EDWARD EATON: Well, actually it looks like we're pretty full up, we might as well get started.

What we're going to talk about today is an experience that I had. I am a longtime SolidWorks user. I've been using it for 18 years. And I'm going to share what it was like to dive into Fusion 360, and using a case study of developing a product to help out a kid.

We're going to talk about just the change in mindset between using a SolidWorks and Fusion. First of all, how many people are using SolidWorks right now? Or have? So a few. OK. And how about the Croes and Inventors? Anybody not using any of those? All right. Now, nothing about that guy. He's useless. Or a sales manager, so.

We're also going to talk about the use of 3D scan data in Fusion, which is something I haven't seen anybody talk about before. Of course, we've got to talk about T-Splines if you're talking about Fusion, and describe that experience. But the most important thing I'm going to be-- or most important theme throughout is when we talk about what it is to be a designer. And that CAD is just part of it, that it's an enabling tool, but it's just a tool. What's most important is our responsibility to the manufactured article, and making sure that that's as good as it possibly can be.

I can speak with some authority on this. I'm a senior industrial designer and principal with the Damani Group. We're a product development consultancy located outside of Chicago, Illinois. We've been around for 20 years. We work in multiple materials, multiple processes-- up there you see injection molding forgings, we have experience in ceramics, soft goods, stampings, you pretty much you name it, we've done it. And we've done it with a high level of expertise.

We get a lot of compliments from our vendors about the quality of the files that we present, because we're constantly thinking about the industrial part of industrial design. We consider the manufacturing processes and make sure that they're baked into the creative part of our design work.

It's a fun gig. It's a rewarding gig. Because basically my job is to help people out, whether it's our clients, help them get to the finish line, get a product to market, or their end users, we're helping them out too. We're making better parts, making safer things, safer products, working out balance on tools that they have to use all day so that they are not getting wrist strain.

Our commitment to helping out is not just to our clients and to the manufactured articles that they create. We're also dedicated to giving back to the community. We've mentored programs with our local high school's engineering program. We invite the young engineering students to come in to our office and job shadow to see if engineering or industrial design looks like something that they want to do, and help them choose majors and programs in schools that they might want to go to.

Gene Damani, founder of our company, he serves on the advisory board for Northwestern University's Engineering Program and Northern Illinois University's Engineering Program. Sorry. Getting dry. He's also got a family involvement with Chicago Special Hockey. And they just do it because it's the right thing to do. They don't have any people who are disabled in their family, but they do have a passion for hockey.

And actually in my company-- it's weird, because basically everybody's got a passion for hockey except me. I don't even skate. But it is nice to have the ability to be a design firm and help out with a organization like this. I want to point you to the lower left side of that banner-- do you see that, where it says Blind Hockey? Blind hockey exists. I recommend going to YouTube and checking out videos. They're badasses, they're awesome.

And we're happy to be able to help as designers. The way blind hockey works is they've got a puck that makes a lot of sound. It's a metal puck-- a hollow metal disk that's filled with ball bearings. They get beaten up during a game. They go through about seven per game, and my understanding is that they're about $70 each. It's very expensive.

And we volunteered to use our design skills to make a better puck that's going to hold up longer. And then we use our vendor contacts to get these manufactured for a lot less. So that's rewarding. It's great to be able to have that ability to contribute.

We're able to contribute like that because we've got cool resources. We've got stuff that most people don't have access to. We've got fabrication resources. Building models. We use this great clay called Castilene, which is awesome, for creating rigid clay prototypes. It is liquid. If you throw it in a microwave, it's rock solid at room temperature. It's terrific sculpting material. It's great for prototyping, for working out handle shapes and stuff. Before you go into CAD, you do it in Castilene.

We have the sensibility to work out things like the balance of a nail gun by creating weighted prototypes. CAD, which is what you've been hearing about for the past two days, is just really

a small part of design. With CAD, you could find out where the center balance is on a nail gun, but you won't actually get a feel for it until you build it.

We also have really cool software, and powerful stuff that most people don't have access to. Regular civilians. SolidWorks is our main line tool. We have one of the first commercial seats of SolidWorks. As I said, I've been using it for 18 years. I've got over 30,000 hours of driving the software. And I'm very, very good at it.

I had the benefit, as I was telling Baer earlier, of going straight from the board to using SolidWorks. So I didn't have any preconceived notions about how you did it in AutoCAD, how you did it in CAD Key. And went in blind, and I was able to develop my skills from the ground up. Made a lot of discoveries that just were revelations to the community. And I ended up getting involved in presenting at SolidWorks Worlds. I've presented at over 14 SolidWorks Worlds. Several years I've been the top-rated user presenter. And I'm in the top 10.

I'm also-- it's weird to say I'm really, really good at SolidWorks. If you just Google my name and SolidWorks, you'll find out for sure. And I need to see that because it's hard for me to leave something that I'm kind of one of the best that and to go into something new. That's a tough thing to do.

Year and a half ago, we got three seats of Autodesk Fusion 360. And we got it because it looked really promising. It was something new. And it did stuff that SolidWorks doesn't do. And it was exciting. It was interesting. Unfortunately with my business, I'm kind of at the mercy of whatever jobs come in the door. I can't just roll the dice on a new software and potentially jeopardize a client's project schedule.

I can take longer to do a project when new software. I can absorb the learning curve and then just discount that time when it's time to build. That's the right thing to do. But it can't add days to a calendar. So jobs would come in, some would be things that, wow, I really want to try Fusion on. But it can't, because I can't extend the schedule. And then other jobs would come in that just had to be either SolidWorks or Creo or Inventor as deliverables. So it just sat there for a long time.

There's also another thing, element that kind of led to my hesitation. I really hate learning new software that does the same thing. This is Outlook on my desktop. This is Outlook on the web interface. Should be exact same program, it's from the exact same publisher. Completely different interface. Everything's in different spots.

When I have to switch betw-- I see some nods-- when I have to switch between the two, I'm inefficient. This is the mobile interface for Outlook. Another complete difference. And remember, this is a family, right here. With Fusion 360, we're actually talking about the analogy of jumping to Gmail. The first time I used Gmail it took me 10 minutes to add an attachment and send, because I couldn't find anything.

So makes it hard to get in and use new software, but sometimes you just have to pull off the Band-Aid and do it. And that's where we circle around to Chicago Special Hockey. And Chicago Special Hockey introduced us to a kid that was born with one leg that's 2 and 1/2 inches shorter than his other leg.

This kid couldn't skate because of that discrepancy. His older brother was playing hockey, and the kid wanted to get out on the ice. But we have all these cool resources. We have designers. And we have CAD, and we have fabrication abilities, and we have great partners. So we knew that we could make this happen for this kid. And that's how I started off this project.

I do not believe in playing with software. And that year and a half when I wasn't using it, [? Var ?] would call me up periodically, like hey, you played around with Fusion? I'm like, no, I'm not going to play around with it, because it doesn't tell me anything, really. The analogy I use is, if I ever have a cardiac event, I don't want to hear that the guy running the defibrillator has played with it. I want to know that they know it.

So this project I started off as a real project. And real projects started out in the field. You're going out and you're doing research to understand the entire problem. A big part of the problem was that whatever adapter we designed, we would have to get it attached to the shoe and the truck. So I needed to see what that equipment was like.

So I made a field trip to the skate shop, and saw what they're using to assemble this. And realized, OK, I've got to have clearance for this entire tool to add this rivet, or it's a failed design. So I knew it was going to eventually have something that was shaped like an I-beam, but I had to split it up. And I--

AUDIENCE: Give me some sexy photos here.

[LAUGHTER]

EDWARD EATON: OK. I also knew that it was going to be machined. Because I wasn't going to trust the 3D print on the forces that are going into-- go into a skate. It's crazy how strong, or how much force goes onto the ice when you're skating hard. So I knew it had to be machined, so I had to plan ahead and think-- and actually research.

Ball [? mills, ?] how deep of a slat could I realistically have cut. What rate I am going to want to use. And I also did some preliminary sketching to make sure that I was eliminating stress risers. Basically, just getting a good foundation of design before going into the CAD.

My mantra with design is, you start with what you know, then you fill in what you don't. Well, we knew the hockey skate that we were going to use. So we had it disassembled, and then we 3D scanned it, so that we would have that data available for reference and for use when it came time to design this in CAD.

And It's great having a 3D scanner. I've got to tell you, it's liberating, man, and there's a lot of power to it. I've gust got to say that.

OK. So there I was, armed with the 3D scan. Now what am I going to do? Well, I'll tell you. I'm glad I didn't do this. I didn't start trying to match surfaces. Because the first step was to get used to the environment of Fusion 360. And for that, I needed a project that was personally meaningful to me.

I don't know how many people have this happen in their house, something breaks and then you just leave it there for a while. A vent broke off in my bathroom. I researched, trying to find a replacement. Well, the vent's too old. I can't find a replacement cover.

So it sat there for a while. Because it starts to blend into the background. And then one day, and this is embarrassing for me to admit as a designer, one day I got out the shower and I remembered, oh yeah, that's right, I got a 3D printer at work. I'll just 3D print something to fix it.

And it was a good opportunity to try out Fusion 360 on something extremely simple. So I decided to make an adapter clip. And in SolidWorks I could have done this in 15 minutes, tops. It took me a couple hours in Fusion 360, because it was my first time.

I didn't know where anything was. And it was confusing. In SolidWorks, over here on the left side of the screen, you've got your feature tree. Here it's that browser that has sketches, but not really. It was a confusing concept.

How many people had trouble kind of figuring out browser versus timeline? Yeah. And another thing about Fusion 360 that got me was, they really use the entire screen real estate. It's not localized up here in the corner. So stuff will happen down in the lower right, and my eye is looking for things over here.

So after every step I'd have to stop and just look all around the screen, trying to figure out where things were. And I understood that this was going to be the price of admission. It's what's going to-- it's what they had to do to go to Gmail. That's what you have to do with switching to any software. And then, of course, was able to 3D print the clips. And by the way, it's great having a 3D printer, too. For minor home repair.

So Fusion 360 has all the basic tools that I'm used to in SolidWorks. I just have to go through and find them. So I made sure to go in and check out every menu. And I'm glad I did. Because I saw some stuff that I didn't-- don't have in SolidWorks.

This Insert McMaster-Carr Component. Yeah. You guys are nodding. And by the way, I have to ask you a favor. If anybody's sticking around, and it runs into me and my girlfriend over the weekend, don't tell her I told you this. She works for Grainger Hates when I mention McMaster-Carr. But yeah, Insert McMaster-Carr Component. That was cool. And it filed that away for later.

Whoops. Let's see where it got. Oops.

When poking around Fusion 360, just seeing what was hidden inside, or where everything was, I saw this setting. And this delighted me. They made it SolidWorks friendly from the get go. Right down here, you can change it so that the pan zoom and orbit behavior is exactly the same as SolidWorks. I have 30,000 hours of muscle memory in manipulating models on the screen. I would hate to have to throw that away, and I'm glad these guys realized that, and give me that option.

How many people have changed their orbit behavior to match whatever system they came from? Yeah. It's nice, isn't it.

AUDIENCE: When I was using [INAUDIBLE].

EDWARD EATON: What's that?

AUDIENCE: When I was using what was available on the list.

EDWARD EATON: Roger, get on that.

OK, now that I was barely comfortable, I kind of knew where everything was, I'd push for the harder bit. First was getting the 3D scan in. And getting the 3D scan in was-- really it was a delight, because all I had to do was open it.

In SolidWorks if you try to open an STL file, you get two options. One is the graphics body, which is just a visual image of it. And you can't section it. You can't dimension it. And then the other one's mostly useless, because it never comes in. So I don't even remember the name of it. Because it tries to make it a solid, and this is not a solid. And it'll come in with all sorts of geometry errors.

So bringing in into Fusion was nice, because not only did it just open automatically-- didn't have to do anything-- I could measure it directly on screen. In SolidWorks, I have to draw a sketch line across to do that measuring.

And the reason that I measure on imported 3D scan right away is because 3D scans are unitless. This was saved in inches, and it is 25.4 times too small when brought into Fusion. So you're-- it has to be a reflex. First you double check the size. And then, if it's the wrong size, which it was, you just go into the scale command. Enter that scale factor of 25.4. And there I've got my model-- there I've got my scan up to the right size. Without really having to think about it all.

And then the really fun part was I was able to suction an STL file. [? The node ?] is that from the beginning, Fusion 360 decided not to make any CAD types orphans. They said, we're just going to do it all. And you don't have to buy an add-on, and we're not going to limit you. We're just going to-- it's just going to work.

And I like that. Because I do have a 3D scanner, I do a lot of reverse engineering from 3D scans. And the SolidWorks way, we've got, we've got methodology, but it's slow compared to what I was just able to do here.

When I got into a section I ran into a problem, though. I didn't know how to get out of a section. Have you run into this? Yeah, it's part of the learning curve. I looked everywhere-- except for here. I literally spent an hour and a half trying to figure out how to get out of a section. And I'm Googling section, but all it tells you is how to get into a section. I couldn't find

any way out.

And it's just because I didn't have the mentality that this browser is where everything's contained, including section views. And sections were hidden under this analysis. I never thought of section as an analysis, I thought of it as a visual tool. And so in order to get out of Sections, you just have to hide them.

And it's really nice to be able to save sections, section views, and revisit it. But it's just another story about having to try to find things and how that's just life, and that's OK.

Next step was to start tracing my 3D scan like I would in SolidWorks. And I was really happy to see that the spline tool works exactly the same as the spline tool that I'm used to, other than to get out of it, you have to hit that little checkbox at the end.

But it has the same rhythm, the same flow. I've drawn hundreds of thousands of splines in my career. And there's a dance to them, and once you know that dance, you don't forget it. And I'm glad that this has the exact same character.

And then tracing over a section view, that was great. Because I didn't have to use any of my weird workarounds to get something that matched, or matched closely, and then I could go back in and edit, just like I'm used to.

I started off with these two curves.

And I've got to stop this for a second. This is obviously a re-enactment. I wasn't recording when I did it in the first place. So what's going to happen next is a little bit wrong for the story.

But my first thing that I wanted to do-- and this is true-- was create a surface just to see where I'm at. Whether a sweep of a single profile through was going to get me close. It's part of the surface analysis of the 3D scan, I wanted to get a sense of how complicated it was, what kind of mess I'd gotten myself into. So you're going to see this swept as a T spline. I did not initially sweep it as a t spline, I swept it as a patch. Just want to be clear about that.

But the result is the same. And the story is the same.

So here I had my swept surface. And I could start seeing that I was in for some trouble. Because the cross-section is not consistent. There's actually a lot of complexity to this mating face. They didn't do a simple shape. It's very complicated. If I was to do this in S-- and I

realized, oh geez, I'm going to have to start adding a lot more profiles. Because that's how my mind thinks. Like, OK, I'm going to have to start plotting out, where would I put another profile, and another profile across, so I could loft them all together.

And this was at about 10:30 at night. And then I realized, wait a second, you idiot, this isn't SolidWorks. True-- this actually happened. I'm like, this is Fusion 360. You've got T splines. Give that a go. And I did.

So I recreated my patch as a T spline surface. And then I went in and just started figuring out how to move stuff. I don't have any training in this. But their manipulators were just obvious to me. I could figure it out. And I hate saying that something's intuitive. This was really intuitive. I got it right away.

And just the rhythm of how moving things works, I got that right away. Where if I move one point, it moves not just that one point, but a little bit further down the patch. That's my experience with splines. For 18 years.

So the net is, started this at 10:30 with the T spline manipulations. At 10:50, 20 minutes later, I had a surface that matched both contact points on the truck, to within 5/1,000ths of an inch. Which is the scan tolerance. And I did that as an untrained novice.

If I was to quote this, matching that surface knowing the complexity of it now, in SolidWorks, I would have quote about three or four hours. And I'm an internationally known expert in surfacing. That blew me away. And it's one of the reasons I'm here to share that story.

Because this isn't random design. You see a lot of presentations in T splines, and they're creating a new shape. And you don't know if it's exactly what the person wanted, or if they just settled for it. There was no settling here. I had to match this exactly or the thing wasn't going to work. It was going to be a chair with one leg too short. And it would wobble. It could tear itself apart. It was a cool moment.

Some people here-- maybe a lot of people here-- have experience with Fusion 360. And I have to address a function of Fusion 360 that's going through their head. Fusion 360 has a thing called a pull command, where you can create geometry, and then invoke pull to match that geometry to an imported body, like 3D scan.

And I have to address it because it's probably never going to work well. Because computers aren't designers yet. When I used the pull command in this scenario-- you got to remember

that 3D scan has got holes in it. It's got the rivet holes, it's got extra contouring that I want to ignore. But the pull command can't ignore that. It's all or nothing. And it created this garbage. Created it quickly.

But I'll still take 20 minutes and I have a designer make decisions on what a surface should look like, instead of having a computer make the decisions. It's not an indictment on the pull command. I'm just saying use it judiciously. This is-- the designer is always going to win out, I think.

While making this transition to Fusion 360, one thing I really appreciated was the dedication Autodesk has to creating training resources. Not only on their website, but they're posting to YouTube constantly. They have a YouTube channel that-- I don't know. How frequently do they update the YouTube channel? It seems like every couple of days have got something new.

AUDIENCE: There's new videos every-- there's two or three videos every week.

EDWARD EATON: Two or three videos every week. Yeah, so that's their frequency. Their dedication is terrific.

Another thing that they do, of course, is Autodesk University. They make the presentation files available. And this is something I didn't know when I was asked to give this presentation. I didn't know about handouts. How many people knew about handouts?

AUDIENCE: I do know a couple.

EDWARD EATON: A couple. What?

AUDIENCE: I do now.

EDWARD EATON: Yeah. The handout. When they were giving-- they were doing prep webinars for speakers. And they said that, at Autodesk University, the handout is considered more important than the presentation. Which seemed crazy to me, until I looked at existing handouts. They're freaking manuals.

Presentation I went to yesterday-- 97 page handout. Handout for this presentation-- 23 pages. Has everything that I'm saying, but more eloquently, because it's note stumbling. And also the PowerPoint file-- that's available. And they're both right there in your AU app. If you scroll down to the bottom of this session, you'll see presentation materials. So I just wanted to point

out the hand-out thing. Blew my mind. And-- oh, you printed it out? I modified it yesterday.

AUDIENCE: This is the first time I've been, so I didn't really know.

EDWARD EATON: Yeah, I just wanted to point that out, because I had not heard about it. I'm glad that I'm speaking up about it. Every class that you've been to, and all the ones you couldn't go to, check out their handouts. And for you, being a teacher, this is a treasure trove of material. OK.

Because of the great training resources, the rest of the modeling was trivial. So I'm not going to cover that. We all know how to model. Then we got to-- we used our 3D printers, our desktop 3D printers at work, to go ahead and 3D print prototypes.

We took it down to the skate shop. They went together great. And the manager of the skate shop was just delighted. He was giggling, literally, because of how well the parts fit. And because he knew the kid, and he knew that this would be just great for him and his family.

For me, the most satisfying thing was seeing this. Skate shop owner said that my parts fit better than commercial parts. That was a great moment for me as a designer, to see that I was able to do this in Fusion 360. In 20 minutes. It blows my mind. Still. OK.

This brought us to a great point. We've got a success. We took some pictures of our prototype, sent it to the kid's dad, kid's dad's happy. Skate shop guy is ecstatic. We're looking at this as designers, like, oh wow. Once we've got these prototypes, we realized, we can get rid of a couple fasteners, and just use one in the middle. It's going to hold together just fine.

And at this point, we were ready to go to manufacturing. And I've got two points here. OK, one I want to set up your expectations. You will not see a video of the kid skating any time in this presentation. He deserves his privacy, and he deserves his dignity. OK. I don't wouldn't want to show a picture of me trying to skate. So him trying to skate for the first time? No way.

Second point relates to dignity. I'm an industrial designer and I hate enabling devices that look like the hacks that they are. I got to this point-- everybody's happy except me. I'm like-- kid deserves better. This skate's got nice lines. I owe it to him to give him some nice lines.

And fortunately, Fusion 360's parametric. And I was able to roll back in that timeline and then change my simple extruded shapes into T spline bodies, adjust those T spline bodies, and then get to this. So being a designer, and living up to your responsibility as a designer, is important. And I appreciate that Fusion 360 gets that. So.

Now this brings us to the most important part-- the manufactured article. Everything I've done so far is pre-game. None of it counts as much as the actual piece when it's made. Fortunately, Autodesk volunteered-- through Roger Orbin, who plays hockey with my business partner Gene-- they volunteered their machining capabilities at Pier 9 to make the parts for the kid. So I really appreciate them doing that.

And getting it to Pier 9 was as simple as sending an email. Because there's this data. All this data is saved on cloud. And if I want to share it with somebody, I just invite them to the project, and they have access to. So we've got a lot of people here. Most of these were just rubbernecking spectators that wanted to see what was going on.

But Martha-- she was the one who was going to do the machining. Invited her to the project. And bam, she's got the files. And what was cool is while she was reviewing them for machining to see if she had any changes, I had some changes of my own. Looked over in the right, I didn't like the proportions that were that-- recess for the nut was.

So I just slipped in a change without having to file an engineering change report. I knew she wasn't cutting anything, but I didn't have to up-rev, I didn't have to do anything besides hit Save. I liked that a lot.

And then she did have comments. She didn't like my pockets for the nuts, even though I had talked to her previously about diameter of her cutters, and made sure that the radii inside were such that that pocket could be machine. She decided it would be better to use a bigger cut-- bigger tool that would go faster.

And that's where the insert part from McMaster-Carr was great. I was able to find an index bolt quickly on McMaster-Carr, and then bring it straight into Fusion. And changed the model in Fusion. Again, parametric. And she-- and all those changes were pushed straight out to her at Pier 9.

So anyway, it was cool seeing how they were able to create the tool paths and machine the parts directly from the same environment. I know you create tool paths right right out of the Fusion. It's also good to know that he did-- it wasn't a big burden and any change. Just-- the new tool [? palette ?] just happened.

I was provided a video of the part being machined in Fusion, which was kind of cool, but unfortunately it doesn't play in this-- it doesn't play well. It's really-- it's got a staccato rhythm to

it. It hangs up a lot. Just like I did when speaking right now. But it was fun to see, and it was also probably very useful from a diagnostic standpoint for a machinist to see what the tool paths are projected to be so you can figure out your set-ups and so on.

And while they were producing the parts, they asked me, hey, you know what, we really like this story. Would you mind putting together a presentation about it? We're-- got this event in Schaumburg Illinois, and we'd like you to speak honestly about your experience going from SolidWorks to Fusion 360.

And I said sure. I told him, I'm going to be honest. That's what I have to be. And they said, that's exactly what we want. So because they were doing these parts, I thought, yeah, they're doing us a cool favor. I'll do them a cool favor.

So I put together a presentation. I started working on it just like I would with a SolidWorks World presentation. And with a lot of effort. For Solidworks World, I put in between 80 and 120 hours to make a 90 minute presentation. So I really want to do a good job. I have a lot of respect for an audience. I don't want to waste your time.

Two days before the presentation, this happened. This is the most expensive anecdote I've ever had in a presentation. Absolutely true-- my hard drive died. If this had been right before SolidWorks World, I would have been devastated. Before SolidWorks world, I'm carrying around couple memory keys, and I'm constantly saving to them. And I'm juggling things and hoping that I'm not a revision off.

Here I didn't have anything on a memory key. And this could have been catastrophic if it was any other software. This didn't bother me at all, other than personally horrible. But regarding the presentation that I was going to give in two days, I just went into work, grabbed a-- checked out a laptop.

In 10 minutes, I downloaded Fusion 360. It's like 45 minutes to an hour on my computer for SolidWorks. 10 minutes. Then I just typed in my log-in, my password, and all my files were there, including the PowerPoint that I was working on.

So that brings us to the conclusion. When I first started using CAD, it was fun. I would not go out to lunch. I would stay at my computer at work and I would work on personal projects. I would pick up things, like, OK, I've got this computer mouse, how do I model it exactly? And that's how I got good at it.

It's not so much fun for me anymore, with SolidWorks. But this was fun again. I enjoyed it a lot. And I really look forward to the next time I get to use it. T splines, of course, rock. I'm really dying to get that project in the door where we can really go nuts with them.

We've had some packaging gigs that have come in that I could use it on, but then the projects got stalled on the customer's end. It's kind of frustrating when you know you've got this great tool, and you can help somebody out, and you're just-- nobody's going to pull the trigger to launch that.

The cloud interface, of course, collaboration heaven. Not having to worry about anything being out of date. And it's as simple as sending an email. Not being stuck with a single device is great. I can go from work to home, home to work, or in the case of that presentation I gave in Schaumburg I brought a presentation on my laptop to show that Fusion 360 works when it's disconnected from the cloud.

But Colin-- his computer was already set up. So he said, just come use mine. And I just walked up, typed in my password on his computer, never touched it, got the PowerPoint and the files in minutes. And that was it. And all your personalization settings, like that SolidWorks pan orbit zoom, that also goes along with your profile.

And the final point-- a lot of you already have Fusion 360, so you're probably already sold on it. And I'm not-- I just have to say that for the richness of the feature set of Fusion 360, and professional-- how professional the execution is. Blows my mind that it's only $300 a year. Just incredulous, but it's true.

It is in my personal and professional best interest if everybody uses SolidWorks. I want to be perfectly clear about that. I've got 18 years of experience in it. If everybody in the world would just standardize on SolidWorks, I'd have a huge head start on everybody that was trying to come in new.

I wish that was the case. But I have an obligation to be honest. And honestly, this is an incredible deal. And if people were to ask me what software they'd recommend, like, you have an obligation to at least look into this.

And you know what? If people really start going over to Fusion 360, I'll start getting customers in it, and I'm willing to start over. It's going to be fun. Thank you.

And here's the obligatory slides at the end. I'd really appreciate if you could fill out the class survey. I want to get a sense of whether this is the kind of story you guys like to hear. And with this audience, if this had value for you. I'm glad to say, nobody walked out. Which was cool.

And then Fusion 360 Answer Bar. Now, I don't know-- anybody know this Keqing?

AUDIENCE: Keqing.

AUDIENCE: Keqing.

EDWARD EATON: Keqing. Yeah? What's he like?

AUDIENCE: Great guy.

EDWARD EATON: Great guy. So anyway, you're supposed to find a great guy. And then there's a AU Answer Bar, and I'm here if you have any questions. We've got-- finished up a lot earlier than I thought. So. Yeah?

AUDIENCE: Does hardware impact how Fusion 360 runs on your local machine? Do I need to invest in the highest technology, power computer to make it robust, or can I get by with my own [INAUDIBLE]?

EDWARD EATON: OK. Did everybody hear the question? OK. Does anybody know the answer? Remember, I'm a novice at this. I will say that Fusion 360, with the files that I've worked on-- remember that laptop I showed you that died? That was a pretty old laptop. I didn't notice any lags. Any lulls. But experiences, anyone?

AUDIENCE: I've had some minor issues because my video card is fairly old. But they're minor.

AUDIENCE: Is it like a video card that's not been updated drivers, things like that?

AUDIENCE: Well, the [INAUDIBLE]. There've been some minor issues, but I've never lost anything because of the issues. I just lose this [? plate, ?] save it, close it, reopen it, and it'll be fine.

AUDIENCE: But you think I should be able to get by with my three-year-old computer--

[INTERPOSING VOICES]

EDWARD EATON: And I know that's one of the goals of the developers. I don't know how much time you guys have spent with the Fusion developers and Autodesk University. I've had a lot of conversations

with them. it's fun to have that kind of access. One of their goals is to make it not require heavy duty hardware. Well, right now they're trying to pour it over to the iPad. And it's a nice system. I've got an iPad. But it's not going to match up with even a basic laptop.

AUDIENCE: [INAUDIBLE].

AUDIENCE: All computing's done on your computer. And if you're just doing storage on the cloud, so you can go offline and work on something fine. And then you throw it back online, it saves to the cloud.

AUDIENCE: Even if you're doing analysis in the cloud, it's just [INAUDIBLE].

EDWARD EATON: In all honesty, though, I do notice a lull on opening. Especially like in the hotel room. I'm going over a hotel Wi-Fi. How many people are dinging that Wi-Fi? Yeah. So because you're loading your files in from the internet, it's not going to be what you're used to with a SolidWorks or an Inventor right off of a hard drive. That's just the case.

Though you can disconnect from the internet and then your files are cached here, and that should be instantaneous. And then you just plug back in when you want to either, at the end of the day. That would probably work well. Any other questions or comments? Or experiences to share? Yeah.

AUDIENCE: I've been following your [INAUDIBLE], and I would like to get some of my other faculty to come and see you. The price of admission is, are you going to be here next year?

EDWARD EATON: I'm sorry?

AUDIENCE: Are you going to be here next year? Do you see yourself coming back?

EDWARD EATON: I'd have to have a good, authentic story to tell. And it has to be something new. He's referring to my Curvy Stuff series of presentations at SolidWorks Worlds over the years. He's using them in his classroom.

And I'm glad to hear that. That's one of the reasons that we went through the effort of annotating our presentations. Because I put 80 to 120 hours into each one of those guys. It would be a shame if it just sat unused.

AUDIENCE: You might want to mention that those are available on our website if anybody else wanted to

look at it.

EDWARD EATON: Yeah. Yeah, if anybody's inter--

AUDIENCE: Information would be perfect for [INAUDIBLE] program.

EDWARD EATON: Yeah. And that's true. A lot of this-- actually-- well, I've got a busine-- my business cards are here. If anybody wants our website. But the question was, would I be presenting next year? Depends on if I have something that I felt was worth 60 minutes of somebody else's time.

Because I know that this is expensive to be here. And at SolidWorks World-- I haven't done math for here-- but SolidWorks World, I basically look at it as $300 a person. So if you put 200 people in a room, I've got to provide $60,000 of value, or I'm wasting everybody's time. So that's why I put all the effort in. Yes.

AUDIENCE: I work closely with a high school, and they're pretty heavily involved with a SolidWorks program. We've been so for the last few years. Do you think I should try to get them to take a different approach and take a look at Fusion tools. And do you think it'd be beneficial for that high school class student learner to look at it? Or do you they should just stay with how they do it?

EDWARD EATON: I think Baer's got an answer, but I do too. My answer, or my initial response on that, especially if they're seniors-- here's what the math is. If they're seniors and they're going to go to college, yes.

AUDIENCE: Yes to what?

EDWARD EATON: Yes, you could look into Fusion. Because in four years, I think the adoption rate is going to be huge. If they're going straight from high school into industry, or tech, I'd probably want them to concentrate on SolidWorks, because that's where the jobs are right now. But Fusion is going to have the jobs in a few years, I'd say. That's my estimation. Now, Baer?

AUDIENCE: Yeah. I teach an intro CAD class. And last-- previous years with SolidWorks and Rhino. This is just past here. These are softwares in college. We do three weeks of SolidWorks, three weeks of Fusion, three weeks of Rhino, and then the last project, they got to choose. 12 out of 15 chose Fusion. So I think there's a real intuitive difference. Now, to be fair, I taught SolidWorks first, so they kind of understood a parametric model and concept. Then once they got that, and then they get to Fusion, they just took off. Like, I was adjusting my syllabus on the fly

because they were already [INAUDIBLE].

AUDIENCE: I-- So I went into education. And I teach [INAUDIBLE] and Engineering, Fundamental Engineering, to high school students. But my background-- I came into the industry as an architect. And like you, it's very typical for architects to, say, shift from AutoCAD to Revit. Because it's an efficiency issue with the company. I started in a company where we still did [INAUDIBLE].

But now I'm teaching students Inventor, so I had to learn Inventor last year. Revit and AutoCAD 5s right? And it was relatively easy. And now I'm learning Fusion, because I feel like as a design, so called. Or, I think it lends itself well to be combined with AutoCAD, or Autodesk SketchUp or that sketch program-- yep-- to help them sketch so you combine them.

And in terms of teaching them the fundamentals of design, I think Fusion 360's the best to start with, and then I move on to Inventor. So I still start-- we're drafting. Then I go to AutoCAD. And then I go to, in the higher levels, when we start 3D modeling, and have a 3D printer. Go to Fusion 360's what I'd like to start next year, and then go into for the highest level students, [? so they can ?] start that. It's free for secondary students. It used to only be free for college students. And now it's free for high school students. You know, so they can download it at home and they can practice it. I don't know if SolidWorks is. It's a really poor marketing decision to not.

AUDIENCE: It's free for college.

AUDIENCE: Yeah, I think that it's a phenomenal resource. And in terms of the architectural industry, it's Autodesk. Mechanical, I see that there's a lot of people with [INAUDIBLE] Polytechnic's management, they use both. They use Autodesk products and SolidWorks. And [? they take ?] some of the issues you've described, which is very difficult to switch programs. But I switched programs in architecture. I started Vectorworks and miniCAD and I even would prefer a nice DataCAD still. And it's stressful, to go from-- you get sick of it, you know.

The thing that really gets me is the inefficiency of it, where I can reorient to a new software package, but I like being fast, too.

I like being good at what I do and it's--

AUDIENCE: Inventor is a really good name. Is Inventor just a step above Fusion? I get so confused. They'd use it at Metro for a few years, and I'm pretty good with that. And the only reason I though I

should look at Fusion is because it seems like it's getting a lot of press. Which, they're like, eh, and you just get to a point that it started in [INAUDIBLE]. The software, to me, [INAUDIBLE] any levels available. So I get to pick off that tree of whatever I want.

EDWARD EATON: Mm-hmm.

AUDIENCE: So which one do I take?

AUDIENCE: I spend half of my day teaching SolidWorks and the other half of the day teaching [INAUDIBLE]. And I get pretty deeply into the software. Fusion, right now, what I see, is it really has a strong industrial design with the T splines. It's not so strong on the mechanics with Rhino.

EDWARD EATON: Mm-hmm.

AUDIENCE: It still has a way to go, I think, with the mechanics of Rhino. But the [INAUDIBLE].

AUDIENCE: Like, the set design aspect of it. Yeah. Which is, it's like, designers-- again, designers versus engineers. Art techs versus structural engineers. And industrial designers versus mechanical--

AUDIENCE: Well, in my world, I get to pick software thousands of users. So I have to evaluate it, I get to learn it, I get to play with it.

EDWARD EATON: Mm-hmm.

AUDIENCE: I have kids who use it in my own world, as far as, I'd like to build a drone. So I'm going to go and use Inventor to build my drone. But I learned how to use all those tools, and that time. It's too complex to try to move into our product [INAUDIBLE] work. It's just way too much. But how far can we go with these tools? So that's-- it's a tough choice to decide. Do I go back to the Fusion tools? And then we live outside of the Autodesk product groups, too. In our community, NX is like the lead product out there. And so there's so many [INAUDIBLE] that just think NX is just the greatest tool. And so it's just--

AUDIENCE: I've got to learn to [INAUDIBLE].

AUDIENCE: So if I could answer your question on Autodesk. Inventor is our third generation platform. Fusion 360 is our next generation platform. [INAUDIBLE] because there is a customer base of Inventor usrs out there. However. Where we are driving our technology and our solutions is the Fusion platform.

.

AUDIENCE: So Fusion is getting all of the attachments, and Inventor's just the en--

AUDIENCE: No, it is still getting attachments. But the division, the strategy of comfortably moving forward is based on Fusion rather than [? feature. ?]

EDWARD EATON: Yeah.

AUDIENCE: Yeah, you know, it must have showed that Fusion is more inferior in mechanical design. I think the joints, we could compare to [? Eraser ?] in SolidWorks, a little bit more intuitive. I wanted to comment on the internet connection thing. I work in Nairobi, where the internet connection is sometimes fishy. I use Fusion all the time. And I don't find that there's any [INAUDIBLE] in bringing it up to work with that, compared to Inventor. I was very afraid of that before I started using Fusion. And it seems to just adapt. You'll go offline, and you can still be working anywhere, update when you go back.

I also have a question. Do you know how to bend things?

EDWARD EATON: Do I know how to bend things?

AUDIENCE: In Fusion, like bend--

EDWARD EATON: In Fusion? No. Because again, novice.

AUDIENCE: Take this. It says exact geometry, and I want to do this.

EDWARD EATON: OK.

AUDIENCE: Yeah. [SNAP] In Inventor and SolidWorks you can do that relatively easily.

AUDIENCE: That's a challenge in Fusion.

AUDIENCE: [INAUDIBLE].

EDWARD EATON: Well, I always-- whenever I'm asked a CAD question, my first response is, what are you trying to accomplish? Are you bending it just because it's a hobby, and you want to-- or is there a mechanical reason?

AUDIENCE: Basically, if [? I'm only for ?] CFD analysis.

EDWARD EATON: OK.

AUDIENCE: [INAUDIBLE].

EDWARD EATON: Because if that's the case, I think you can split the body, rotate and then extrude a bridge.

AUDIENCE: That's what I did.

EDWARD EATON: Yeah.

AUDIENCE: [INAUDIBLE].

EDWARD EATON: Mm-hmm.

AUDIENCE: Nowhere the answer, [INAUDIBLE] very well. He's experienced, very experienced Fusion modeler. And he'll also run simulation. Same [? type of ?] question you have. He's at the answer bar [INAUDIBLE] right now.

EDWARD EATON: Yeah, that's a great point.

AUDIENCE: I want to be able to position things in parallel.

EDWARD EATON: I didn't hear that.

AUDIENCE: Positioning different components in parallel.

EDWARD EATON: Mm-hmm.

AUDIENCE: There is an easy way to do that.

AUDIENCE: We've been-- we're moving into Fusion 360. And we do a lot of carbons. And we were told they're going to be having machine [INAUDIBLE], features. That will be available soon.

[INTERPOSING VOICES]

AUDIENCE: I want to be able to fold something, some thing in a particular-- a particular position. And [INAUDIBLE].

EDWARD EATON: Yeah.

AUDIENCE: But there are techniques to do that, such as [INAUDIBLE] T spline body, [INAUDIBLE].

[SIDE CONVERSATION]

AUDIENCE: With that top [INAUDIBLE].

AUDIENCE: Excep to [INAUDIBLE].

EDWARD EATON: Yeah. Well, and the talk about sheet metal reminds me-- brings you back to the thing about computers. They're really great at stuff. But also-- they don't know what we designers know. If you're using sheet metal to bend stuff, and then you want to do an analysis on it, the mass of your part had changed if you're using sheet metal features. From a flat to bent up-- they're different masses. If you're trying to get something that's really precise, you've got to account for that and model what is actually happening.

AUDIENCE: Collapse, and they have to tuck in, obviously if they touch, big problem. And that's part of our problem.

EDWARD EATON: Right.

AUDIENCE: Have to work through all that.

EDWARD EATON: Oh, another one.

AUDIENCE: So I work with people who use SolidWorks all the time. If I was to tell them any one thing about trying to convince them to try out this software from your-- what do you think I should tell them would be a selling point to try this software out? What's so valuable about this software to you that myself as a Fusion user could tell another SolidWorks user, this is why you should try this sofware out?

EDWARD EATON: Well I think the real hook for Fusion is the T splines. That's what got me. Because I was able to do something a lot faster than I was able to do in SolidWorks. All the other stuff, all the extrusions and whatnot, if they're already SolidWorks users, why would they bother with Fusion? Because they can already do that in an environment they're familiar with.

That's one of the reasons that was sitting on the shelf for a while. I needed to have a project that I could take advantage of something new in Fusion. You're not going to switch software packages just to switch them. So that is the rub. At least right now.

However, there are some things that are in Fusion that are exciting to me that I'm going to--

we're going to try to use in the office when I get back next Monday. The [? generatives ?] of the design, the iterative FEA analysis. That's something I can use right now. And I can hopefully import a model and run a simulation. I want to check that out. And otherwise I don't know. Anybody else have a really compelling reason to go to Fusion?

AUDIENCE: The thing with-- the whole cloud thing.

EDWARD EATON: The whole cloud thing?

AUDIENCE: Maybe not-- Maybe it's not very [INAUDIBLE] now, but there's no doubt [INAUDIBLE].

EDWARD EATON: That's where we're headed, regardless.

AUDIENCE: Cloud-based is awesome. Microsoft does the same thing on Office 365. We use it in all our students,

EDWARD EATON: Mm-hmm.

AUDIENCE: You know, with this [INAUDIBLE] high schools with 2,000 students. It's a crazy rollout, but Microsoft 365-- And then you go into Office, any of these things that they automatically send, offline or [INAUDIBLE], in the area, and people can view it, and it's collaborative. That's, I think, the most important thing for students right now. That's what's going to be happening in high schools and going into collegiate levels and then into professional brackets. And I think that's [INAUDIBLE].

EDWARD EATON: Well and I think there is also a strong case, outside-- beyond the student workspace. If your guys were collaborating on a project, the cloud makes an excellent argument to try Fusion. Even if you're doing simple shapes.

AUDIENCE: It goes to [INAUDIBLE].

From an IP point of view, for the schools, cloud-based also eliminates possibly bringing in bad things from [INAUDIBLE] and that sort of thing.

EDWARD EATON: That's a great point.

AUDIENCE: Because end student can pick up-- if they're working on stuff at the schoool, they can load the software at home, no cost there. And work on things, they've saved their project back, so they've got everything they need both places.

EDWARD EATON: Yeah, I don't know if people in the back heard that part. By collaborating on the cloud, you're inoculating yourself from somebody bringing in a memory key with nasty virus on it, or malware. And putting it into a computer that's connected to your system. So that's an outstanding point.

AUDIENCE: A quick point. I just attended the Microsoft conference, and I saw the new 3D World that they're going to. And it's going to be amazing. In the next six months we're going to see all kinds of 3D construction tools [INAUDIBLE]. While we could just take an object, and take your hand, and you'll wrap around it, and it will give you a pretty surfaced model. And there's going to be a 3D paint program that's going to be available right away. There's going to be some great technology real soon. And I just hope that we'll be able to leverage that in and be able to make things.

EDWARD EATON: Mm-hmm.

AUDIENCE: We are. We are-- Actually, we are tied to all those initiatives at Microsoft where you can actually design in an AR or VR environment, using what's going to be an entirely new interface.

AUDIENCE: And it's going to be [INAUDIBLE]. We're going to see a big jump, I believe, in the next four months. That's my-- I think we're going to see some amazing this. And it is awesome.

EDWARD EATON: Yeah. It's a fun time to be alive, isn't it? There's so much neat stuff happening.

AUDIENCE: [INAUDIBLE] for ten years. They owned a dealership. So a lot of that. It was very successful, [? as ?] well. And I remember the one client that I walked into, and he says, well, can you draw this [INAUDIBLE]. And I looked in, and I thought, no way. All of those surfaces, all of that. And you can't even draw toilets. Just to show you how far we've really come. Literally. [INAUDIBLE].

EDWARD EATON: All right, well, thanks a lot. Actually this last half, I had a blast. I really enjoyed it. Thank you.