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[Captioner Standing By]

Welcome and thank you for standing by. All participants are in a listen only mode until the Q&A portion of today's conference. At this time if you like to press a question you may press*one. Today's call is being reworked courted -- recorded and if you have any problems please reconnect at this time. Jeffrey Forbes you may begin.

Thank you. I have known Dan Garcia for a while, I met him back in 1993 when I was a respective graduate student at UC Berkeley. That was a long time ago. I think we remember, I distinctly remember Dan passed computer science and it made the field seemed really exciting and engaging in something that you want to do. I did end up going to Berkeley and we spent a lot of time together. Dan has continued, he is now tenured teaching faculty at Berkeley. One of the things he has done there is he has continued to really work on idea of how to you engage students and one of the things he has done is he was inspired by the keynote address. [Distant audio]

He really try to get at this idea of how to we as faculty and how to we really engage and what makes Peter science interesting. -- Makes computer science interesting. Dan turned to start his own course and [Distant audio] that is what he's want to talk about today. He was trying to change this, [Distant audio] to dry, difficult and irrelevant instead to something that is engaging and really transformative. This new course [Distant audio] [laughter] in an effort to really transform education by bringing rigorous academic and engaging computer science to 10,000 schools taught by 10,000 [Distant audio] teachers. Spec thank you very much Jeff.

He was amazing. [laughter] how many of you know in the room 100% about the distillers lecture? I want to talk about CSN and are nationwide PD efforts and about going off-line and our experienced and how all feeds together. I am borrowing these slides from Jan and if you knows that she is ill today but she sends her regards and I'm going to do her slides are I will do my best Jan impression for the next 10 slides. [Distant audio] We are not hitting these remarks. We are not producing enough graduates, they don't look like the rest of the country and we have no engagement with K-12. [Distant audio] It is not even filling this cylinder and what you are finding with the folks at Google and Facebook as they are converting to smart business majors and they're going international and try and open up pieces and they want to get the flow of talent into the jobs are getting ready to jump -- ready to go.

We should really still be doing a better job. -- The jobs we're talking about our amazing. This is a CNN Money graph of the best jobs in America and the ones circled are relevant to computing. I think if I squint this is a systems engineer and these are the best jobs in terms of flexibility, salary, mobility and all the things you used to measure quality of jobs are at yes, the time we need them, where is the student interest? It is not there. This is a graph of the percent of folks intending to major in computer science, and over the course [Distant audio] goes to 82. Up around the code -- the personal computer era and the.com bubble that came and went and look at where we are, the lowest. It is a scary thing and we need to work on that.

One of my hats that I wear is [Distant audio] will try to address this and have remitted Dutch have tried to admit -- and have tried to remit this -- [Distant audio] we were following since the bubble. Some folks have done better than others. You hear about it mostly on the coasts. At Stanford their numbers are going through the roof. There are many people and their computer science program and as much as another history and we have Berkeley just this past fall, 1000 students once major which is an incredible number three. We turned away 100 people. -- We cannot support 1000 people, we can try 800 which is the biggest impact on the public cannot do 1000. We're doing very well on the coast. We will see later propagate back into the middle.

Terms of representation we don't see people going into computers that look like us. These are the people taking the advanced placement exam and this is the gender breakdown and you will see the biology, [Distant audio] and calculus is about balanced and this is 19 to 81. I understand this is the worst gender balance in the history of the AP. They have never had a year where it was worse than [Distant audio] and that is scary. We were bad for a while but now we're going up. My understanding we are as bad as it is ever been. We are not doing a great job in terms of engaging young women in high school to think about this and take this course.

In terms of how does that affect folks in college, this is starting in the 70s, a 40 year low. Where are folks or women going to spend college? [Distant audio] The one that continues to rise and rise and rise, if you are a start -- a stock person by five, that would be biology. [laughter] followed by [Distant audio] and look at math. It is great. They are doing fine. Physical sciences climbing and climbing and climbing, they are doing great. Now it's to these last two.

Engineering is the lowest one. Engineering starts really far down and climbs as Whittier and computer science starts prodigiously well, and right about now it is at 20% and that is the numbers were see our major department as well. 20% of [Distant audio] an 20% of us at the undergraduate level. There's a smaller piece of it. The staff in yellow represents 28.5% of the population. 20.5% of the CS majors [Distant audio] and we call this the dwindling pipeline were folks fall out of the pipeline at some point. They like computer science and undergraduate and they want to go get a job. Certainly there are fewer people getting masters degrees and undergraduate degrees but they have changed what they look like.

Folks we need to change with the program, their falling out and they say they need to get a job because I have other concerns. The pipeline is 1/10 of the numbers. [Indiscernible-low volume] looked at the unified school district. They did a deep dive into looking at the middle income school and an underserved school. The computer science courses or look that at these three schools and what it meant and they were dysfunctional for three different reasons, but certainly

dysfunctional and aggregate. Even if it is the wealthy school, you are not engaging, often your teaching PowerPoint and Internet search. [Indiscernible-low volume]

The reality Jan pushes for an eyesore to subscribe to is that we need to focus on the high school piece and fix that. And K-12 the future doesn't look right because this next generation isn't engaged and getting great construction. [Indiscernible-low volume] what you're seeing, everyone is taking more AP exams. -- [Audio distortion] One that is constant even the population is growing his computer science. Also people are not taking it and people are not engaged in this course and there is something wrong. But talk about that.

How do you fix K-12? I've propose a multi-department approach. Let's look at that AP course. We will table that for now but that is not the focus but the focus of this initiative is to really think about that course being fine, it is not great at it is fine, but the language is Java, it is hard to go from no computing experience in this course to doing well and that course so wouldn't it be great if you could introduce a course before that that had more prep than just programming in the professional language questionnaire? It is still rigorous and it is still AP but it approaches the broad perspective of what computing has to offer. Set introduced the computer science press was about his idea of this message and it drives all of my work.

I'm on the advisory board for this so thinking about this amazing course really does take a broad perspective of engaging kids in learning and programming and that is still part of it, he cannot just read about it, have to do it and get your hands student -- get your hands duty. But also thinking about the big ideas. We have six great big ideas. This drives it and that is just a framework and it is a principle to live by. Have substantiation to say of course I wonder try to attack that. [Audio distortion] Adding this new AP course will continue to make this national change. This is the goal of LE unified. How can we get engaging, rigorous computer courses and to roughly 23,000 high schools? Can we get it into 10,000?

It is a really big thing to tackle the first thing and if we get into 10,000, maybe 10,000 is really high and urban sensitive places. We can do it in terms of representation as well as numbers? They are all engaged. The part of his goal is to introduce students to an amazing and rigorous course and if it is the last course they taken computing they will be happy because it might just be this one chance and there is this just one shot.

The goal is to get them engaged by 2050. -- 2015. This is a pilot at the University of Washington this is from the University of San Diego. We were chosen as one of the five national pilot. We're excited to share your work and that is the preamble. This is an important slide. Tiffany Barnes have the right side of this. [Audio distortion] [Distant audio]

Fall 2010. We were doing this and it was outstanding. Tiffany got wait until the spring so she got to watch everything we did, everything that didn't work, all of the trials. [Audio distortion] Tiffany looks out into the crowd as this got me going for whiteboard and design a perfect course. But for coherency what course look like that one. And Dan she said your course is exactly what I was assigned, can I borrow your materials question Mark and I said I would be more than happy to share every thing we have with the two Tiffany taught our exact course but she got out a little

expertise here and there. She got some grants to engage. Making games and design all that wonderful stuff so she added that at the end of our course. [Audio distortion]

We have our first example.

[Indiscernible-low volume]

Is it okay to ask questions now question Mark

[Indiscernible-low volume] This is all to the University folks. It was part of the University pilot in the next round of AP was some University and some high school. We were certainly working with local high school teachers and we got many grants to work with them and help us influence of course and they were taking the course and give us suggestions. It wasn't just an ivory tower view. We engaged high school teachers, some great folks, and great leaders and Josh and Eugene. [Indiscernible-low volume]

This is why it is not just a Berkeley thing, it is a team effort. -- [Audio distortion] We created a nice logo at the top right. So we got some success was a Lockheed Martin and we so we need to have money to develop this course. It has happened at Berkeley as well as national and can you help us question and Lockheed Martin said fine and here is a big check. [Indiscernible-low volume]

Would've applied locally to a prison innervation during -- innovation grant. We won that one and it was great. I would also apply for a UC online, I will talk about that later. -- We are maybe 10 years behind the curve. We want to have this: imagine a world where the scores were off-line and how that would help okay solution. [Distant audio]

[Audio distortion] The status of this has been we started small, a small pilot and we had our first course taught. They have an even picked it -- they have not even picked it. [Audio distortion] [Indiscernible-low volume] and it kept growing and growing and growing. With 25 high school teachers online. It was cobbled together, this tool am a that tool, some duct tape, which is made at the. We learned a lot about what didn't work and it evolved. There were 500 students a semester and then we had 70 students. Those partial development. Now we were at 259 were at 300 so we are excited. We hope to get a lot more folks coming up this spring.

No I don't want you to leave this room thinking this is a Dan Garcia course this is a team of a lot of people building this course group ran as another senior lecturer, alongside myself, as the leads initially. [Indiscernible-low volume] [Audio distortion] and Luke is now at Google. All these award-winning graduate students who opt us build the cross -- the class. As well as maybe 30 of undergraduates who came and wrote a package here, so it really wasn't just Dan or it was all me, and pat me on the back, it was a lot of us work on the project. [Audio distortion] All of this was a team effort.

What is it question Mark this is the course. In the olden days, the programming was it when we did have someone kick us in the pants is a Dan, Inc. about the fact that computing makes the differences aside and tells how that impacts the student. Where is that question our old course,

wasn't about what you can do with [Indiscernible] so we took a step back and said we need to build the greatest course of her so that if you only have one semester with somebody, never again taking a computer course, what should they know question Mark that was one course.

[Audio distortion] And what AP principals wanted was 95% there and Jan goes for the 95% of it, and you can sustain it with a 5% moving forward. I was delighted. [Indiscernible] [Audio distortion] Was a lot of really smart, wonderful, and caring people. No one is still finding a reason to fight, [Indiscernible] so it is a too pillared structure were one big idea is the programming and one big ideas computing. That is what put our eyes open as to what we should have in our course. This is not a required list. There is a movement of how stuff works, how engines work and all that stuff.

How does 3-D graphics work question Mark --? Would bring folks and we talk about that. There is more with graphics behind it, then there is what is the design structure that goes into that? Talk about complication in game three wishes one of my passions. I done research in that. We have worked on the game of Tech 4, and there was asked many number of hours to do this. [Indiscernible] And some people liken that to cutting down the trees in the Amazon. [Audio distortion] And the structure is a big long table.

[Indiscernible-low volume] then in the olden days, many courses had surveys. We have somebody come in and talk about the research and then they said just talk about the research. And they go blah, blah, here is a small window of my world. We're going to change this up it is not about that small window. I need to summarize the entire field of AI Anna said really? And I said yes, it is only chance to impact the students and summarize all of AI where all of this exciting pieces are invasive but do it. Probably the rest to exciting areas going forward with students is AI an self driving cars and theory and all of that. And also HCI. Students love those lectures.

How can you change the world? -- [Indiscernible] We talk about ethics and privacy and copyright. Saving the world of computing is a lecture we have folks talk about the work at LBL and climate change models. We have an industry guest lecture from twitter and we have Pandora which students loved this, and the folks said that what you're learning of his classes relevant to me. [Indiscernible]

Things we've never had in our particular course were the old days the theme. Here's the social paradigm of their other paradigms we can consider when we look at other tools in the tool belt when you become a graduate student or graduate of this course. And because we use a scratch base language, and they have concurrently built it in [Indiscernible] and which is recently introduced this new data and we are excited about that. [Indiscernible-low volume] why do I call it the joy of computing? No student will come in feeling frustrated. Pick student comes in as is I don't know computers and I am scared and I don't know computer science Dan and that is no problem because you work with someone who is also the same way. [Indiscernible]

In fact, [Indiscernible] we haven't already as part of that background. They could choose products -- projects of their own choice. There are nifty assignments we were going to mandate an assignment across the whole class, you can have five people doing five different things as

long as it is something that is engaging at Israel and shows their learning the material we can have people working with them and look at the projects that are important to them. Though climb some really cool thing and have everybody do it. This was delightful. They want to do it all and it is really exciting. They had to do a three page paper. [Indiscernible] And I said you know we're missing some social piece of this.

They did some research and have some references and they write a one-page or. They submitted to a social of public space digitally, and then they are forced to look to the right and read that person's paper and write a paragraph reflection on that and then go to the left and read up versus neighbor into a one paragraph option on it. And people more paper they like based on the topics and comment on that so ever at least gets to people commenting on your work. We are really excited about the social network has come into that. This really does have a beauty and joy peace. [Indiscernible-low volume] In terms of format, locally we have the most contact hours of the entire campus. We believe that learning can happen when you are in there helping them and doing things with them and not just go do it and come back later. And would said what has been the most contact hours, what has been the record question to Mr. has a record of seven hours a week and we said that is what want. So we figured out a way to structure our course of seven hours a week. [Indiscernible]

We have taken the two labs here we have moved them to Tuesday and Thursdays or like I give a lecture on Monday, an overview of something and then you actually do something for two hours, and engage in the lab were you're doing things and were playing. Well no it is not just the listening it is in the doing and you have to watch. Then there's another lecture where you have perspective MM learning has happened on the third day. There is a nice metaphor for how it works, big idea, do it, that idea, do it, summarize a talk about and engaged I get is plugged into activities.

This is about 100 hours. Five hours a week outside of class. Select reading comes from Blown to It. And Blown to Bits is a delightful book and if you haven't read it please do. In the middle of it, right here is PDF. [Indiscernible] Here's the key thing I will highlight for us as we were designing our course we set we cannot design a course that has required [Indiscernible] that requires $2000. We have customize it has no barrier to entry. Steve talks about some are right now. So somewhere in the United States there is the most underserved, underfunded course during. [Indiscernible]

Once other course that anyone can teach. -- We want to have a course that anyone can teach. Nothing is hidden away. In fact we even give our exams away. They said Dan, it is really hard for us to write the exams. That is what the teachers said. I don't know how to write the exam like you do. What if we wrote our exam and did not put them online for our students but handed them out. -- What ways we didn't put them in online or we gave them to you or instructors only had access to it? I'm writing exams for my course I give them away to his -- to students.

[Audio distortion] There are some webpages. We are running this course and this is robust they were, computing affects today and it is all about Facebook, and here's this new technology that has been invented. It is amazing. Sacramento passed a law says you cannot [Indiscernible] with past cars. This book is the anchor. This book helps anchor the affects of the course. [

Indiscernible-low volume] The lecture is not a boring lecture either. Hopefully it is engaging and fun and is not just me talking, I talk for 10 min., I talk for 10 min. Every single one of my students has a clicker and some of the money from Lockheed Martin went to buy clickers. [Audio distortion] I hand out the clickers and get them back at the end of the year. I do say Dan, there is a cost, got you. You can have a free clicker situation having colored index cards. Hold it up like this in your hand and your hand can block the back of it and you can allow the ceiling so no one in the back can look behind you. I get mostly reds and some yellows. Even the clickers you can use in your class, use a potential teacher could use it in class. I asked this question, you all vote and that I have you talk to your neighbors.

And then you come back and you vote again. This is really a way to make this engaging. [Indiscernible] She really believes in the like scratch if you draw a square in Scratch, you have to copy it. Peter sciences function abstraction. [Indiscernible] Scratch does not have that but it does have it now. It will have it but it did not have it before so we actually created something BYOB which is build your own blocks and this adds functional limits. And scratch there were things or global, and you could not return a list. I can make a list of figures a list.

We added a generic list and we added a function of first-class data so I can make our square, but not even in Scratch can I draw a square in and say look, I made my stripe and draw five different things for it was draw a square, one was draw this one was draw this to guess what? And BYOB I can make a list of five functions and I did not draw that list into a bunch of things or do everything on this list. It is like that to do list. I draw my close off the cleaners, that is a to do list. Why can't family which diseases we have created to say this is functions of doing things, wrapped them in an aggregate like a list? It is amazing.

It is not that hard a concept and the kids don't mind so one of the research questions is can kids really good idea that you could just pass around functions as easy as you can data. It is a really powerful idea for abstraction as well so we created BYOB. Many languages have [Indiscernible] but how many kids could write a formula that does not exist? [Indiscernible] The nice thing is we set ourselves in or have [Indiscernible] [Distant audio] him talking interpretive language so it is a little slow for that reason. This also we would love it if we didn't have to install a new one or anything. So what do I do? I cannot live with Scratch. [Indiscernible] What if we gave you something in the browser?

There was Scratch and there was Java script. About six months after we started that we continued with mobile development access. Unfortunately, the Scratch community went with flash. It was a good technical reason why they needed that. [Distant audio] What that means is every single [Indiscernible] device cannot use scratch in the browser and the scratch book try to write it for Apple -- an app for Apple and Apple said no way and they said why, and they said you could write angry bird into scratch and we wouldn't get any money out of that. So Apple stopped allowing that to happen in IOS. Go into a webpage.

This was taking back. You should be able to write a color under iPad. Here is our version and it is a picture. I want to show you a little bit of this. This is BYOB. It looks like Scratch if you have seen Which I believe is as the greatest project ever created for BYOB. This was created by three

students, to students in three weeks. People would never program before, they went through our class and had never program before and for their final project they built this.

This so blew me away. How did they do that? These folks were music majors. This is that part of the piecework they want to make a looping program and this is called Magic Machine. Can you see this? This is left to right NEC timecode going back and I will add a little click on the bottom, just this once. And you hear the rhythm. I can do this then I can do this.

I am not a music person but imagine someone who had some talent. [music] I have played this 100 times and never the same way twice. This is called generative technology. You create I can never envision. I cannot envision what you can create with this but it is lousy to be creative at another level like the micro tool. It is just delightful, delightful, delightful. [Indiscernible] But picked Mary had a Little Lamb, it shapes this is a year Mary has a Little Lamb it's a little bit off key. You can edit this and it is really, really delightful. [music]

You just clicking it. It is just really, really exciting. That is an example of BYOB. I also want to show you this one. I sent his programming and BYOB and so this was his second program. My son is seven years old, he was six when he wrote this program. I want to show you the range. This is seniors and juniors at Cal. [Indiscernible] This is the first program he ever wrote and we ended up watching the moon landing and talk about that so we watch this. I got up and he written almost all of this and he said that he how do you change the background? The sound as if the graphics are his him all the logic it is except for changing the background. Watch this. I am wonderful screen this. -- I am going to full screen this.

[Distant audio]

It is Cape Canaveral, it goes to the top and it scrolls and next and now it is in space. I'm flying around the stars I am in there and [Indiscernible] now here we are at Mars, it is a red planet. I'm flying around here. Now we get to the moon and he says I want to land on the moon so I have to scale it down.

[Distant audio]

He is six years old and using the BYOB function. This is an engaging and exciting things at really all levels group. [Indiscernible] You can do a generic landing, you open up that wall and now the same program can be started at kindergarten all the way to the university level. Let me show you what Snap looks like. Here is Snap and it looks just like BYOB. I can go and I can change and I even have this licking sound. I can go here and I am now programmed by dragging. You just dragging with your finger and it is delightful, delightful, delightful. I can go over here and this is the major Snap, webpage, I can scroll down and I can say I like Jurassic Park.

If my website is still up, it will create, I will full-screen this and I can run this and it works on my phone, I can go find this URL and have this same information on my phone. [Indiscernible] Or other tools., The idea that you write on a computer? Write-down resolve it and you could have this URL were used more -- were you point your smartphone browser to a new running it in the

same program as all along. This is just exciting and you can imagine having all of these interactive things that people get the rock -- walking around with. It is exciting stuff.

[Indiscernible-low volume] that is great stuff. So the language is great. How about testimonials? Dan, I wanted to how much this course meant to me. If I had taken this course earlier I would have changed majors. [Indiscernible] I made one video. The next year I taught it I had 17 people come to me independently, I didn't even have to call and say hey, if you want to take this course come find me. Independently people were taking the pilot exam. [Indiscernible]

I have a YouTube playlist I would be happy to share with you which is 17 people telling me this course changed my life, this course is amazing, discourse works. It is exactly the demographic we wanted a were excited about that. We are really excited about the results we got. Yes, are they doing very well? This is a weird graph your the left to graphs are the old class raw average. This is the new one, the CS 10 class. What I did was a lot of the percentage of women in these classes that had never, from 32% up to 45, women either about 45%. This is one simple matter.

I look at this spreadsheet in Excel. Which of the students were women in that screenshot at the top? You'll see they are not really in the best course students in the old class. Look how didn't they are in the new class -- this green line has not changed look how many more women are doing really well. You will see that there are almost 60% of women on this graph so they are doing great. They are at the top of the class. In fact, the first time in history, a top student was a woman and I was really excited about that bird

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Overall, how are they doing? Their GPA is just a click -- is statistically higher than men. It is a plus and minus grade differential and people so why do you think that is question the first time we are having a major part of this clasping writing, reading, and then writing about what you're reading and how is. And what the old class was was was just programming. Is more than just the right brain of it and it is touching a lot of the creativity that you did not have in the old class where I told you how to do it. They're doing their own creative thinking they are blowing up in terms of success or at their having their own creativity enhance NAR engaging the right part of their brain.

[Indiscernible-low volume] they are doing great. So that is the course. Now let me talk about this other. [Indiscernible-low volume] you can see online pilot project, the visionary project of both [Indiscernible] and we need to get this to the 10 campuses. We to go into the online space. It was a mission. What we did was we offer $25,000 to take [Indiscernible] the course online. So let's ask the kids, would they want to keep going online? [Audio distortion]

Even that nice and beautiful interface. And when we get stuck, what of an instructor that is [Indiscernible] and they were very successful and that other course. The instructor would go [Indiscernible] and they would then do the homework from scratch. We did that. [Audio distortion] We have a instructor who is a senior TA, he explains his thought process and student love that.

[Captioner has another event on schedule and must disconnect.]

[Event concluded]
Actions