programmer was a woman.

**ALICE STEINGLASS:** The first programmerwas a woman,Ada Lovelace about 100 years ago,and then you look in the '50s,in the '40s, computers werewomen and computerscience was a female,the stereotype wouldhave been women.

**KEVIN SCOTT:** Yeah.

**ALICE STEINGLASS:** Then, it's men, and wecan get back to aplace where it's both.We can get back toa place where welook at it and we say, "No,no, computer science, it'ssomething that everybody does.There's no reason it'sone or the other."But, it's not just teachers,it's also parents, it'ssocial, it's friends.

Let's say there'san after-school program,you can just see this.Mom says, "Oh, look,some after-school classes.Bobby, looks like there'sa coding class afterschool on Thursdays.Do you want me to sign you up?"Right? "Emily, it looks likethere's a dance classon Tuesdays,do you want me to sign you up?"It's so easy. They'renot thinking about it.They're just trying to findactivities for their kids.

So, when we do it after school,what we see is that same skewwhere boys are more likely toget signed up after schoolfor computer science.If we do it in school,we don't see that.So, that's why we want tostart in elementary school.

**KEVIN SCOTT:** Yeah, which I think isawesome becausesometimes when you'refocusing later,it's just really, really hard.I had this friend call me up.He was like, "I'm tryingto get my daughter tostay enrolled in herAP Computer Science class."She was a senior inhigh school then.She just didn't wantto be in this classbecause she wasthe only girl in there.

**ALICE STEINGLASS:** That's so hard.

**KEVIN SCOTT:** And this isn't Silicon Valley.

**ALICE STEINGLASS:** Yeah.

**KEVIN SCOTT:** What wound up working wasconnecting her with a bunchof really successful womencomputer scientists,software engineers,who were havinga really great time intheir career. And she stayedin AP Computer Science class.She went off to university.She majored in Computer Science,dean's list student, isnow in a professional,so she's a software engineerat a tech company.And that whole thingis hard to scale.What you would want to dois do that for everyone.But, it's so hardwhen you're startinglater, whereas starting earlieryou can maybe get to the pointwhere just naturally you'renot having a class full of boysin 12th grade in this APComputer Science.

**ALICE STEINGLASS:** Absolutely. We just hireda woman for our engineering team acouple of months ago who'sstudying computerscience in college,was one of the only womanin her class,dropped out because shefelt she didn't belong,but liked computer science.She liked it. Shejust didn't feel sheshould be in it becausethere weren'tany other women in it,and finished collegestill regretted it.Still wanted to docomputer science.Ended up doing night classes andside classes andlearning it after work,eventually did a boot camp,learned computer science,moved into the career,worked as a computer scientist,and just recently joinedour engineering team.

**KEVIN SCOTT:** That's awesome.

**ALICE STEINGLASS:** But, you knowthat's the hard way.

**KEVIN SCOTT:** Yeah. That's the hard way.

**ALICE STEINGLASS:** It would have beeneasier if she had just beenable to stay in those classesin the first place.

**KEVIN SCOTT:** Yeah.

**ALICE STEINGLASS:** Yeah.

**KEVIN SCOTT:** Tell us a little bitabout Hour of Code.

**ALICE STEINGLASS:** So, Hour of Code hasjust become a phenomenon.It's exceeded our expectations.If you're not inschool right now,you may not have heard of it.If you're in school,you probably have.It's like Earth Day,but for computer science.

**KEVIN SCOTT:** Yeah.

**ALICE STEINGLASS:** It's a national holiday.I don't have the exact numbersor the number of whichschools participate.But, as far as I can tell,everybody I talked to, theirschool seems to be doing it.

**KEVIN SCOTT:** I realized there wasa bigger thing thanI thought when Steph Currywas posting on LinkedIn abouthim doing his Hour of Code.

**ALICE STEINGLASS:** Oh, yeah. Oh, hey,if you're into sports,then Steph Curry did it.If you're into other things,Barack Obama's done it,Justin Trudeau's doneit, Dave Cameron,that we've had abouteight world leaderswho've participated.We've had musicians. We'vehad actors, actresses.But, I think the mostimportant thing isthe schools andthe teachers are doing it.

**KEVIN SCOTT:** So, tell folks what theHour of Code actually is.

**ALICE STEINGLASS:** So, the idea isthat I can tell you,until I'm blue in the face, thatcomputer science is going tobe fun, that you can do it.There's nothing likeactually trying it.So, what we do iswe get students andteachers to spend one hourtrying computer science.We've built scaffolded activitiesthat make it easy for beginners.

In one hour, they canactually build something.You could actually builda little, mini game,something you can shareand be able to say,"Hey, I did that," andyou actually learnedsome computer science.I mean, you don't learnall of computer science,it's one hour, but youlearn a concept or two.You might learnabout if statements,you might learn aboutloops and how they work.So, the students get to tryit, they get to try one hour.It's a great introduction.

We did a survey last yearlooking at thousands ofstudents before and afterthey tried the Hour of Code,and what we found was thatit does increasethe amount that they say,"Hey, I like computerscience or I'minterested in computer science."But, was especially cool forme was that the groupthat was themost impacted by doing thiswas high school girls.

High school girls were probablycoming into it thinking,"Hey, this is notsomething that I'm into."They try it and thenthey're into it.At this point, we've had million hours ofcode around the world andit's been in 180 countries,it's in 50 languages.It's a huge event every December.We do it for CS Education Week,and basically it's just a way tointroduce students aroundthe world to computer science-

**KEVIN SCOTT:** That's incredible.

**ALICE STEINGLASS:** -by actuallybuilding something.

**KEVIN SCOTT:** Yeah. It's really incredible.

**ALICE STEINGLASS:** Yeah. it's not just us,this is one ofthose things that wedo in partnership withabout 200 different companies andorganizations that runit and do activities.Microsoft has partnered with uson the Minecraft Hour of Code forthe last few years which is our most popular Hour of Code activity,and students andteachers love it.It's an opportunity touse these charactersthey're familiarwith from Minecraft,but to learn computerscience with them.

**KEVIN SCOTT:** So, what's the dreamfor Code.org?If you had a magic wandto wave over the world,and you can achievewhatever success youwanted to achieve,what does that look like?

**ALICE STEINGLASS:** I think it lookslike every childhas the opportunity to learncomputer science and thatthe students who arelearning it look like the world.That the diversity matches,so that when we look atthe workforce 20 years from now,whether somebody is in educationor marketing or retail,they're going to beusing computers.It's going to bea part of their livesand everybody gets to understandthings like how the Internetworks and how computers work.

And that when we lookat the tech workforce,that the students who areprepared to join this,that they look the population,and I get to look aroundand half my team is female.I want to state that we'reworking on one partof the problem,which is the K12education.That won't solvethe tech workforce by itself.There are definitelyissues around hiring,retention, workforce bias,all of those other pieceswhich also need to be solved.But, I think if theywe're working onone really important partof the problem.

**KEVIN SCOTT:** Yeah.

**ALICE STEINGLASS:** We do need to bringmore diversity intothe tech workforce and Ithink education is critical.

**KEVIN SCOTT:** Yeah, I think it really is.The thing that keepsme up at nightabout our futureis I just look atevery year technology hasa bigger and biggerimpact on the worldand the trajectory tells us thatthat's going to continuefor the foreseeable future.And in a whole bunch of different waysyou want as many people andas representative a set ofpeople as possible participatingin the creation ofthis technology.You want all perspectives,all backgrounds,all ethnicities, you wantit to look like the world,which I think was beautiful waythat you said it.

But, you also wantsociety at large to be wellinformed because a lot ofthe funky stuff that's goingon today we're going to have tomake an increasingly largenumber of decisions,policy for instance,in ethics and the laws thatwe pass and the regulationsthat are put into place togovern the intersection ofsociety and technology.You want people super wellinformed when we'remaking those decisions,and you want themrepresented--it's like everybody.

**ALICE STEINGLASS:** Absolutely. I mean,it's just criticalthat in this world,everybody has this opportunity.

**KEVIN SCOTT:** Yeah.

**ALICE STEINGLASS:** At Code.org, whatwe do is we make itas easy as possible forschools to teach this.We offer free curriculum,we offer freeprofessional developmentfor these teachers,we help teachers who don'thave a computerscience background.

**KEVIN SCOTT:** Yeah.

**ALICE STEINGLASS:** Because the teachers don't.I mean our schoolsdon't teach it.They didn't learn it whenthey went to school.

**KEVIN SCOTT:** Yeah.

**ALICE STEINGLASS:** So, giving the teachersthe opportunity to learnto teach computer science.They're History teachers,English teachers, Math teachers.

**KEVIN SCOTT:** Learning to teachcomputer science,as you pointed out earlier,is different than evenknowing computer science.

**ALICE STEINGLASS:** Right. It isdifferent. That's funny.We actually find that it's notthe computer scientists makethe best teachers ofcomputer science.It's teachers teachcomputer sciencethe best becausethey're good teachers.What we've found is thatexperienced teachers withno background incomputer science makeexcellent computerscience teachersbecause they know how to teach.

**KEVIN SCOTT:** Yeah.

**ALICE STEINGLASS:** If we give them the tools andthe resources and the curriculum,they're fantasticin the classroom,and their studentsdo really well.So, that's what we'reworking on doing.I mean, these schoolsteach computer science.

**KEVIN SCOTT:** What are some ahasthat you've seen overthe past several years trying toteach computer science kids?

**ALICE STEINGLASS:** Oh, there are so many.I'll give you a personal oneto start out with.So, I came intothis thinking I wasa good computer science teacher,and it turned out surprise,surprise, I was not.I love teaching. I thinka lot of people like me,they enjoy it. It's fun.I taught in college,I started a programto bring studentsinto local schools toteach computer science.

I was TA, I wasa teacher, and I alwaysgot good reviews.I always gothigh scores on thewhich TAs are the best,which teachers are the best.So, I had this misimpressionthat I was good at teaching.It's been fascinatinggetting to work witha bunch of pedagogyexperts on how do youactually teach becausewhat it turned outwas that I was entertainingin front of a room,which is different frombeing a good teacher.

**KEVIN SCOTT:** Yeah.

**ALICE STEINGLASS:** So, when we teach networking,we have a thing called ABC CBV,which is you do the activitybefore the concept.

**KEVIN SCOTT:** Yeah.

**ALICE STEINGLASS:** You do the conceptbefore the vocabulary.It's not about a teacher standingin front of a room lecturing.It's about letting kidsdiscover it on their own.The art of teaching is steppingback. It's doing less.It's not being entertaining.It's not being this personwho's like super energetic,exciting person to watch.It's about craftingexperiences where the studentis going to get to figureit out without youbeing involved.Because if they figureit out themselves,they're going to remember it.

So, let's say, we'reteaching TCPIP.We pair them up and we say, "Hey,you guys got to figureout how to sendsome messages back and forth."We have this little softwarethat lets themsend these little packetsof messages back and forth.But, our software is going todrop some of those packetson the ground.We're just going to lose them.We're also going to sendsome of them out oforder because that'show the Internet works,and they've got to figure out,"Okay, I'm sending you messages,some of them come on out oforder and some ofthem get dropped.How am I going todeal with this?"

I don't care howthey deal with it.Some of them will sendfive copies of the packetbecause there isgoing to be like,"Okay let's justkeep sending thembecause they're goingto keep dropping them."Some of them will number them,some of them willsend back [inaudible] to say,"Yeah, I received or didn'treceive your packet."It doesn't matter whatmethod they come up with.The important partwas that they reallyunderstood the problem becausethey tried to solve it.Then, after they've donethat we say, "Okay,that thing that you just did,that's called a protocol."

**KEVIN SCOTT:** Yeah.

**ALICE STEINGLASS:** The protocol the Internetuses is called TCPIP.Now, what did the teacherdo in that whole lesson?They facilitated thecommunication with the students.They got the students paired up,they helped a student who wasblocked get to that next step.But nowhere in that lessonthat the teacher standup in front of the room anddraw a picture of TCPIP.

**KEVIN SCOTT:** Yeah. I've hadsimilar sorts ofproblems with my kids and itwas the same thing for meat my goal in life was to bea computer science professor fromage to whenI left academia.I taught undergrads for years,I taught grad students,and now I'm tryingto teach a couple ofreally young children aboutthese computer science concepts.

And so I'm sitting down ata restaurant and teachingthem about binary search,and that will give a total win.I think they got it rightaway because I made itinto a guessing game.I'm going to teach youa trick for how youcan get someone to playthis guessing game withyou where you can find thenumber that they guess betweenzero and inseven steps or less.You know they're like,"This is great."

But, then I wanted to teach themhow to do search,and there are likethese little thingsabout teachingsearch that sort of hard.One of the thingsis, if you just takea bunch of numbers andwrite them down and say,"How would you sort these?"One of the thingsthat's interesting ishuman beings can see all ofthe numbers at one time.So, they're cheatingin a sense whenthey're imagininghow they're sorting.

And so I devised this thingwhere I could give thema bunch of blockswhere the numbers on the blockswere covered up and,so they could go examinethe number on the blockone at a time,which is how the computergoes and does things.I just really realize that I wasall kinds of wrong about how goodI was going to be at teachinglittle children thesecomputing concepts.

**ALICE STEINGLASS:** Actually, the way youended up doing it isvery similar to how wedo it in our class.So, what we do is we givethe kids decks of cards.They're only allowed tolift two at a time tocompare them because that'show a computer would do it.

**KEVIN SCOTT:** Yeah.

**ALICE STEINGLASS:** They can't look atthe cards when they flip on.They show him tothe other studentand the student sayswhich one's bigger.

**KEVIN SCOTT:** Yeah.

**ALICE STEINGLASS:** So, they get to pick two ata time and see,and then actually,one of the thingsthat's cool about thatand a lot of our lessons isthey're not on a computer.They're actually usingphysical cards in the classroom.

**KEVIN SCOTT:** Yeah, which I thinkit's actually great.

**ALICE STEINGLASS:** It's great. Yeah. Because youknow when you saycomputer science,I think, sometimespeople think, "Oh,it's all on a computer," andreally about half of our lessonsare off the computer,and it's about interactingwith other students.It's about internalizingthe concepts by working withthe actual concepts and the logicoutside of the contextof the computer.

**KEVIN SCOTT:** Thank you so muchfor doing this work.I couldn't be a bigger fanand I think you guysare having an enormous andamazing impact on the world.Thank you for taking timeto be on the show today.

**ALICE STEINGLASS:** Oh, no, thank you,and thank you forMicrosoft's support.

**[MUSIC]**

**KEVIN SCOTT:** Well, thanks for joiningus on Behind the Tech.I'm back with my colleague,Christina Warren.Some of Alice'sinsights were prettyawesome. What stood out for you?

**CHRISTINA WARREN:** So, one ofthe interesting thingsI thought aboutyour conversation with Alice,and we talked about thisa little bit before,was hearing her storyand hearing aboutthe atypical journey and howshe got involved with technology.

**KEVIN SCOTT:** Yeah, I think there'san incredibly diverse setof folks in tech,just sort of basedon the path thatthey took to getinto the industry.I've had the greatpleasure of beinga computer scienceteacher and beingan engineer and engineering leaderfor a really long time now,and have just comeinto contact withtons and tons andtons of engineers.

Each one of their storiesis a little bitdifferent and some are sortof stereotypical image.But there are all sorts ofother folks like Alice,who discovered computer sciencein their senior yearof high school.There are some folks whodiscover it in college.There are some folkswho actually go off andhave a career insome completely different thingand decide that theywant to get intocomputing later in their lifeor later in their career.

The thing that I'mseeing now is that,it's increasingly easier to makethose transitions becausethe tools and capabilities andsort of richness ofour programming environmentsand the way that we buildsoftware just sort of allowsmore and more people to getbootstrapped moreand more quickly.Part of that's a byproductof the open source wave ofsoftware that we've beenwitnessing overthe past three decades.

**CHRISTINA WARREN:** Yeah, definitely. One ofthe things I love aboutcode.org is that,even if the kids who aregoing through thisprograms, even if, say,they don't choose to studycomputer science in college,they still have that foundation.

**KEVIN SCOTT:** I think it'sa really important thingthat everyone in societyunderstands a little bit aboutcomputing because computingand technology ishaving a bigger and bigger impacton all of our livesall of the time.So, being informed aboutsome of that stuffand having an ideain your head about how thingswork is going to helpyou be a better citizen.

**CHRISTINA WARREN:** I feel like that'sthe only way thatour products getbetter is by havingmore diverse viewpointsand different types of peoplecoming into doing things,because you neverknow what someone'sperspective is going to bring.I love what code.org is doingin bringing more and more peopleinto the fold andletting them know,"Hey, you can dothis and it's fun."

**KEVIN SCOTT:** Yeah, tons of fun actually.But I have a biasedopinion there.I think that wholepedagogical framework forteaching computer scienceto kids is really great.I think it's actuallygoing to prove to begreat not just forkids but for adults.

When I was a lecturer atthe University ofGöttingen in Germany,I was teaching a classon programming languages andthe theory of computation,and some of that isdifficult material to teach.That certainly challengedmy ability as a teacherespecially becauseI was lecturing inEnglish to a class fullof non-native speaker.

**CHRISTINA WARREN:** Yeah, I was goingto say, so you'redoing this in Germany,teaching English and thenthere are non-native speakers,although I guarantee that theyunderstand Englishfar better than Iunderstand German, but still.

**KEVIN SCOTT:** That was alwaysembarrassingly true for me.Their English was waybetter than my German.In some ways, it'sa different challenge toreally bring someone upfrom the ground to howdo you get over this beginningset of conceptual hurdlesso that you can then getinto the computerscience curriculum?

By the time I got them,they knew sorting algorithms,they knew if-then-elsestatements and while loopsand all of the basic thingsof how you construct a program.I think at least untilI had kids of my own,I took for grantedhow difficult itis to teach the "quoteunquote" simpler stuff.I think the lessonfor me is appreciatemy teachers even morethan I already did.We should all appreciatethose teachers who are out thereloading knowledge into the headsof our future fellow citizens.

**CHRISTINA WARREN:** Absolutely.

**KEVIN SCOTT:** Well, thank youso much, Christina.This has beena great conversation,and I look forward to beingback with you againin the next episode.

**CHRISTINA WARREN:** Me, too. Thanks so much.

**KEVIN SCOTT:** Next time on Behind the Tech,we'll talk with Andrew Ng,the co-founder of the GoogleBrain project, Coursera,and most recently,deeplearning.ai and Landing.ai.Andrew is one ofthe most influential leadersin AI and Deep Learning.Be sure to tell your friendsabout our new podcast,Behind the Tech, and tosubscribe. See you next time.

**[MUSIC]**