Supplemental Material A1. 22011 Interview Summary

Researcher: I guess where I would start is does the office use technology?

Interviewee: Yes. AutoCAD.

R: Is that it?

I: We’re not using Revit, a couple of different reasons, I don’t think its there yet. It’s still in its infancy and I look forward to its developing more. I think that it’s a great idea, great direction. It’s probably better to think of building the way it thinks of it. It’s developing a whole model, and then spinning off of that model to do the details. I understand the concept, but I’ve never, you know,

R: the actual practicality of it?

I: Never, gotten into the application itself. We also use SketchUp. And we use SketchUp not to do finished renderings. I really believe that the art of drawing is really important, and the softness of it, especially in the initial design concept is really important. I mean if you bring out a computer generated (.) rendering, if you will, it looks cold, it looks final, and quite often we want the ability to just dive into one little area and show a concept and then you can go into lighter on the others and you don’t have to finish the whole thing. And with a skilled pencil, you can do that. But,

R: With a skilled pencil?

I: yes. Well, and quite often, I’m gonna digress here a little bit - I’m asked by students when they come through, sometimes, if they don’t ask me I tell them, “what is that we should be doing to better prepare ourselves for practice?” And I always say, draw.

R: Yeah.

I: Hand draw.

R: Yeah.

I: Because if you do so, I really firmly believe, you’ll understand what you’re drawing a lot better. You can take a picture, but if you draw it, you’re gonna understand why that texture works really well. Or the balance just is striking. Or, ah, the proportions are wonderful. Or how the details connect. But you’re not gonna get that unless you have the ability to dissect it mentally and very few people do.

R: I guess, just off of that, and I don’t mind if we kind of move around from here to there
because everyone has some things that they find important, that just that idea of looking at something and not having that ability, you have to develop that. I’ve read some research that seems to implies, that a computer model allows to you see things, but

I: Well, I think that I would put that in a different context. Ah, I would put it in, and I would agree within this context, that we can model something up in wireframe and we can quickly move it around to find the view that we want. Whereas, in the old method, and I still use the old method, because we know how to mock up a quick perspective using, judging the depth by just sort of playing with it and getting till it feels right. And then projecting it out that out and you get everything in proportion. And that’s a quick way to do it. But, I quite often get something set up, I think I know where I want to look at it from, I’ll wire, I’ll rough sketch it all out, and then I’ll look at it and realize that I really want it to move the perspective over. Now, if I have someone who is really (facile) with the 3D program and they can wireframe it out, and I (told) where I thought it was, and I’m in error, we can move it around. And so, you know, one of the younger guys is doing that right now. He’s working up a wireframe and I’ll manipulate the views, and then I’ll overlay it, and do the changes on it, and the combination of those two methods is faster than, ah, one of them by themselves.

R: I’d agree with that. I have found it very interesting because I don’t’ - my background experience in trying to teach … technology to students is that because they can often look at those things, and understanding that students don’t have all of the skills quite yet, and where does technology fit if you’re going to teach them basic skills that designers would start with, otherwise they just get tangled in technology and that’s really all they want to do, is to play with the thing, and fix it and fix it and fix it, and now you’re this close, and when you pull out, everything is, there’s not, essentially it’s not where it should be because they’ve not necessarily gone down that pathway. So, I have to look, I often look at that as skeptical, for those reasons.

I: And I have other reasons too. I agree with what you’ve said, but my other reasons are, the majority of the time, the computer operator, computer drafter as you will, is looking at the screen, and its a composition of various colors, lines. They don’t vary in width. They don’t, when you lose that, you lose the ability to put depth in a two-dimensional drawing. And just the flat screen and coloring, you don’t get the feeling of how (.) are really coming together. Whereas, even in 2dimensional quick drawing, if certain lines are heavier than others, you start
to feel how this really is pointing up.

R: Where’s the profile [  

I: Right.

[R: What’s the detail, yeah.

I: So, in that you’re not connecting your mind with the actual building. It’s really interesting,
I’ve read several proposals, and I’ve that I first heard from our other partner, you really don’t understand something, unless you’ve drawn it, from the standpoint - one of our biggest residences, over in[...], had these huge moment frames, and X was standing in a meeting with the structural engineer, and our lead architect on the project, and several other people, and he asked the question, “How may of these moment frames do we have?” We didn’t have a full set of documents there, so nobody really knew. He kinda looked around, and we were doing this project totally on CAD, and he said, “you know, if you’d drawn it, you would know.” And he was right. But know, they’d plotted it out, replicated it, and there it was.

R: Just array that.

[I: Yeah.

[R: Till the end of the building.

I: Now I’m not saying that everything should be drawn completely by hand, I think that [  

[R: I wouldn’t think that.

[I: there are really strong parts to CAD, especially if you have to change it, or replicate it. If you’re doing a high-rise building, and you wanna, just do 22 floors that are virtually the same, it’s great.

R: Yes, I think that has the level of, what does the technology do for the efficiency.

[I: Right.

[R: of the office.

I: So what we’ve discovered, is, it’s a combination of both. That’s sort of been hinting at. And if we know something’s gonna take a lot longer we’re gonna put in CAD. So, the floor plans, the sections, the elevations, because as they come up through the development of the project, things change. So we’re gonna do those in CAD. But the details, that aren’t’ gonna change, we quite possibly, might draw them by hand.

R: I like that. With that in mind in terms of the process, um, do you find that most of the early conceptual, they’ll start all by hand?
I: Yes. Totally.

R: And, just out of curiosity, that at least within the office, the preferred method, no one, you’re not to start in SketchUp.

I: Correct. SketchUp is a wireframe tool for looking at what we can from it. And I have several, the paper B did deals with that too (he indicates the paper that another student has written on sketching), I really think you lose the connection between ah, your mind and the project, if you slip CAD in between it. He doesn’t necessarily agree with me in his paper, because he argued, well, let me step back and say why. It takes a lot of metal capacity to operate CAD. And it takes the left side of the brain.

[R: Yes.

[I: The right side, is the creative side. So when you switch over to the left side, you’re choking down the creative side. You got the left side, going to operate this very complex, ah application, you’re not being creative. Ah, so if you design within CAD, I really think you’re cutting everything short, of what it could be. Ummm, so we try to keep it by hand.

R: I’m only nodding because, well, I, myself, and I’m trying hard not to be biased, I have, I didn’t learn on the computer. I took one quarter, one semester of CAD, I think when I went through school, because it was required. Right, it was CAD one, and probably version 9.

I: Well, and that was a good thing. R: Yeah, but everything else all of other things, every piece, every project, all done by hand, at the level I could manage it, in school, but none of this, and certainly my first portfolio, it was all done by hand. I made copies, I cut them out, I pasted them on. You know, I did it that way, it was not, move this, move this, try this new layout, okay let’s change the color, I used black museum board, cuz I didn’t want to use white museum board. I didn’t really have any other colors. And I try hard not to be biased, and that something for me, its a different, its changed. It’s a different world, but how do we, how do we reconcile that? In a way.

[...]

I: B kinda touches on that a little bit, when he politely disagreed with me, or brought in a different point, I should say, he didn’t disagree. And that was that perhaps, there are people that are so (facile) with CAD, umm, that they can stay on that side of the brain and still be creative. I personally can’t see it, haven’t seen it, ahh, but that’s an interesting thought.

R: I would have to imagine, and maybe this is where that kind of thing is headed, is you know, as
we develop the connections between the two sides, some things that have to be developed also, like from childhood, so maybe.

I: Well, we’re also fighting how many thousands of years of evolution, they’re trying to do it in what, twenty years?

[R: I don’t know. I don’t have an answer for that, other than that you have those students don’t know what an album record, album vinyl, let alone a CD half the time.

[I: and we lost the album art.

I: if you scan this really closely, there was another objection I had with CAD in general, and that is ummm, it’s level of satisfaction for people working on the job. In the old days, if you put together a beautiful set, that represented the project really well and was a great document, you had a lot of art to it. And there was personal satisfaction. If that person was just detailing toilet partitions, you could still make it art on paper. And at the end of the day, you can look back at a nice set of drawings. I don’t think that can be achieved with the coldness of a CAD project. And we’re all in this for some sort of art aspect.

[R: You hope. ((laughter))

[I: I hope.

R: Yeah. Well I think if you’re gonna take the time and put in the effort to become and architect, whatever that means at different levels, at different points in life, or twenty years ago as opposed to now, there’s some sense of the aesthetic and the desire to make something, and to make something beautiful. Whether it is a physical object that gets completed, or the set that gets you there. Or the rendering, that, you know. And I think there’s some level of satisfaction still, but when I had to do CAD documents, it was always just getting it done that was the satisfaction, not the beauty of the layout necessarily. In that sense, all the bugs are right.

I: Well, when I used to do them, when I first started, it’s just the way a elevation is put together, and the line weights, and the crispness of the corners, you know. It was a type of art. And everybody that I was working with was the same way.

[R: Yeah.

[I: They all were striving to put together a really good looking set of drawings. And that care would project to the contractor.

[R: Ummhmm, I think so.
I: His level of care, too. If it was a sloppy set, contractor’s (gonna say) are my expectations not that high? Because, we haven’t projected it? I don’t know.

R: I’d say yeah. Anytime your work, collaborate, it wears off, every person on the job, typically.

I: Sure. Right.

R: and the client I would suspect.

I: The other problem I have with hand drawing versus CAD is CAD can look complete and done, before it is, and hand drawing you can’t disguise that.

R: you don’t have it if you don’t have it.

I: Yeah.

R: I think that was the other part of it, if you don’t know how to build it, you can’t detail it, because you don’t know how to build it.

I: Yeah, you can fake it on the surface, but pretty quickly.

I: okay.

R: Okay, past that one. Umm. I think that’s really process, technology, incorporation…let’s see.

Okay, how about this one. This one is interesting. I have a couple of questions, and they vary based on who I’m speaking with, which is umm, do you think technology’s important to design. For designing.

I: In a way. And I think it enable us to do…(hhhhh) umm, different kinds of design. Umm, the example would be the experience museum. That was not, you could not have done that by hand.

R: Right.

I: The computer was really important. Ummmm. I’m not saying I appreciate that particular design, just pointing out, I’m not gonna get into commenting.

R: You don’t have to. I was just there Monday, experiencing it is always fun.

I: Yes. Well there are various aspects that are excellent, especially where the, you know, the tram, goes through it. Those are really nice. Ah. And it also, I think it enables us to um, probably, well, we originally thought it was going to be faster, and it wasn’t, totally, not till we went back, and discovered if we partially hand drew some areas, that we could actually get a little more done. But, in the end, I don’t think it really has changed. We haven’t saved any time or any money in construction documents. But, it has raised the standards.

R: Sure.
I: The standard of care. As we’re judged legally.
R: Oh, right.
I: Ah, if you get I would be willing to be bet, at some point, we’re either there now, or in the future, of a practitioner was hauled off to court, and, accused of not being professional or not putting together an adequate set of construction documents, and they were hand drawn one of the first things that would be said, is, these aren’t even done on CAD.
R: right, these aren’t accurate.
R: And that would be easy to sell to a jury, but it’s definitely not true. So, anyway, yeah, I think we’re given more opportunity to do different things. But, we can argue whether that’s good or not. And the example that I used in a lecture three or four years ago was, the introduction of fiberglass into yacht design. Instead of the inability of wood to do certain things, it always dictated a certain shape, and it had to be efficient to go through the eaten well. Fiberglass could do just about anything. And then you further add the technology of being able to, ah, counterbalance the boat with ballast tanks, we end up with these ugly blocks ((interview laughs)) that go across the water and they don’t have the beauty that the old wood ones used to have.
R: and they can’t, essentially.
I: no. And, so, is there a parallel there? I don’t know.
R: Perhaps, there might be. I think, and you’ve probably heard that discussion about, you know, these are SketchUp buildings.
I: Yeah.
R: It’s forcing, you know, and it also brings up that question, if you only know how to do using technology, does technology start to really influence the design. Yeah.
R: I think the only person that can answer that is often the individual who’s actually using it.
You know. You can’t make curves very well in SketchUp, so darned if everything isn’t boxy and this and that are pushed and pulled. It’s hard to say, in that sense, because that’s one of the questions. Does technology actually aid designing, if you use it, when you use it?
I: We’re very aware and we made the statement multiple times within the firm this is a tool.
R: Yeah.
I: We’re not going to let it drive us.
[R: No.]
[I: We’re gonna try and use it for what it’s best able to do.]

R: I would have to stay too, though, that what area of concentration and the type of work that the firm does, that makes all the sense in the world. Because you’re not doing office buildings, or necessarily trying to create shapes and experiences that (usually) like EMP. I wonder what would happen if we took it turned it, and did this and that, and look at that and you, know, say, let’s make that. I read a very interesting article, and I still have trouble with it, because I’m not sure how to approach it. Saying that, parametric design, and using technology to create something interesting, and then using that interesting thing to be the concept and to create the way that architecture, you know, this is really what we should be studying, what are the possibilities, and then wrapping our architecture around that, and using that to create new spaces, is where education should be going. I don’t know.

I: Our designs always start with the spaces, and what they’re supposed to support, and relate to, and then from there, out the rest develops.

R: Yeah, I think, the first time I ever went to EMP, I’m assuming you’ve been inside as well,
[I: Yeah.]

R: I think that the disconnect between the uses of the space, and the exterior - you look at the exterior and expect it to do something when you walk inside. I’m going to have an amazing sort of experience just walking in and it, none of it, very little of it made sense to me. And I thought where’s that - and the sort of inside to outside I had trouble with.

I: Yeah. That would have been nice.

[R: and I assumed that was something it was going to do, and I think making that assumption was probably what I shouldn’t have done. But that’s okay. And just experience it for what it is. Which is a structure that houses other things, and don’t look at anything else just the things that are inside.

I: And it was meant to grab attention, which it does, R: ummmmm, oh boy does it, in every way shape and form, which we know. But, I hadn’t been close to it since Monday.]

 […]

I: But the library, when you’re inside, and I really believe, and remember when I talked about the way we start with interior spaces and how they relate to each other, and how they work, and they support people that are using them. The library has a really good system of structure,
relativity, and the exterior skin is just sort of draped over it, but the main thing is the inside. So from that, when I first saw it, I didn’t like it, but when I toured it and understood it’s structure, I liked it.

R: I had the opportunity to hear the structural engineer speak […] just listening to that thought process, and how do we work through, how do we make this happen, and preserve that inside feeling.

I: Yeah, I went on a tour with, I think was the local architect, and they worked really closely with the main architect, and it was the structure and organization of the spaces, that I was speaking to, and they pointed it out, and went through it very carefully, and it became really apparent to me that that was very well thought out.

R: and I think, I don’t know, I guess, knowing that it had been well thought out makes me appreciate it significantly more. As opposed to […]

R: I asked about technology, and aiding the design process. Why do you think students should prepare to use technology in design?

I: Ah, well, I think it’s here to stay. I think it’s gonna evolve. Ah, my own personal experience was, I went to XXX in the early seventies, and our university was on the forefront of computers. That’s where XXX went to school, and he was probably laying under one of the punch card desks when I was up there in the middle of the night trying to, trying to get my project through, and he was trying to grab a hour’s worth of sleep, but anyway those guys were always up there. Ahh, and I, kinda had an inkling that computers were going to be an everyday thing.

[R: Yeah.

I: So I took a real pertinent, beginning level computer class. What it did, it just gave me the aptitude to better understand this when it became o everybody’s desk. Ahh, so I had leg up, for my age. And not everybody had that. So I think students these days, even though, you know, the CAD that we see now, compared to what we’re gonna see in twenty years, is going to be looked at as archaic. Ahhh, and because it is awkward and is difficult, but you still have to get into it and understand it so that you can you can better use the next generation. So, it’s a tool,

we need to know how to use the tool.
R: I agree. Definitely. And it came about because we were going to use these tools and it became more efficient, in many ways, I think. I don’t know if the efficiency, where it fits into the process, if it is exactly where everybody thought it would go.

I: Well, I think it depends on the firm and its practice. Again, we can go back to the forty story office building, and you’ve gotta have it, or you’re not gonna be in competition with other firms. Our office, well, you can argue you can just do without it.

R: And that actually leads me to the question, that is ah, I ask this because I like to hear the different answers to it. How would you approach design without technology?

I: But we do approach design without technology. Cause we’re not using till we’re, with the exception of the wireframes in the 3D programs, we’re not using it till we get to construction documents. But, that said, there’s still a lot or design refinement once you put it into the box.

[R: Of course.

I: So, how would we do it without it? Well, we used to do it without it. Ahh and I don’t think our design philosophies have changed in the last thirty years, but I it’s not because of the computer. It’s because of, just the evolution of our practice. We’ve tried to become much more modern and a little less sticky northwest contemporary.

R: I don’t think that’s bad. I, actually, that’s one question I’ve been trying to ask consistently because, for you I don’t think I would have had to ask it, because I would have guessed that was the answer. But I do know, that I’ve asked it and had people smile, because they know there are some people that would not be able to answer that.

[I: ummhhmmm.

[R: And in straight forward a manner as you can. Well of course, I do this, this, and this, and if I didn’t have a computer, I’d just start drawing, by hand.

I: Yeah, but, I have to put the caveat in there, we, most employees nowadays, have more training in cad than they do in hand drafting. Ahh, and that’s exhibited just by the quality of simple things like lettering. You know, you did not get out of architecture school in the seventies unless you knew how to letter perfectly.

[R: You pretty much wrote books.

[I: Yeah

[R: practicing

[I: Yeah!
I: Not so much nowadays.

[R: Yeah, and I think some of the difficulty certainly, to go to any school that has design in general, there are rarely drafting boards and everything has been replaced with a computer or a space for your laptop and a place it, and it I don’t want to say it’s heartbreaking, but it in a way it kind of is.

I: Well, when I went over to XXX and that computer thing first started hitting and XXX donated a whole bunch of money in the architecture department went all over to CAD and computers.

And drafting desks were gone. But, they’re back now. [R: That’s nice to hear.

[I: They have both. They’ve evolved also.

R: I don’t think I’m going to find any answer, you know, truly that is we need to do it like this.

I: Well, it will be interesting when you go into a lot of offices, I don’t tour a lot of offices, we’re so busy right here, we don’t get out all that much, are there offices that don’t have drafting boards?

[R: Umm hmm.

[I: Yeah, I’m sure there is.

[R: And that’s why I’m asking all different kinds of firms that do all kinds of different things, because maybe that’s the consistency really, is that certain types of practice just need, if that’s just what you would like to do, as a beginning architect, that these are the kind so skills that you should be developing and maybe that means education has to start thinking about, what kinds of - you end up on some kind of track that allows you to develop the kinds of skills that your particular interest is going to value more. Because it is a shame for someone who believes that they want to go into one, to not have enough to get into that without actually having to work first a fair amount. But I don’t know, I don’t have an answer for that. I’m really curious, though, and I’ve been talking to people who have said, you don’t want to talk to me, I have a lot of opinions. And, my answer is I actually want hear those opinions, because, id rather in my point of view. My advisor calls is the XXX hypothesis. You know, something’s missing. Something’s definitely missing, and what’s missing. I’m trying to figure out, can we actually pinpoint what’s missing, or is it something that, we don’t, there’s no way to tell. Not that the graduates, aren’t smart, they’re bright, they’re well trained, they’re this, they’re that, but there’s something that’s not quite the same.
I: Yeah. R: I don’t know what it is.
I: I think learning how to sketch is what’s missing.
[R: Probably.
I: But, you know, technology is a great tool, and the kids know how to use it.
[R: Do you think it’s that’s its stated to force them to see differently too, though?
I: Yeah, I don’t think they see as well.
[R: Do you think they see, long and skinny now?
I: Remember when we first started talking, unless you draw it, you don’t really understand it. Ahh, you’re not understanding it when you draw it in the box. Ahhh, you’re manipulating colored lines. And also going back to when kids come though and tour the office, well talk about sketching. I really try to encourage them, don’t take a picture, sit there and sketch it. Ummm, when I was a freshman, there was, oh I don’t know, 900 to 1200 kids trying to get in to a 65-person program. And the way they took care of that in early studios is, is just handed out an unbelievable amount of sketching requirements in the first week, three quarters of the people would drop, and the rest of us would benefit because we learned to sketch.
R: I know I run into students that say, I can’t sketch that well. It’s because you’re not sketching, enough.
[I: Right!
[R: People who sketch beautifully, do it while they’re standing in line at [the coffee shop], do it when they’re in a meeting. Essentially, if you were to aggregate the hours that they spent sketching, there’s a reason.
I: It’s like anything, it’s practice. Some people are better than others, they just start quicker. But in the end, if you put in the hours, there isn’t gonna be that much difference.
R: It’s a skill. And, like you said, you have to practice it, cause you will lose it.
[I: yeah.
[R: I have told my students, that I got to a place in my career where it wasn’t really necessary, and you stop doing it because you’re churning out whatever needs to be done, and you go an try to sketch something, you find that it’s not, this isn’t easy anymore. That didn’t come out right, and I’m hoping to add that into this, its’ the physical skill of doing that, it’s a learned muscle skill, to be able to draw a straight line
[I: muscle memory.
[R: That’s why you do it, so you understand, this is how it should feel when you’re doing it properly.]

[I: Right.]

[R: You know, when you learn to play the piano, it’s the same thing, anything almost, but right now this is the muscle memory, right here, and with this thing.]

[R: Ummm. I don’t want to keep you for too long. How about, do you use technology, in this case it would be AutoCAD or SketchUp, which is what you currently use in this office, collaboratively? In the office, outside with consultants, does it serve a purpose in that sense, do you have to use it because other people want to be able to use it also?]

[I: Well, our consultants really appreciate a background, if they’re going to be doing the documents. Yeah, that serves a purpose. But, and this is maybe a different subject, but it lends itself to the same concept, we, we’re reticent, to let, let’s say a structural engineer, draw our structure. You can check a drawing till you’re blue in the face, you might miss something. But if you’ve drawn it, you’re gonna get it. So, what we, our structural engineer went to school two years behind me in architecture, got out of school, and things were really depressed, he went to work for structural engineer, and where we went to school, we took structures from the engineering department. We’re only a few credits short of getting an engineering degree ourselves. But, he’s really good, and he sketches everything out by hand, gives it to us, we draw it up in construction documents, and he checks it. That way, we can make sure it is coordinated with the architecture. Whereas, in a more traditional method, you may miss how a beam or purlin interacts with the spaces that we’re trying to create. So, most of the time we do it that way. Sometimes it gets really tricky, and we have them draw it up, then we have to take the extra time to make sure the integration is working perfectly.]

[R: I think that at all levels, but not every office will see the time as valuable, you’re responsible for yours, we’re responsible for ours, let’s figure it out on site if it becomes an issue.]

[I: Well, you know it’s tough, because sometimes the building department wants their stamp on the structural, where legally our stamp is supposed to suffice. Typically, we’re able to get by with the engineer stamping his calculations and we’re able to submit them.]

[R: Good. Umm, that sort of collaborative thing, I know certain places, you are probably not experiencing this, do you run into the issue of we took your thing, and we did this to it, how does this mesh together. Our insurance companies and lawyers when this first started]
happening we saying, don’t share electronic files, they become corrupted, you can’t lock them all that successfully, and so you don’t know who’s manipulated what, and when you get it back, something might be changed. But some people insist that you do it. So we have this little legal statement that paste on it when we send our electronic files, that say they’re responsible and we’re not. It’s kind of sad, but in the end, I guess it does save time. To have the backgrounds. In the old days, what I would do is burn a sepia, and I would draw over the top of the background. If you changed a sepia, you could really see it. […] So our preference is to send them a pdf and let them go from there, but they always want the blocks.

[R: Well, yeah, essentially they’re gonna have to put in the time, and redraw it, and they don’t know if it’s correct.

[I: Right.

R: I’ll make this essentially the last question because it’s something else that I wanted to ask, mostly because in general I’ve started to see a change, Does the level of technological ability for any individual, actually determine what roles they can play in terms of the design process.

I: No. I think it’s design ability that is that. Our associate is a very talented artist. Ahhh, he draws really well, is an accomplished sculptor. And he is the best person here, and its because he has that ability, and it’s not, you don’t know Revit, you can’t take these roles. A few of the younger people have played with Revit, but everybody that is here is here because they are interested in the art of design. And they know about us and they want to be involved, and that’s why they come here.

R: The assumption for me would be, because of the way that you approach the design process as the office, umm, you wouldn’t put someone in the position of, well here’s this, draw this, not just draw, but put this into CAD, they’d also have to have the design ability, before they did just that. Not just drafters.

I: Because if they understand it, and understand what we’re trying to do, and they understand the philosophy, it’s going to become enhanced, when they’re working with us.
Supplemental Material A2. 2222 Interview Transcript

R: Essentially, today, just talking with you, I really just want to get your feedback. I have three or four questions

[I: okay. I

[R: if we get stuck, [I have] some more I can ask you. But umm, yeah, just based on that premise, that’s really all, I’m trying to find out where, where everything is going, where you think it might be going, how we could possibly better educate. So, knowing that you’ve seen the history, or seen different levels, is helpful.

I: Well, umm, you know, just basic to start with, you know that anybody coming out of school today better know how to operate a computer. Now, you know if you’d ask people…go way back fifteen - no - computers started in the industry, heavy, in the early, not heavy, but in the early eighties is probably when you first had computer to do something. And then it was, ahh, again when we bought, I bought a system, in nineteen, let me think for a minute, 1984. Yeah, I was at XXXX. And we were faced with, and, and, there was no CAD. Everyone was doing things by hand. And, nobody was trained in computers. And so, what we did, was, you know, I got this crazy-ass idea that, you know, we ought to go in, this was out there, you know, and the firm was interested. So, we went and looked at a system, ended up buying a system. It cost us $450,000. For basically, four stations

[R: My goodness.

[I: And, ah, we bought a flatbed plotter, or, a flatbed digitizer and a plotter.

[R: With a pen I’m assuming.

[I: With a pen plot, oh yes. And ah, um, we, we bough this to use…everyone said, don’t do anything hard, don’t do anything big, don’t do anything that has a fast schedule, okay, all those warnings. I said, well, that doesn’t work, it doesn’t put anybody where it has to solve the problem. ((R: laughs)) So we bought this to do an eight hundred thousand square foot office…that has a tight schedule.

R: nothing like a good challenge to start with.

I: And, to this day, I don’t really know how we ever did it. But, it basically, and talk about the education opportunities, with when you’re in the middle of a crisis, you solve things better, than if you have too much time.
R: You’ll fill the time otherwise.
I: And, what we did, initially was take an entire team, in shifts, during a review period. We had

started the project during a review period. We were at basic, you know, schematic design,
where you know, it was a navy project, and it went from forty, sixty, and hundred percent
design, it was different. We were at basically, conceptual schematic level by hand. We had a
month review, and at the end of that review, we took the entire document set, and put it in the
computer. It ahhh, didn’t fit.

R: Not enough memory.
I: Well you gotta realize what we bought was, think about the date, technology, we bought a
system that was, each station, stand alone station, had a disk drive that would hold forty
megabytes.

R: I learned to use a commodore 64 was the first time I ever used a computer - in high school
I: Yes, yes. It was in that age. So, basically, we went, we probably ended putting, close to half
of the document, mainly floor plans, ceiling plans,
that kind of stuff, on the computer. But then you have the problem of the output. The pen
plotters, for every three plots you did, you had one you had to throw away. ‘Cause the pens
would clog. We ended up…running that project as a three shift project. We had people
working twenty-four hours a day.

R: Swing and graveyard.
I: Yeah. Because we could not, we didn’t have enough machines to do all the input. And when
we went to plot, there was no way we could plot it all…in a timely manner. That was…the
first wave. Then, as that evolved, umm, you know, you started buying the desktop units. And
these were big, these units were big. It was amazing. We started, and they were all black and
white - or green and black. Green and black, except we had one color one, it was awful, but, it
was supposedly colored. And we evolved through, that. It was, ahh, a system that was not
very well used throughout the country, and at some point in time, we decided we should
switch our operation to AutoCAD, because AutoCAD had the largest…you know, it was
getting, his was probably ten, twelve years later.

R: It was gaining ground fastest, certainly.
I: The other thing that happened there that I think was significant in the evolution of
technology…is we had, um, every, every, you got to the point, this was in the early nineties,
about ten, twelve years later, where we started having computers on everybody’s desk, you
had AutoCAD on them, and you had, you started to build infrastructure of people that took
care of these things for you. And there was absolutely very, there was very little knowledge of
the individual architects of this machine, they learned how to do this, that, and the other thing
on it, but they didn’t know how the machine worked. They didn’t know how it was hooked
up, they didn’t know anything about it. And so, in the firm you kept adding (fat) to help people
deal with these machines. And then it got bureaucratic, and if you wanted you actually had to
go through the system. And you stymied the creativity of what you could do with, you know,
technology. You basically, you can do it if you can, you know, get it budgeted for next year.
And so, what you had was this cycle that was, you know, somebody wanted to go try, you
know, there was things coming out, you know, umm, you know, modeling things, there
weren’t quite that, but there were softwares, you now that were coming out that people wanted
to try because it sounded interesting. But you couldn’t go buy it because it wasn’t it wasn’t it
the budget.

[R: Right.]

[I: You know, and so. Ahhh, I got really irritated, and went to the system, I was a principal, and
so the system was kinda like ourselves, and said, umm, we, we were in studios, we’re gonna
unplug.]

[R: Wow.]

[I: And, and ah what unplugged meant was, we don’t want any of your computers firm. We’re
gonna buy all new computers, and we’re going to charge, you know, everything was charged,
job charged. It would cost them, I forget the numbers but it was probably five bucks per billed
hour that we were paying for computers. And it seemed really high. And so, although when we
did the first job we were charging thirty five dollars per hour, we almost paid for the 400,000
dollars in the job, and we made a good profit. All this has a good story. But other big move
was to unplug. What we did, and this was all a part of how do people learn how to use the
machine. You buy a computer, you go to the computer store, something goes screwy, you
gotta figure out how to fix it. And you start to learn how these things work. We had people that
didn’t know sh[..] about how they worked. So, what we did, we took all the old computers,
gave them back. I mean this is virtually what we did. I remember it so vividly, then we had, I
mean we were twenty-eight people maybe, we bought twenty eight new boxes. And we had
them all delivered, and the first thing everybody had to do was go down to the semi that pulled up at the door, and take their computer and take it to their desk. And then they had to hook it up. Nobody was gonna do it for them. And the camaraderie between someone who knew a little bit, somebody that could everybody to learn, how to hook it up.

[R: Right, exactly, that community doing it together.]
[I: the community do it together. Loading the software. And then we had a couple of guys who were really interested that put the network together.]
[R: That’s wonderful, now the knowledge belongs to these people.]
[I: the knowledge belongs to the people. Then what we caused to happen is we had to have some wire that went between us and the system, we developed it. But we, then monitored the cost, we got what was bought, and if somebody wanted software, they’d just come over to my desk and I’d like to try this, and I’ said, okay. You know, and we spent three hundred dollars, and five hundred dollars, a thousand dollars, whatever it was, we’d try it, sometimes it worked. You know, people invented something new with it, sometimes it failed, and you wasted a thousand dollars.]
[R: at least you know. ((laughter))]
[I: But we didn’t waste, you know, five thousand dollars in time talking about it. You know, and that’s what’s so ridiculous, so I’m taking you, I’ll get you to today]
[R: no that’s wonderful because it’s a different thought process from other offices that don’t work that way.]
[I: You know, the problem is…umm, the nature of what we’re doing is changing. I still found, you know, people (grousing) about, well, my computer went bad, well, fix it. You know, ah, and they, and fixing it was taking it apart, and it took their time. Somebody didn’t, just come to help them. And you know, it never goes away. You got some people it’s no problem, they just take care of it, there are other people that, you know, oh sh[...], but you eventually develop a higher level of knowledge across the people working on these machines than you had before. Are you gonna have everybody that’s a computer expert? No. You know. But you’re gonna have everybody with a little higher knowledge, and that was the goal. Ummm, today here, we have an IT department in our [portion] that takes care of everything, and its somewhat back to the same kinda, you know, we just had a real problem with our network, we’re all connected to Portland, and there was all this grousing about, can’t they do what their job is, and why don’t
you fix it? And the problem is we’re in a technology where, absolutely, you’re not gonna learn
everything there is about running a computer system. But you better know enough to ask the
questions of what I need to do. So, today’s knowledge, it’s not just the software. It’s the
software and the hardware. I don’t think any education system teaches anything about the
hardware.

R: No. Probably not.

I: Now, where is this going? You know, I, ah, I have believed that ever since computers first
came out, that it’s only going to go to where you’re actually are driving all of the, umm,
industries that build things, you know, that you’re not going to be doing a set of drawings that
somebody takes the quantities off of and goes to that. You’re going to, and you’re going to
have extreme flexibility as to what you can do in the construction industry. You don’t have to
stick to standard sizes, you won’t have to stick to standard shapes. Ummm, if you can draw it,
you can probably find somebody that can manufacture it. And, you know, with tools, like, you
know, like Revit, that’s probably the one that’s used the most, it keeps track of quantities.

Umm, it creates a 3d model that you, with the proper interface to machining, if you put a
window in a certain size you can probably have someone deliver it, and it’ll cut the schedule
time down. The ability to visualize and walk through, umm, is here today, it will be quicker
and easier. We’re building the model in the computer today, we’re not drawing much of
anything. But there’s still people that will visualize things with hands. And, with everything I
said, everything I’ve been, then I’ll let you ask some questions, the quickest computer is your
brain to your hand. And so, you know, not your brain to a keyboard or a mouse, but your brain
to your hand and a piece of paper. You’re not, well I’ll never say not, because, you may have
technology that puts your brain to that may allow you to, and that may come, I don’t discount
that. Ahhh, but, you’re still able to be, the art of creating an idea, the quickest way is a pen to
piece of paper. But today, there isn’t a firm that is going to bring in somebody new, that they
say well, I only do pen to paper, no I don’t know AutoCAD, or I don’t know Revit, SketchUp,
what’s rhino. What we’re looking for What we’re looking for people that have done all that,
have you ever played with x,y,z every who interviews here they do something a little bit
different. And that’s the kind of person you want, who can push the limit, who can match
different softwares to create images. But clients today, are looking for, they just don’t want a
nice idea, they want to see it, they want to walk through it, they want to fly through it, and they
want it tomorrow. They don’t want it - oh, well, we could.

[R: six months from now.]
[I: Six months from now, and education of people to do that is extremely important. So, now, I’ll
shut up.]

[R: No, it’s quite delightful to listen to the, the history of it. The background, essentially, and I’m in
the design computing side, the theoretical side of things at the XXX, and for me, sort of
looking at it, I’ve had in my past the opportunity to teach technology to beginning designers.
And that thought process of what’s the best way to do that. You know, we use technology in
practice, very differently, I believe, than what we actually teach our students. Because of
course they don’t know anything, and as the years continue, they know more and more about
using a computer and they already have a predetermined thought of how they should be using
a computer. But then, depending on the program, umm, they’ll come in, and they’ll either
learn, and this is where education is sort of maybe struggling with the thought, do you just slot
technology into the studio and show them how it would be used, like it is in an actual office, or
do you teach them that separately from what they’re learning as the foundation of learning how
to do design. Structures. There are people who argue that we should learn to do it by hand first,
rather than with a calculator or computer. Count these up, add these in, and then show them
the process that you just put these things in, so you know how you got there. So, it’s, and that’s
the struggle, as I was saying earlier, you have only so much time, to be able to try to prepare
every student, okay, here you go, out you go, to give them what an office thinks that they’re
going to need from them. So, that’s where I’m at, is trying to say, is the way that we learn,
you mentioning how you learned together, and with other people, and your level of knowledge
increases because everyone in the room is doing something. And back when, and back when
the studio consisted of a lot of people, and you have lots it trace, and drafting boards, and
pieces of things getting piled all over, someone else could come along and say, wait! This is
one’s a really good idea, or you could go back, and now, if they’re learning, and it’s all in the
computer, and we can’t see the evolution of they got there, it’s a different thought process.

[I: You just hit something there.]

[R: Okay.]
I: Make sure I show you before your leave, the way our office is designed. Our offices are, you probably saw the open space. Well, on the other side, of the gallery, are a series of cubicles, that are like little conference rooms open to the studio. But that’s where we assign a project and we put everything up, because the computer does not allow other people to see things. We have crits in those spaces, we bring, and it stays up. The problem, in an office space if this is a room, where if somebody comes in to meet with you, you put stuff up, for that meeting. In those, the stuff is always up, so that people within the studio can see what other projects are doing. Because we used to have stuff laying around

[R: All the time.]

[I: on the desks, that was interesting things that showed you what people were thinking. Now you don’t. And yet, so when we did the office, we searched for a way to do that. It takes more space. It takes a lot more space, actually, but it, it does solve that problem somewhat. That paired with opened plan, you know, open plan is all about, everyone has a collaborate effort as opposed to the old architectural office, where partners. The engineering world still does that. If you find an one of those offices, stay away from it. They all work. Anything can work. It’s just, umm, you know.

R: you want to be able to, I think, facilitate, continuing.

I: Now back to your question. Ahhh, which I think, I’ll try to repeat it if I can, is the education one of having people understand. There are several ways you can educate. Understand by doing everything the old fashioned way, so they understand, you know, everything I know from having done the same thing, or do you start them somewhere in between, and just, you know, they don’t need to know because it calculates it for you. You don’t need to know that one and one equals two. You go to your calculator, put in one plus one and it comes out with two. You don’t need to know that six hundred and forty eight times three thousand and sixty two equals, you don’t need to be able to do the hand math to get there. You have a calculator. I don’t think today, you need to know how to do the hand math. You know when I was in school, I learned all the things the old fashioned way. I don’t use any of that anymore, I still could do it. So now you were talking about how you envision a building. You know, the old fashioned way is you know, by hand, drawing, you still have a large proportion of people that came, anyone that graduated from college before 1980, ahh, you know, isn’t there yet. A lot of them never will get there.
And that’s okay. That’s not the future.

Right.

The future is, ahh, people who grew up, using a computer. And so, I believe, and you can, you probably at the U have, it would be interesting to take a survey of the educators there of how many graduated from college, I’m picking 1980 because I know that’s when it started, and how many graduated after 1980. And ahh, you know, I would guess there are more that were before 1980. That’s the problem. Just wait, it’ll take care, but, is that gonna help, you know, I shouldn’t give you a bias. I don’t think university education gives you very much of what you need to do and know out in the real world. It never can. You know I’ve told students, I’ve told people for years, don’t let your classes interfere with your education. Because, college is about learning to live in society, and to think, and to learn, but I also believe you want people to come out of school with skills that they can, you know, put them in a place where they can be productive. We never hire anybody and put them in a [desk] and say just spend your time thinking. ((Interviewer laughs.)) But, back to the 1980’s, I have a daughter, she was born in 83, you gotta understand, she grew up, there was always a computer in the house. And, you know, when she was tiny she was playing on the computer. And when she was about ten, one of my partners at XXX called me to ask me about a computer question. And she answered the phone. And he said, I have this problem with my computer, could you have [your dad] call me. And she said, She said, […] maybe I can help you. What’s your problem? And he told her what the problem was, and she said, you should do this. And it fixed it. And it basically, showed you, vividly, the difference between the next generation, and our generation. Ten or twelve.

But she, cognitively, she was already thinking like that.

She was thinking like that all the time. So, you really have to understand that that’s changing.

The big disadvantage at the university, with all those people that graduated before 1980, never will get there. They never will. I mean, I think I’m somewhat of an oddity, but I’m not there. You know, if I had my druthers, I’d just retire and learn how to use Revit. I know how to use Revit. You won’t find any senior principals in architectural firms that know how to use Revit. I know how to use SketchUp. I know how to use AutoCAD. Am I proficient in them? No. I don’t claim to be.
[R: But you don’t necessarily need to be.

I: I don’t need to be, but I’m fascinated with them. Revit is actually. AutoCAD tried to do 3D stuff, you know, at one point in time, never developed, but Revit is starting to get you there. I mean. And you, know, early on programs, I actually know how to use Rhino. XX had this class, that they taught for professionals, of a interface, and I took the first quarter, and learned how all these different programs interface with machines. Fabrication, yes, we played with the plasma cutter that you’ve got, we played with the, that’s probably where you live, the laser cutter, the plasma cutter.

R: Typically, in the design computing, that’s usually what most students are interested in doing, is going that next direction. People will come in with an architecture and will say, oh I’ll learn how to this. I came in because this is where things are going, and how do we educate towards that, now, because, where is that happy medium, is there one, or do we need to keep evolving education also. Along with.

I: Unfortunately, you’re going to have to keep evolving, because, the architectural profession is just gonna evolve, basically, with who graduated when and what was there. It takes a long time. I wish it didn’t, but it does. I mean, how many people in our office, have any passion for learning, not many. They have, they get out of school, they rent an apartment, then they get married and have kids, and they don’t break out - they all want to, but they don’t have time to. And the profession, even though we have all these educational programs, people come into the office, they don’t know how to use Revit, we sent them to Revit class.

R: The office makes sure they are trained.

I: You have to. I mean, you can’t.

R: They don’t have to learn it on the job. Sometimes a smaller firm will say,

I: Well, if someone comes in and says I’m not proficient at Revit, but I know it, they’ll probably learn it on the job. There’s a lot of people. You know, it’s a collaborative, the person next to you probably knows how to do everything you need to now how to do. And ahh. So, it just takes, plugging away at it. The best thing I got out of going to that class is I had could buy student rate software.

[R: ((Laughter.)) That is always a really good plus.

I: You know, we spend six thousand dollars or something like that for a copy of Revit. I could buy a combination Revit/AutoCAD for a hundred and fifty bucks. It just put’s this black
education thing on the front. So that’s what I play with at home, and I got a couple of other
pieces of software, Rhino, you know, it was like
[R: it can’t be more than like, a hundred
[I: Yeah, and it was a full version.
R: If you can get five, which is the new one that’s out, apparently fantastic
[I: Really?
R: It’s the next new version, cause it has it’s own renderer, within it also.
[I: it does.
R: A better one, I guess, than the one that was.
[I: We had a these little seminars, for the connection of grasshopper.
R: Yes, that’s its’ own, area.
[I: I’m not quite there yet. Where you set a formula up that drives all the components and
whatever you’re drawing, and then if you want to make the column longer, you just change
this number’s input value.
R: It’s quite something, and we, there’s a lot of people who find that, you know, really
fascinating.
[I: Oh, I think it’s really fascinating, but, the problem, this is one of those global problems. Is the
size, and capacity, and the speed of your brain. You know, what can a single individual,
know. You know, you start to say, well, first of all an architect, really needs to know
everything there is about structural engineering, mechanical engineering, electrical
engineering, civil engineering, landscape. If they knew all that, they wouldn’t have to hire a
civil engineer, a mechanical engineer, but why can’t they? Why can’t they, because if you
could learn all that you could be more cost effective. But they can’t. It doesn’t work. Your
brain’s not big enough. Or your capacity to feed in, is not big enough. Now perhaps, education
will find a way to feed that all into your brain, and you won’t have to spend time in classes that
do an experience, and you’ll get there. Maybe that’s the solution. Maybe it’s a robot that has it
all fed in the brain and you tell the robot what you want. But that’s the limitation. Take that, to
your training an architect to understand what they need to know to deal with spatial
relationships, how a building works, what the needs of a client are, how to interface with a
client. The contracts they need, the codes they have to deal with, and now you’re telling that
same person they have to learn some complex software that has all kinds of rules, that you
have to learn how to use. Is that asking them to do too much? And, you know, would you be
better off just training them real well how to draw by hand. And then have a whole nother set
of people you train to take that input and have it drawn up. I.E., our industry came from, where
the architect was the master of what needed to be done, and you had tradespeople that drew it
up. You know, the drafting room. Umm, I’ve been in firms like that. And, you know, I pushed
away from that throughout my career because I think there’s more capacity in the brain. I also
think, not unlike, this is a linkage that you want to make, what we’re dealing with today is not
unlike what we dealt with forty years ago, where the architect never learned how to draw.
Documents. Never learned how to do that piece. So they had the drafting room that did it. I
throughout my career have said, from a cost-effective standpoint, if you teach this person how
to draw, you don’t need these people to (assist you draw). And if they learn how to draw, not
just draw, but how the details go together,
((the light in the room goes out.)) I: We may have to move. The lights go off if you don’t.
R: Where’s the sensor?
I: I don’t know. Somewhere. This room is funny too, […] ((Return to seats.))
I: That you have to detail, you have to learn how to put the funny little sketch so you can build
it. That’s, you know, there’s architects that don’t go that far. Because their capacity of brain
doesn’t take care of it, or their interest doesn’t take care of it. But, so what they used to do is
they had a drafting crew. Today, I think we pretty much got everybody that goes on a team can
draw. They have to draw how it goes together, they can seamlessly go from. [R: they, they
know, how to draw. I: They know what to draw and how to draw it. What they don’t know
today is how to have Revit draw it, or AutoCAD draw it. So we’re in the same transition, that
you had when you used to have the drafting room. So, you know, now, these people, they can
draw, but it’s not worth anything anymore. What are we gonna do with this hand drawing. We
need in Revit. And so we’re facing, that transition. You look at the industry, we made that
transition, we don’t have drafting rooms, so to speak, anymore. We actually have in, the
SketchUp room, you have a lot of the same thing, it’s a similar kind of thing.
R: You have the people that are the modelers because they do that -
I: Well, you know, we have people who are very skilled in it that end up doing too much of it.
We work real hard at not getting somebody pigeonholed. And it’s hard.
R: In terms of the actual, in terms of hiring staff, you don’t hire someone who can just 3D model, and is not also capable of knowing what to draw.

I: We want them both.

R: They have to have both.

I: We’re, you know, we’re in the process of trying to find two or three new people, not specifically because we’re extremely busy, we have a, we see this workload coming along, we’re going to be extremely busy, so our goal in finding, we would like to find the three, best brightest, most capable people in the world, that are graduating from college right now. That’s our job description. Doesn’t matter, but we do want smart people that can take things and just do it. And the reason we want those people, we’ve got a couple of those, and you know what, somebody at twenty-four can do a lot if they’re smart. And somebody at twenty-four that isn’t, can’t do. Or somebody at fifty-four, who isn’t, can’t do much. And we don’t want to have people when they’re fifty-four, that we hired because we were too busy, and we had to take what was there, sit there and say okay, maybe we can find something fro them to do. I’m just being realistic about our firm. So, if you have bright, intelligent people, it doesn’t matter what comes along, they’ll learn it. They’ll learn it. If they don’t get too heavily involved with life. But, again, from the education standpoint, you need, it’s probably a combination of your descriptions of you know, giving everybody a little bit, but also being able to give them a lot. But your biggest detriment, is professors.

R: No, that’s fine to hear.

I: And don’t, it’s not that they’re bad. [ R: They do know what they’re doing.

I: They do know what they’re doing, and some of them may be very interested in it [technology], but they don’t know how to do it.

R: because they don’t have the experience.

I: We have people that say, you know, I want this 3D model walkthrough, and I say, sit down and do it. I don’t know how to do it, I shouldn’t have to know how to do it. Well, okay, the person that is doing it today, for you. Fifteen years from now, when they’re in your position, they won’t need to have that done.

R: And that’s the transition.
They will create the original idea that you’re trying to feed to that person to put into a SketchUp model, straight out of the SketchUp model. So now, you’re not wasting that time, and you know, and you always get back, well it’s not worth my time to learn how to do it. Well maybe not. So that’s the issue. And it’s a transition. And you’re not there yet. But, you need people that can think, that can learn, and you know, if we had people. The ideal person out of school, from a technology point of view, if they’re extremely proficient in Revit, extremely proficient in Rhino, or in SketchUp, one of those early stage things, extremely proficient in 3d max, so you can render things after you’ve created where they are. And know the entire Microsoft suite and the entire Adobe suite, inside and out, that could do all of that, you know, if you had somebody that was extremely proficient and knew a little bit about architecture, and had a passion for architecture, they would be better than somebody that knew everything there is about architecture but knew nothing about those things. Because you don’t learn anything in school, about architecture. I mean, you maybe learn five percent of what you need to know.

[R: Everything is gonna be learned through experience]
[I: and learn way more experience on architecture, in doing the business of architecture. Very little about what we do, as the business of architecture, teaches you how to use Revit, other than you have to use it. So, if you’re gonna use it, and use it better, but, going out and meeting with a client, to discuss what their needs are [will] teach you about architecture. So much of what happens in the academic world, there’s no cost associated with it, there’s no codes associated with it, oftentimes there’s no client associated with it, although they’re getting better at that. Does that address the first question you kind of –]
[R: Well it does, kind of. And that’s the thing is, I don’t know that there is, necessarily a specific answer, to any of the questions that I have.]
[I: No, there isn’t.]
[R: I’m hoping to, by talking to a number of different people, finding one or two trends that seem to be, that seem to be what the practice is looking for now. And only by looking at the practice from, everybody has a different concentration, they do things differently, the design process, essentially doesn’t change.]
[I: Yes.]
[R: But how we slot technology in, and where we use it, and when we use it]
I: yes.

R: whether it’s at the initial stages, where you’re preliminary, or it’s all the way at the end
where it’s usefulness is at the document stage, or collaboratively with the rest of the other
consultants. That has changed significantly from what it used to be.

I: Well, the trend, in manufacturing is going towards less a […] and more you can have whatever
you want. [

R: Far more specialized because it can be done now.

I: Because it’s all in how they put the numbers in the computer. If you want a window that’s
twenty-four and two eighths inches wide, as opposed to making a twenty-four inch one work
you could get it. The manufacturers are going through this trend also. They say that it’s not
true in every manufacturing industry, but they’re probably ahead of us.

R: I think architecture tends to lag behind in terms of technology.

I: But that’s the mentality that you have to slowly learn how to deal with.

R: Right, we don’t have to work in twos and fours and eights and this and that.

I: And the nature of what the shapes and forms that you can use, and build effectively are
changing. A curve something used to always cost more. They curve something probably still
does, but I’m not sure that’s going to continue. And there’s some things that to curve
something is a little bit more but not a lot. And so, you know, as it evolves, you’ll find that it
doesn’t have necessarily have to be as rectilinear.

R: Do you think that, just based on that, do you think that the ability of technology or technology
in the way that it can be I guess manipulated now, as opposed to just hand drawing, does it
allow people to think- to design differently now, than they used to?

I: Absolutely. But how many of the people are at the point where they’re leading design, and
they are in fact choosing that technology. That’s an interesting question. Are the originators of
design offices, the principals that guide them, using technology to start that process or not. My
guess is that, this is the older offices, not the young offices, older offices, it’s probably ninety-
five percent don’t use the technology.

R: Maybe to open it and look at it, but that would be it.

I: If I was a betting person, if you did a survey of principals, in architectural programs, and how
many of them are proficient in Revit, ah, proficient in Revit ((emphasis)), you - well it’d be
interesting if you found any. How many know Revit? Not very many. How many know the
word? Probably seventy-five percent, probably ninety-five percent. Now go back to something like AutoCAD, the percentage will go up. Take new 3d Studio max. How many people, that’s one I’ve haven’t ever used, how many people have used that.

R: It’s got an intimidating interface.
Supplemental Material A3. 2261 Interview Summary

I: 32 years in practice - 34? Graduated in ‘79.

R: How many familiar are you with technology:

I: Definition of technology? Used to use Leroy pen on vellum. Didn’t learn in school. Have to know how to learn on the job. Have to understand how to learn technology - can’t learn all at school. Traditional definition of tech - computers used in design phases.

R: Whether production or development.

I: Production - has been at XXX 16, previous [company] 19. Started basically with first version of AutoCAD. Didn’t learn in school. Company wide charged to be on top of that. Took a few classes, then let’s go. It was really just floor plans at that point. Elevations and designs were all the old fashioned way. Even perspectives were on the drawing board with pins. Any of that design never got into that company. That was through 97. We went from floor plans to elevations. Pretty soon after we started. Then it got to - we never got to detailing. Mostly plan related things and elevations. AutoCAD is sort of dumb, there is not a connection. It [AutoCAD] helped more in production than design.

R: Office here - what types of design software do you currently use?

I: Revit, previously on AutoCAD, still part of some projects. Consultants are usually more AutoCAD. Just finished job that was in Revit. Engineering add-ons for Revit aren’t as far along as architecture. They can’t do the same thing as the company can. They develop new routines and shortcuts to make models work together.

Company is in [three metro locations]. For the first 30-40 years, all design was in [a major California city], satellite offices were production. They’ve used the latest 3d since early 90s. Form z, 3dstudio, all iterations of that come out of that. When I first came, we’d get an update before it comes out [to the public]. We’re on the bleeding edge of that. I think there’s other 3d software that we use that is not Revit.

R: No SketchUp no rhino?

I: We do rhino, we do SketchUp. SketchUp is a little but of an add-on, we’re trying to switch the work we do in SketchUp to Revit and rhino.

R: assuming based on level of images, you also do illustrator, Photoshop, etc.

I: Right, yup.
R: You said, no formal training in school, does the company do formal training?
I: We will, Revit was a big change, 3-4 years ago, we didn’t have anyone that had learned it in school, at the leading edge, we wanted to get on top of it. We had a strategy of sending people to workshops to learn that.
R: Typically, when someone comes in, whether they were experienced or not, would you send them?
I: Kind of depends on our needs, and the type of person. Doesn’t necessary raise a flag to train. Let’s see what he can do. Some people can learn on the job. There are some who don’t like that, they feel you need to start Revit with a class. It’s been both ways. I want to make sure they’re good enough for us to invest in a 3 day class, we test them a little but, to be sure that it makes sense. Other side of that is we’re on deadline we can’t take you out to learn Revit.
R: Trial by fire. Do you yourself use Revit/AutoCAD?
I: I did AutoCAD, then gradually moved into management role. You do less, and less of that, at least I did.
R: So you use it for review?
I: Yes. I’m on the point of I’m not ever going to learn this. I might have 10 years left in the industry.
R: Sure there are other things they want to utilize you for. But someone new, assume they would go straight into using technology for their job.
I: Right. That’s true. We basically say, if you don’t know Revit, and have no background in AutoCAD, you’re kind of (…) there could be a few exceptions - we have needs over the years for just CM [Construction Management]. But even with that you have to get back to the model to make changes.
R: It’s difficult to fathom anyone who would be doing that. Does the office use refit now, to do conceptual work? Besides DD [Design Development], or is it traditional?
I: More, we use, the 3D stuff in concepts and schematics, but that is matter of personnel familiarity. What someone is comfortable with.
R: Would you allow - the way that the team wants to start is fine.
I: We make sure we understand that we will want to be here, but if it takes some other sketch or model to get the point across, that’s fine. But eventually we’re gonna translate that.
R: [Always] budget and deadlines. Over the years, has technology changed the way the
I: No, I don’t really think so, we have foibles on how we’re not necessarily good at delivering our product, but we generally have, in particular in healthcare, we have planner, designer, project manager. Those 3 leaders are involved in the beginning. However they get to the technology to present ideas in design is still kind of the same. SketchUp, Revit, same steps in the process are still there. We haven’t silo-ed people, but we have designers, planners, managers, that are aware of what their world is and how they have to work together. Technology hasn’t really changed those relationships, from the beginning, probably changed a little more in the end, but DD, CD, CA, still have a product at the end. It still is some documentation of what we’ve done to build this building.

R: Has the amount of time in CD preparing the CD has changed?

I: Trying to convince clients that we’re spending more time upfront to develop, but they haven’t really bought that we need to expand SD and DD phases. And the total is about the same. They like the idea of shorter CDs. ((Laughter))

R: Of course, shorter everything.

I: So that has shifted a little bit. Minor shift in us and how we deal with that, how we get approval in the DD phase. That still is in flux, in terms of how we manage that internally. We’re finding this, we should document what we know. Still people in our group that are not on board with that yet. They don’t understand the specifics of that and how that changes the project roles of people.

R: Would you say that the roles and responsibilities have shifted a little?

I: Yeah, I would say that’s fair. We’re expecting somebody who knows Revit to do a little more than someone who is a junior level person 20 years ago.

R: It’s not just production.

I: They are in the same model that is the final project, as opposed to just doing a detail. There is nervousness that we have about having junior people open up the model and do this redline.

R: It could impact far more than just this section of this drawing.

I: Right. I think that is where upper management has said, we need to make sure that we have good people that now what they’re doing with the Revit model, if they’re just good people, that don’t have that training, let’s train them. Investing in that.

R: But would go back to having the right foundation built in education, design, creativity,
I: Yeah, right.

R: Not leaning heavily to need to have Revit, need to have CAD,

I: Right, yeah. I guess that leads a little into my bias.

R: Biases are good. There’s many of them out there.

I: I think that - it makes sense to me - I think that there other people that share this sentiment, when I see a resume, just out of school or have been out a bit, I take a look at their skill sets, that’s not what on the table for me. It’s this (gestures between R and I.). What you say, how you say it, the non-technology part.

R: You can’t teach it.

I: I can’t teach it. I expect the technology part, you gotta have it, but if you have it and you’re a jerk, I don’t care, I don’t’ want you on my team. This might be coming from some who isn’t’ a Revit guy, I just think that just confuses the issue for me. I wanna look at what value do you bring. I want that [technology] but I want something else. A lot of it is basic, good people skills, good life experience. And then if you have that, I’m gonna spend all the money I can to get you up to where we think you need to be if you’re not there already. Its interesting the parallels of the general subject, with work and personal life. I’m intrigued by how it impacts people lives. I cant live without technology, but its not what I look for. I want to have a human experience with people.

R: You might be able to live without technology for a bit.

I: Yeah.

R: Essentially I know that education as a whole is looking at technology and saying how do we manage this interface, this technology. You have no idea what students are doing, if they’re engaged. One of my questions - we use so much technology now, in practice, but we don’t necessarily, bring in the computer into the studio space, and train how those go together and how do we use them. As an overall whole, students are left to decide that.

I: Right, yeah. Right.

R: That’s my question. I don’t know that we know. It changes everyday, how we use it. There are some people that do their jobs without them. I would say there a balance we’re searching for. I’m hoping to find that.

I: That’s a tricky balance. When I was graduating, we looked at ourselves, some had summer jobs, just drafting. They came back, and said, we don’t know what we’re doing. We don’t’
even know what a door detail looks like. We went to the professors, and said you guys aren’t
teaching us what we need to know, we’re going to be blindsided. He said, well the philosophy
is, you’re gonna learn that out there. And what you can learn here, you’re not gonna learn that
out there. You’re’ gonna learn design, you’re’ gonna learn the stuff that is fundamental, that is
important to architecture. The technology, you can learn that. And that we expect you to learn
that when you get out there. Were not gonna teach you all those things. That made me feel
better. Let me get what I can from here. I might be designing these big projects that I might
not do when I get out.

R: Don’t’ worry so much about the things that you think you might need to have, if you don’t
really know that you need to have those yet.

I: Right. Yeah.

R: The practice will determine what other skills you’ll have to include.

I: Right.

R: Learn the basics. We’re all on the same page.

I: I think that’s kind of what I got out of that. And I might have put this into his words in my time
since then, but I think to me, we had some group projects, and situations where we had to deal
with people, there was some focused attention on people skills, and human stuff. That I
didn’t’ really realize at the time, but I took that way, and that’s kind of what I’ve focused on
more as I’ve gone through.

R: Well, the business of architecture is very collaborative. You need to learn how to work with
other people. Do you - have you hired anyone recently - would you say there is a good
balance at the moment?

I: we were actually on the threshold of adding folks last year, I brought in a lot of people to talk,
I guess I placed an add, had a lot of response. Mid-level person - 5-10 years or that. I got a lot
of people from 30 years, and graduates. Some of them there was something compelling. Of
the people I talked to, I would say there was, half went away pretty quickly. Not too much
about technology, we don’t’ have a rigid formal testing.

We might get other folks in the discussion. It’s about trying to get a feel for who they are. See
how they follow along with you or not. I try to get personal reactions. Of the people that
didn’t’ seem to be appropriate, everybody seemed to have a comfortable level of basic
requirements. Skills set was all there.
Actually one guy, I hired him six years ago, he’s still here. I noticed that he said eagle scout, that he was a French horn player in the college band. I’ve been through architecture school, and I know what that involves. And I said, wait a minute, you were in the marching band, and you did architecture? And so those totally unrelated, but not really, sort of made us have a different conversation. We came back to the basics of what he learned I school and his AutoCAD experience, but that really wasn’t what sold me.

R: It’s the other things that are outside - that are really interesting. I think that makes for the most interesting thing in general office relationships.

I: A whole culture of an office is the underlying with not only the technology, but how effective you can be, how happy you are, that’s a tricky one.

R: What you do involves the people that you have to work with every single day. Education is about creating the environment. With that in mind, its good to know that you feel people have what they need, would you say that technology - it can technology assist in design, or improve design? Is it part of it now? Many years ago it was a tool for production, we’ve changed its role over the years.

I: I would say in the early phases of a project I think it’s still a tool. It’s not it will help you communicate, envision stuff, look at different situations, and it might instigate certain lines of thinking. Umm, but I guess I think that it’s still a tool. I’m looking at the board over here, for some project. Whatever was the difference, we had option A,B,C. I forget what it was, what we used for that, but we imported the existing buildings. We had these three different schemes, but somebody has to have the idea first. You can’t really, you have to think about the relation of the street, the relation of the exiting…after that comes, then the technology can say okay, well, here’s what that looks like. But sort of the early parts of getting to that, is sort of fundamental design training and what you experience in what you’ve done before, (35:38) what you’ve worked on before, hat you’ve even seen, just when you walk around the place is really cool or whatever.

R: So, in this office environment, that would not necessarily a manipulation of shapes to see what would happen, without that design process. Let’s try this, move this here, move that over there.

I: The moving of those things out there - depending on the person, it might be on flimsy. It might be SketchUp. I’m not sure I said that, the first 30 years of this office, we didn’t do that,
but now anyone can be sitting here or in XXX.

R: You did mention that there are people who would prefer to visualize in 3d dimensions, I’m sorry, 3 dimensions as a virtual model, rather than 3d dimensions as a flat 2d model. Even a model is still 2 dimensions in a flat plane, but you’re able to manipulate it around.

I: Right, right.

R: Do you think that’s something that has increased over the years?

I: The visualization in the 3d?

R: Preferring the 3d?

I: Yeah, I would say so. It may just be people that are grounded in stuff before that, may not have the preference to not do that, or this is how my brain works when I’m in that situation.

R: But it doesn’t change that actual process

I: True. It still would think about this option, or that, however you get there is whoever you are.

R: Everybody is different. Sometimes it just takes the way that you see something, or someone sees it slightly different that train of thought.

I: Right, and again, that’s sort of to my point. Was, that collaboration, that these two people that work together, a guy that does sketches and a guy that does the virtual, if they sort of don’t allow each other the voice to do whatever is brewing inside of them, then the whole sort of party goes to pot there. ((Laughter)). You’re not gonna get anything going. If I can draw this and say, I like the idea of moving this, and then Joe over here, yeah, let me try that, and that sort of dynamic that happens between those people, that’s as important as however they’re each doing their part.

R: Do you find that that has increased some over the time also? Someone who is more senior, someone more junior, they both understand what they’re talking about, not someone in production, and that there’s a let’s try this, or this point of view.

I: yeah, I would say that ahhh, I think that’s grown in general, probably the number of the junior 3d people is growing, I hope that it doesn’t’ overtake the other people, but I don’t think it will, I don’t think it will, the other people that are senior and don’t have the skills and don’t have the technology, I think they have developed the fundamental stuff that these people don’t have. And I think that still needs to get folded in to everyone’s experience. And I think that might even be, not an explosion, but some sort of intentional addressing of that fundamental thing.

Because there are plenty of cases that I’ve seen, that these people that have all the technology
will try to use the technology to hide their inexperience of fundamental stuff. These other
people can see through that pretty quickly. They might be sort of thrown off a little by the
snazziness of the stuff, but it comes down to really hard things that won’t get built right if that
fundamental experience that we look for isn’t there.

R: That’s always the struggle, if you’re going to include teaching technology, where is the right
place to put it so it doesn’t become the most important thing, the be all, end all, and students
are still trying to balance how that works out, but not allowing the technology to get in your
way, with the design creativity and freedom we need. I don’t think we know that yet. You’ve
probably heard that comment, that’s a SketchUp building.
I’m looking at it from that point of view, we don’t’ want to get in the way of those foundation
skills.

I: I would agree with that.

R: I don’t think accreditation would allow us to anyway.

I: True. But, I mean, I guess the challenge is identifying the foundational skills, and how do you
get there.

R: Are they the same or have they changed? I don’t know that we know that answer yet.

R; I guess I’d just err on they’re still the same things. We’ve been building buildings for
thousands of years, and there’s some parts that have changed, but you still need basic stuff.
And umm, you know, I thought a lot about when you go to Europe, and you look at the old
buildings, or the colonial buildings around here, and you read about the stories about how
buildings are built, if you’re building it this way, then it’s this. Then I look at a lot of things,
and I think, they could use a few rules. But that’s the nature of change. You have something,
you go somewhere, and this looks all good. You can’t necessarily go back there, but you can
apply few of things that were here on these prescriptions back there, and then straighten this
out. You’re never going to go back to the old rules of colonial architecture, but you can look
at them and reinvent them.

[...]

R: Do you have anything you’d like to add? I have many different thoughts - but essentially, - I
don’t know if you have a suggestion, that seems to work better.

I: I think mostly, start from the beginning, there’s so many other things. To have an office that
does architecture, and then we complicate by having multiple offices good and bad, and then
the interactions with clients, and contractors, the whole process of a project, the collaboration
that’s needed, it just seems like that whole ball of wax is really complicated. It’s hard to parse
it out and say, here’s something clear that we have to do. And technology is woven in there.
It’s hard to figure things out. I guess I have wondered, from what I have learned in my career,
what can I offer, what do I think architectural education should look like? I got nothing.
R: I thought you had a magic answer for me.
I: It’s life 101 is what it is. It’s sort of a cop out, because we’re gonna give the degree in
architecture, what do we have to teach to do that. What those components, are, what the need
to be to be accredited, what the industry is expecting out of school teaching folks.
R: We’re still going to ask. In case things are changing. But I sort of believe that the discipline,
it’s still sort of the same thing. When you’re a kid and you say I’m gonna be an architect, it
still means the same thing. You won’t spend hours on the drafting board, maybe a conference
call, but it’s still going to be the same tasks.
I: You know, that’s a good point, when you’re a 10, 15-year old kid. Being an architect sort of
means you design buildings. And it was that way a hundred years ago. And it’s probably
going to be that way a hundred years from now. We’re always going to have buildings.
R: The change is what’s current and where do you fit into that world.
I: It’s gonna be something different.
I: If you say ask and listen, it’s what do I do with what I heard, what sense can I make of these
good things that people have said.
Supplemental Material A4. 3011 Interview Transcript

I: I hope I can help. You said more of the management level was fine.

R: Oh that’s absolutely fine. I have talked to a number of different people. I’m trying to sort of get a good of, um, range of different people who have finished or who have been in practice in different levels, different years, because of the way that each person uses technology these days is very different, in may cases.

I: Right.

R: But, as a sort of an intro, my background is in design, and in teaching, and I ended up at the university asking lots of questions about how do we, I’ve had to teach technology classes before and had to teach CAD, and teach, um, sketch up, or illustrator, and because of doing those things, my question was, do we have a way that we like to do this? Because design is a difficult thing, alone, let alone, putting, in, including trying to learn technology, or master software, or learn how to use it properly. And there isn’t really that much out there. Education in general, I think, is really struggling with the question, because you have post-secondary, where it’s understood you’re using a computer, but you’ll have elementary teachers saying, everyone needs an iPad because that way they’ll be able to read and get their homework. But you, know, we didn’t have those things growing up, and I wrote everything by hand, and when I had a typewriter I got really excited because it was faster. But umm, just looking a those different things, my thesis is sort of floated around into this question, is the way that we’re doing it right, or do we know, are firms looking for different things now, out of graduates, or the same things? And then other things,

I: Yeah.

R: And then sort of approaching that question that has popped up once or twice, you know they’re really good, but they seem to be missing something. That something, I don’t know if we can tell what it is, but talking to enough people I might center in on something else.

I: Yeah, I think there’s an opinion about hand drawing versus technology, and I’m sure you’ve heard it, and I’ve been in this career, I graduated in eighty-three. Um, from XXX. At that time there was a small group in our class that was trying to dabble in computers with computers and stuff but I wasn’t one of those. But then my first job, I started to play with an apple computer and kinda get to know that and start to do written stuff like specifications. I grew into
managing projects and such rather quickly, and never really, I went from drawing by had to managing, and then others would do it on CAD and those things.

R: You’ll have a very, probably a really nice kind of overview sense of watching it happen.

I: Yeah. And see the big thing was in design, that people would, um, sketch, and draw, and would be very facile with that, in my generation, and then we’d get people that knew CAD, and they’d want to design in CAD, and we would say no, you’re missing a - you’re getting too specific too quickly, you don’t keep it loose, then SketchUp came along, and that made it more intuitive, a little looser, and I can just see that now, it really is shifting to, it’s all technology, that the sketching side of it is really becoming something in the past. I notice it in the people that we hire, and what we’re looking for, and you know, do you know SketchUp, do you know Revit.

R: The requirements have changed significantly too, although.

[R: Assuming you are still looking for people who can think.

I: Right.

[R: Thinking is very important, ((Interviewer laughs)) because now I think we’ve accepted the fact that they think using technology rather than using a pencil or a pen and sketching.

R: Do you believe that it’s similar? Or does it just depend on the individual?

I: I think, there’s… a really good example is, we recently had an early design concept, that we, in the old days would’ve just done hand drawings very quick kinda just to get the feel for what would fit on the site, and um, in today’s technology we typically use SketchUp. Which is very loose, and, and you can go pretty quickly and get some data from it. And the team made a decision sort of separately to use Revit, which is a more robust system, but less kind of loose and facile. So they used that, and it was a disaster. Because they were getting so specific so quickly, and their whole idea was well, we’ll have a rally good data base here, that then when we change things, it’ll be if we add units, or delete them it will all just kinda automatically update. But, in that expediency they lost sight of what we were really doing, which is trying to come up with a really cool idea.

[R: Start at the beginning.

I: Yeah. And I had a, you know, pretty direct conversation with the team, about why are we using Revit versus SketchUp, and they, they came around, they realized that wasn’t the appropriate technology to use, for that.
R: Do you think it was maybe, not as much in depth knowledge about knowing which might be
the right one to use? Or just a -
I: I think what it was, was trying, they were trying to be expedient, to be able to do things
efficiently, quickly, and they, and, I mean, people who use Revit here are very good at it. But,
um, it’s not the kind of program you can sketch it, it’s a pretty definitive, you have to know
how it all kind of comes together. And it takes longer. And,
[R: It’s not just lines anymore. I think you can, I’ve heard a similar sort of conversation with
someone regarding doing, starting as-builts just to get a sense of what that space is, and
starting off in Revit may not, might work, but a little bit more difficult because of the changes
involved until you really know what the space is like [I: Yeah. R: There are three extra feet
somewhere in this building and I don’t know where they are! ((Laughter from both)).
I: And yet I’ve got a Revit model that closes, and it works.
[I: So where so we split it up? Maybe some of that is experience, but the right sort of leading
also, I don’t know.
I: Ummhmm.
R: I guess I would ask, in the office, do you typically try to start conceptually in sort of a
SketchUp and the move to Revit, is Revit what the office uses now rather than AutoCAD?
I: Yeah. The office has been using Revit for a long time. About fifteen years. [R: really. I:
Versions thereof. BIM, I guess is what I should say. The software that we use. We have
capabilities in CAD, but we, it’s not, it’s usually dictated by a client, that we have to go into
CAD. We have a few projects that we’re doing in 2D CAD, AutoCAD and Microstation.
R: Oh, you have them both.
I: Yeah, we don’t have a lot of Microstation people here, a couple that know it, we tend to want
to do it in AutoCAD or Revit, and convert it, that’s how we tend to do it.
R: Instead of starting in Microstation.
I: Yeah. But we’re doing a subway station in Toronto that has to be in Microstation, 2D, so we
have a couple of people who know how to do that.
R: Do you find that you, in terms of which software package you use, is sort of dictated by client,
consultants, whomever you might be working with?
I: We try to do Revit. We call ourselves a BIM firm, we do everything in Revit, everybody’s that
doesn’t have the training is trained. Get’s into it. So, buildings, like that one right there
((points to rendering in corner of room)), that’s all done in Revit, that’s a hand sketch.

R: It’s lovely.

I: We’re doing all our buildings in [this office] in Revit, I think [our other office] as well. So.
The two offices. And um, we’re actually modeling, because we do a lot of urban design, we’re
modeling a district in Honolulu right now, but, in the past we would have been in sketch up,
we’re doing it in Revit for very specific reasons. And that’s because of the data that we want to
be able to pull out from it, and we want it to be adaptable, so if we change things, that data is
available. But that’s a little different from doing a building.

R: Right.

I: It’s modeling a district.

R: That’s quite a, quite a feat.

I: Yeah, it’s a big one. ((Laughter))

R: So, in terms of um, training, we you recommend that a student have a little bit of experience
in school in Revit, at least just a taste of it?

I: Absolutely.

R: That’s helpful?

I: Oh yeah. We are at the point where we, that’s one of the things that we look for. Ummm,
obviously, if they haven’t used it, in a project, we know that there is a learning curve there.
And it’s not always, you know, if a person doesn’t have Revit, it’s not like they’re out of the
running. But, it’s a big factor. Specially for someone that’s gonna jump in, into a project. We
tend to, just like you talked about ideas, we don’t look really look at the skills first, we look at
the person, and whether they bring to the table, and then, a lot of times we convince ourselves
that, okay, we’ll find a way to train them

[R: We’ll get you trained.

I: Yeah.

R: I have talked with a few people who have said, you know, if it’s the right person, and we’ll
bring them in, and if it works out, we’ll train them whomever we have to, because the team is
more important, and the relationships between the people, rather than just a great skill set that
walks in, and can do everything they need to.
I: Yeah.

R: I think it’s understood that any graduate has a very small amount of what they will need when they get here, and they’ll learn everything else when they get to whichever firm they start at.

I: Yeah. We do have a, not at a graduate level, but at a sort of mid-career or early tenured period level, we’ve hired somebody, who had, you know, knock out Revit skills. And he has helped us grow. But most of the people we have, are not, they don’t want, that’s not where their focus is. They want to be architects, not Revit technologists.

R: Sure, I went to school to be an architect.

I: Exactly.

R: Well, with sort of that in mind, have you seen, I guess over the years and maybe just looking at what it is now, the type of person that you would hire, the role and responsibilities are based on technological and design ability? I mean we had at one point, obviously drafters, production, and you could do redlines without knowing as much about really designing or you could learn at the same time. Do you look for people who are able to do both essentially, or a more senior person, how does the team work, based on, because of BIM, you can’t - you don’t want to move something and not know what it’s going to impact in the model.

I: Well, we have all levels. You know, obviously. There’s young people coming out of school, we don’t expect them to be able to jump in and know how to put together a building. But as they work on the project, they learn that. So, what we’re looking for, and we rarely hire straight out of school. So, umm, we may bring in an intern for summer, but usually they’ve got a few years of experience before we have, you know, they join us. But um, I think the bigger thing we look for is SketchUp. You know, on building projects, and even on planning projects, if they know SketchUp, that’s a great entree, because there’s a lot of need for SketchUp. And then what the trick is for that person to be a contributing member on the team, doing SketchUp, which can sometime be months of, just basically, rendering, and drawing things that somebody else is directing.

[R: production.

I: Kind of production level design, yeah. And not to get pigeonholed into that. And we’ve had just a series of people who are two, three years out of school, that have been that role, and they get to jump around a bit, from project to project, because we have a lot of early stuff that we’re studying, or we have a study over here or a study over there, and they have the SketchUp
skills, they can be really contributing to the project. But, we try not to let that go on for more than a eighteen months. So that they [R: they can move up.]

I: Continuity is the big thing for a lot of folks that they - they want the continuity from beginning to end of a project. And they need it architecturally for their internship for IDP. For planners, is the same sort of thing. They want to be doing - we have two kinds of planners, one that are more about policy, and ones that are more about design. Umm, but those people also need to get the full breadth of experience. So being stuck doing SketchUp for projects for too long, at some point, they gotta move on. But we’ve usually got one or two people in that position. That they’re doing that work. And it’s a great learning.

R: I was going to say it’s probably a developmental place to be, you’re sort of contributing what you can, and then learning and contributing more as your able to so, with a little it of, with guidance as well.

I: It works pretty well. We had one guy, when I joined three years ago, he had been with us for about six months, and that’s exactly what he was doing, and he kept doing that for another year or so, and now he’s on a um, a similar project to this one, which is a from the ground up high-rise, and he’s gonna stay on it. I mean he’s been doing the SketchUp, but he’s also got the - the technical experience now that he’s contributing and worked construction a little bit.

R: It’ll move in to BIM and he can take on

[I: Yeah, exactly, it’s already in BIM, yeah, and because it’s a clone of that one, sort of, we’re in BIM a lot quicker. The decisions are made, we’re now documenting. And we still design, obviously, in BIM, we keep saying we never stop designing, but we have to stop at some point. It’s in what we call design development, but we’re working at it, so.

R: Have you found that design development, I guess, construction document time has lessened, in terms of the actual production time because of BIM?

I: No.

R: Still the same.

I: Yeah, because there’s so much coordination. And um, the owner’s decisions, and I’m talking specifically about building projects here, umm, I always have to be careful here because we have urban design, we have infra structure design, bridges, and stuff like that, and we have buildings. So, most of my comments are about buildings.
R: The smaller, smallest, in some ways, in terms of footprint.
I: Yeah. So, ummm, I’m just trying to think. It takes about the same amount of time. It’s not, the check ins, the coordination with the structural engineer, the mechanical, electrical, plumbing, the city, all those processes, haven’t gotten any shorter. Yeah. What is cool is that when you get all those entities, structural, mechanical, electrical, plumbing, all into the architectural BIM model, a lot of the coordination, happens, it’s obvious, what you have to coordinate. You find it earlier. You work around it.
R: the visualization has increased on that end.
I: Yes. But it doesn’t take less time.
R: Understood. Do you think that at that level, because it’s become more visual, can someone with less experience catch those kinds of coordination issues?
I: No. Well, coordination issues, probably are more obvious. Ummm, but the coordination is at such a sophisticated level that you need to have that experience of understanding how things kinda go together. The other piece, umm, about the whole Revit thing is what you’ve talked about with the as-builts, you’ve gotta know how buildings go together if you’re gonna work on the model. You can’t just kinda, you know, sort say, oh that’ll work itself out. It’s very, very, specific.
R: Right. The reality of the physical, when you get there, and there’s always something left over or something missing, understanding what will happen and what you would do, when you come to that issue, I guess.
I: The other piece for me, I just want to get this out because of your comment about time, is that, as I’m not a user, I’m more of a manager, and I always thought, what a cool thing, you’re designing, you’re doing the whole model, you’re basically building the building in the computer, and then when you cut sections, you can pick where you want your sections or your plan, and there it is. There’s so much work beyond that in documenting it as a 2D set of plans, it’s huge.
[R: The traditional 2D set.
I: that was the, making sure that the dimensions make sense. Making sure that all the notes are there, all that stuff hasn’t gone away. So it’s a myth to think that, oh wow, put it all together in the model and then pop, we have a - plans. I remember having a conversation with a Revit user who said, yeah, it’s just a push of a button ([(Laugher)]) and then I kinda went along with that,
and the I learned, well wait a minute, it’s not - that’s just the plans. None of the notes, none of
the thinking that goes along with it. So.

R: I have actually spoken with someone who said you know, he’s working with a younger
engineer, who believes that he does all these cool things in Revit and then sends them out -
he’s the architect - for him to review, but there’s no notes, it’s just a cut. Or there’s nothing
indicating what this should be or that should be, and he keeps sending them back saying you
need to finish these so that I can review them, but they’re done, the model’s complete, and
they’re just meeting on the same level in terms of communication, or understanding what
they’re trying to communicate. He said, it’s really frustrating, but I had to ask to talk to his
manager, so that he could understand what I was asking for because he didn’t really understand
what I was asking for. That traditional communication. And I think that’s what’s interesting
too is that, in technology, people have been believing that BIM will take over in the sense of
creating these documents that are the traditional way that we create send something - the
communication - to the builder, to the general, to the subs, to the city, to everyone that has to
look at them. It may be more efficient in it’s own way, but we’re still communicating the way
we used to. Two dimensions.

I: yeah, two dimensionally. Well, officially yeah.

R: Do you think that will change?

I: It may. I mean, definitely, we’re working with a contractor right now, on that building, and its
sister building, that we have given them our model. And they take that model and they use it
for their construction purposes. Coordination, in some areas, you know, they manipulate, and
they change, they go to the next higher level. We’re all working on the same model. The other
interesting thing about that one is, is that the mechanical, electrical, and plumbing engineers
are actually, they’re design build. So they’re working for us, as the engineer, and then they
will build it. So, the level of documentation is a little different than if we had a standard
engineer, which would then bid from those drawings. It’s a lot more integrated process.

[R: Yeah, it seems like it would be.

I: and on that one it’s because, I think we have a pretty sophisticated general contractor,
sophisticated design build engineer, and we’re pretty sophisticated. Ahh we have other
projects, where similar situation, contractors on board, we’re working in BIM, and structural
engineers are working in BIM, but the mechanical, electrical, plumbing is a different tire or a
different level. You know, they work on more lower cost projects, wood frame, metal frame, rather than concrete, and as a result, they don’t have that BIM capability. They have the BIM capability but they use it in a different way. They don’t use it with us. So we’re not sharing our model, and it’s an interesting world, because I’m gonna work so well on the high-rises, and on these other mid-rise projects ummm It’s been a more of a struggle, a little more traditional.

R: I’m assuming you’re outputting something for them to work with, and then they’re doing something and then that comes back,

[I: and that’s how they’re used to working, and that’s how they want to work, and they’re really 2D, and even on the high-rise, the electrical, we’re typically in 2D. They, well, to be a participant, you have to work in BIM. So, the first project we tolerated it, and the second one, we said, if you don’t have the capability, you have to find it, and bring it into your team.

R: and that’s not been a deterrent in any way for most people, they just make it happen?

I: No. Because, well, they’re gonna build it, they’re gonna make profit from building it, I think they probably have internal conversations about hey, this is the new world.

[R: This is the opportunity to move forward with something like that.

I: Exactly.

R: Change is good I suppose.

I: Yeah. And it’s not, you know, it’s not perfect by any means. I mean we still run into issues, that one’s being built right now, we’ll find coordination issues, even though we did our best, or we did a high level of coordination, through the model, there are still issues that come up.

R: But you’ll, the assumption is you’ll learn from whatever new things come up.

[I: Right. R: And improve for the next one, and I suppose just keep moving forward as if it had been any of the other technologies that have come our direction.

I: Exactly. Yeah. The city, it’s interesting, I don’t think the city of Seattle has the electronic document submittal yet. I don’t think we’ve submitted - I think we submit everything hard copy still. But they’re moving in that direction, I know some jurisdictions already do it. My experience is mostly with Seattle currently. But that’s, that’s a really cool thing, procedurally. We don’t have to print as many drawings, we don’t have to haul them to the city, stamp them all,

[R: stamp and sign everything.
I: Yeah, so, it’s, that’s a nice change. And then in construction administration, we have programs that red mark submittals, when we get submittals back from subcontractors, through the contractor, we’re marking them up in the computer. We put our electronic shop drawing’s stamp on them and send them back.

R: have you found, and this is just a curiosity question, that some people still prefer to print something out to review it and then [send] it?

I: Yep. Yeah. I’m one them.

R: I am too. I just thought I ask.

I: I review a lot of contracts, and I do that all, I can’t view it on the screen.

[R: It’s difficult.

I: Even though we have track changes and all the different things, it’s easier for me to look at a hard copy and have a blue, or green, or red pen.

R: I’m imagining, and that’s because of the way that students have really started to move along with technology, the assumption is that whenever they show up they going to know how to use everything, you don’t have to teach them. The same way we may have had to when you start in an office space, word, and excel, and PowerPoint, they’ve had to use it in high school, or they’ve had to use it in elementary school. That will probably continue to move along the same way, that anything else would. I’m also observing a class at the U for a friend who is teaching Rhino at the same time. We did a little survey to ask the students what they thought, and it’s very interesting to see what they’re thinking about, you know, technology helps me to see things better, and flat out asked, is it easier to sketch or is it easier to use software to do something, and it’s kinda still leaning over to sketching is easier, which is kind of a nice thing to see. And a few that do think that technology and software is a lot harder than I thought it would be. Which is kind of an interesting thing too, because there’s so many - you can do so many things inside the computer, but when you get to fabrication, that’s when you realize, it’s not just that you push a button and make it come out.

I: Umm, Couple things that come to mind as your talking, one is my son, who is now twenty-two, when he was graduating high school, he and a friend, they just picked up SketchUp off of Google, and they played with it. And they’re both artists, one of them, not my son, is studying to be an architect right now. And they just created these fantastic buildings, and really beautifully done in SketchUp. And they learned all that intuitively. Umm, his friend, actually
came and did a um, six week program that the high school had, he came and worked at our
firm, and at another firm. And I included him in a lot of meetings, and after one, he
approached me and said, would it be okay if I took the sketch up model of that and made these
revisions to it, you know because we’d talked about different approaches, and I said, that’d be
great, but you actually have to do the right heights, lengths, and stuff, it’s not just that stuff is
coming out of your head. And so he did. And he said that was a little different for him. It
wasn’t that kind of - it doesn’t matter, he had to hold it to some parameters, but it worked. I
mean, he enjoyed doing it. Other software, because you’re talking about PowerPoint, excel
and word, Microsoft project, for people who are more managing projects, is one of the ones
that we use a lot, here, and, we use a program called Deltek, for our accounting software, but it
has a planning module. So we use that a lot, and that’s a learning, curve, and we find that very
few people really know how to use that.

R: I’d assume just based on the level of representation that Photoshop, InDesign, illustrator all
those things are part of what you do as well.

I: It is. And not everybody knows it, but most people do. And that’s wonderful tool. And in
fact, we have some people that are more my age, that will, umm, do hand sketching, and then
bring it into PowerPoint, and do something wonderful with it for presentations and such.
There’s a lot of flexibility out there too, that impresses me. You mentioned Rhino, we don’t
use Rhino, but a lot of students come in with it. I don’t know it, as a result I don’t know much
more than it’s name, but it’s something that a lot of students come in, it’s on their resumes, we
don’t use it. There’s been some talk about maybe being able to use it. And then, rendering
software, like, ahh, I forget all the names but there’s several of them

[R: Maya, vray, all the others, ahhhh 3D studio,
[I: 3D studio, yeah, umm, we have some people that know that, but we don’t really use that
either. We tend to use SketchUp and then a use a program called Maxwell.

[R: Umm-hmm, I think Maxwell render.

[I: Yeah, Maxwell render, that’s how we do it. I think there’s another program that’s similar that
people use here that’s an overlay,

[R: Could be shaderlight, or one of these others, SketchUp has a lot of plug ins.
I: and that kind of satisfies everything that we need, and when the ultra, super realistic stuff comes up, it’s hired out. Usually the owner just you know, hires it out, as an entity for their marketing, or whatever, and they take our drawings and plug em in.

[R: budgeted for in it’s own way because it marketing.]

I: right. But it’s interesting that that ((points to image in room)) is a traditional rendering, by XXX, here in XXX, and that, it’s a work of art, there’s less, and less, and less of that. In fact, I know XXX, I see her on Facebook all the time, and she’s pushing, she’s teaching how to draw, painting, watercolor, that kind of stuff and doing a lot less rendering for projects.

R: That’s too bad. In it’s own way.

I: It is too bad. It’s, it all is just the way software is taking it. I’m the chair of the XXX Design Review Board. I see a lot of presentations every week. And, recently another firm came in, and they had the most beautiful renderings, and they’re all basically hand drawn, but over SketchUp. Framed. It was a nice blending. It’s a little more relaxed.

R: I sometimes think, it would be, and granted, there’s not enough time in any degree, let alone, first you need to teach them the foundation skills and everything they should be learning, and then somewhere in there try to slot in all this technology that they want to be learning, let alone anything else, but in whatever I do, when I’ve taught students to use SketchUp, my hope is simply asking, you need to find your own voice, using something like SketchUp, or Photoshop, or illustrator, any of these tool. Because you don’t want your vision to look exactly like anybody else’s. So just like when everyone still has to learn how to draft by hand, no body uses it, but everybody has to go through that process, everybody’s lettering it all has a distinct sense that it belongs to you, and you don’t want to lose that same identity as you go through with just turning something straight out of SketchUp.

I: Yeah.

R: Because that looks exactly like SketchUp, and everybody knows what that is. You need to tweak that a little bit and give it some personality. Which is lost by not doing everything by hand anymore.

I: How do you, I’m sure you’ve talked about this or researched into it, but the whole idea of the hand and the brain, connecting, and how that encourages more creative thought than, when you do that through the keyboard.
R: I’ve read a few things, and that’s the question that’s really starting to come up. My point of view is simply that there are other disciplines that have started to look at that, our discipline in architecture has not, because we do something else. Learning, or that, that, that creativity side, is as important in the sense that we’re building buildings. This is what we do, and research is not really something, that kind of research is not really funded by anybody. But there is, in terms of learning and cognition, how you think about thinking, embodied cognition is something that exists. The idea of physical, something physical helps you think differently. And there is research out there that does actually talk about sketching, there’s a difference between sketching and doing something in the computer, in the sense that sketching is very conceptual, and it’s almost more in an effort to save the idea and then go on to the next idea, and go on to the next thing. There was a time when you had five, six, seven, eight, versions all on trace, and you could go back to one,

I: Yeah.

R: if you decided, that one was better.

I: right.

R: And studios were the same way where your instructor would come up and say, you went wrong, about here. As opposed to it, the way, you’re doing conceptual on the computer, and we’ve lost that because, unless you’re saving every couple of frames something separate, or a view thereof, you have to undo everything to go back to it. That’s something I have wondered about, each office, how does an office manage that, we all collaborate, we work in a team, how do you get that up to where people can see that now. Or do they look at the models and work off of that.

I: We’re tending to work off the models. Which is that’s where my concern is. In fact, had a conversation last week with one of our really senior designers, umm, he’s over sixty, and he’s an amazing craftsman. He was basically saying, we don’t do physical models, here. We do it all in the computer and we’re losing that - and I don’t mean a presentation model, like that one out there - I mean the little maquettes and little studies that a lot of us are used to from, from our early years,

[R: just see what the massing looks like.

I: Yeah, and then you can look at it, and now we do that same thing, we look at it on the computer. Ummm, so what we’re doing, we’re not setting up a model shop, but we are really,
one of our people, she went to the UW last year and was trained in umm, 3D printing, digital
fabrication, we’re gonna start using that. We’re going to try it on a project and see what we
can do with that.

R: Well, even using a laser cutter to cut pieces and then to glue them back together, that’s really
changed education, just the existence of a laser cutter, to be able to produce a drawing, and
then have this thing cut it, gluing it together is easy in comparison to having to cut every single
little piece by hand.

I: Exactly. Like my wife nearly cut off her hand one studio. ((Laughter))

R: and all that drafting tape.

I: So, there’s that. You know, it’s interesting, because I came from a firm that, even though it
had a lot of technology, in the middle of the firm, was a model shop. IN fact one of the people
that we hired there, straight out of the UW is now about to get her license and she works for
us, here. What a wonderful transition, from that craft to doing buildings and such. Now it
really affects things like kinda stuff Hoff is doing or the Barcley center, and such that, where
you’re actually creating stuff and then sending it straight to the fabricator. Scary as hell.

R: But it can happen. And that’s sort of the concentration at the U and using parametric
modeling, it’s very accessible to students, in general, both cost and training, that kind of thing.
And then in conjunction with Rhino is Grasshopper, which is the programming language.

I: Yeah, I hear it all the time, but I only know what it does conceptually.

R: I started off in the class and said I’d rather read the code, visually it doesn’t work for me
where I put these batteries together and then these batteries move this thing, and I change this
formula, and it spits this out at the other end. But that’s my own shortcoming and married to
doing it like this. Rather than imagining it all in here in terms of a program and what it’s gonna
do. But in any case, there’s, that’s the direction that things are going, and the branch of the
architecture department that I’m in is that digital fab side.

I: Oh, okay.

R: Most of the people graduate making something, or writing a program that helps architecture
and design in terms of technology. I’m sort of on the other end of that thing, okay, we’re doing
all this stuff, how is it impacting us in general. How is it making change in terms of how we
think and I’ve been to a couple of firms where, it’s just understood, some people sketch, other
people work in the computer. Okay, I guess that works, as long as we’re not losing anything along the way.

I: Right.

R: I did also step into another firm where because everything is being done in Revit, they produce physical drawings all the time, or sketches, where they are and they maintain separate, not really conference rooms but extra areas but everything gets put up for that particular project. So that the rest of the team can see what each person is working on. Because we’ve lost that sense of things all over your desk, like we did before.

I: It’s really interesting because Alan Hart, our founding principal in our Seattle office, he, and one of our premises here is we don’t want to grow more than thirty people. We’re trying to avoid middle management, we’re trying to the connection. So the communication is actually really good. Umm, we have a lot of, we try to do smaller concentrated teams, and so, Alan will check in design, he may not be the key designer, but he’ll come in and give crits and such. And a lot of times it’s him sitting on one of our stools, next to a 3D [rendering] with a designer, and they’re manipulating it right then and there. So, and Alan, is my generation, and he’s able to work in that world. He can’t manipulate the model, but the designers can.

R: Kind of a pairing.

I: Right, and there’s always flimsy, and what about this? And XXX, who I was talking about before, is such a craftsman, he’s fully Revit capable, he does all the Revit stuff, but he still hand draws, and he’ll make his own little models of stuff. So around his desk you’ll see models, physical models.

R: I’d like to, that would be a PhD if I started heading into that kind of research, to find out that, what are we thinking about when we’re building as opposed to when we’re doing that or when we’re sketching.

I: And for people like me, I went into architecture originally to design buildings. I now manage a firm, and design, I call it designing a firm, and designing buildings as a result. The, I love drawing, and to lose that, to me, is a huge loss.

R: That would be the tragedy in many ways.

I: And I know that my son, when he was considering architecture, and he, he, is a visual artist, although he is technically capable, just like all kids are nowadays, he loved to draw. So he’s got a sketchbook with lots of drawings. So we do try to, even though a lot of our people work
in technology, to encourage sketching and the art side of it. Maybe not as well as we could, but it’s a work in progress.

R: Deadlines are always going to show up. Not always time.

I: So we’re at about twenty minutes to ten, and I wanna make sure we get through any specifics you, or if this is helpful.

R: This is, you know, I have sort of approached everything, I have a list, in case we get stuck, but in general it’s how does this office work, how do you think it should be working. Let me see if there is anything in here that I didn’t necessarily… I’m assuming the office was already using technology when you got here, and the office practice has changed sort of how we discussed it to accommodate the different kinds of tools that are being used, but we talked about construction documents and design development, that has not really changed all that much. Umm,

I: I would say that right now we’re on that cusp of the 3D, model, and that digi [R: digifab? I: yep, 3d printer technology, maybe even getting one, and then I’m personally very interested with one of my colleagues with exploring the idea of direct fabrication. Because there’s, I think that’s the future. That’s gonna, when you look at the Barclcy center and you see what they were able to do, that they couldn’t do otherwise, it’s really exciting. Now I’m not into Frank Gehry designs, but the flexibility of being able to do things in a logical way…umm, they had a great example of more of a rectilinear building on top of an existing building, and I’m sure you know it, where they were able to get a much better building because they could directly communicate to the factory in Europe, and get everything sent over less expensive than going though a traditional system, for the cladding of the building. To me that’s huge, because that gives us a lot more flexibility.

R: I’ve heard that from somewhere else before saying over time, very likely, the restrictions of materials the way we’re used to thinking about them will go away. Because you can communicate directly to the factory what you’d like to fabricate. As opposed to having to say we’re going to start with this particular material, it comes in these kinds of sizes, and then we will make it do what needs to be done. It’ll just be I need you to fabricate a window that looks like this, here’s the model of what it should be. Now just make it. Done. This might have all different odd tolerances within it, but you can do that now. As opposed to before when you couldn’t because of what comes in between.
I: Well, there’s also the cost. And what was amazing to me is that they did a very unique approach, and it was more cost effective. They got a better system than they would have, off the shelf. So that really intrigues me. ((Laughter))

R: I’m sure, well, especially coming from the management side you’re looking at more things than just the design alone. The things that impact it including time, cost, budget.

I: Well, it’s that designing a practice. You know, and what should that practice be.

R: It’s gonna evolve, it’s just gonna keep on moving.

I: That’s right.

R: I guess, one question that I do have, that I find is really kind of interesting, do you think that being that being able to design, essentially creatively and thinking about a concept, should people be required to be able to do that without using technology? We had briefly discussed.

I: Sketching, yeah. That’s a personal opinion, kinda thing, but practically speaking, in today’s world, um, it, I’ve seen that it can be done without doing that. Some of our younger talent, is really able to work in SketchUp. Revit definitely not. But SketchUp, definitely works. I’m starting to come around to understanding that people are wired differently.

R: I think we’ll find that out. We’re not going to, architecture moves so much more slowly in terms of the way that we adopt technology, manufacturing has been doing things completely differently for a long time. We’re hanging on to a lot of the old traditions. But I do believe we’re going to find out if we take the time to really study that, that people will be thinking differently because they’re thinking virtually in a different way from someone who typically would sketch but would still be imagining it in their head. There’s a different - I’m not sure how that relationship is slightly different, than it might be.

I: And that’s the part, I’m not sure what we’re losing. And we may be, fifteen years ago, I would have said, absolutely, if you’re gonna hire somebody, they have to be able to draw, they have to be able to communicate by hand. Umm, its totally wrong if they would design in AutoCAD at that time. With SketchUp, there’s been a bridge. Although, I haven’t learned SketchUp, and just from looking at it, it’s still not that direct connector, the brain to the hand.

R: There’s an extra step. How will I make that, do that.

I: Umm, but the result of what I’ve seen come from people, I’m a believer that it can be done different ways. Umm, I worry what we’re losing.

R: You’re not the only one. ((Laughter from both)).
I: I know.

R: There’s a hypothesis floating around, but I don’t really know how to pinpoint that. Or identify what it is. So, I don’t know that I’ll have that answer at the end, but if I find it, I’ll let you know.

I: Yeah.

R: Essentially, I’m trying to find, if I talk to enough people, perhaps one or two trends, in terms of some of the things that we could improve, in terms of preparing students might show up. One of the things that could be very helpful, would be, we don’t necessarily, at least at the U, we don’t teach technology use, the same way you’re going to use it in practice. You have your studio classes, and you can take an elective, in Revit, in AutoCAD, in Rhino, if you choose to. That class will have its own set of design or problems that you need to solve with it. But the idea, many students will take those skills back into the studio, and instructors will allow them to use technology to present their projects. But the explicit, well, we’re going to work on that project this way, now maybe these are views you’d like, isn’t necessarily something that is specifically done. But we do it in practice all the time. Where you sit together, and you talk about this, and you work on that, and can you build this other side and look at some viewpoints from over here and get a sense of that. I’m thinking perhaps maybe that’s where we’re going to have to start heading, is training instructors to be able work with those together, or to use them specifically. But is don’t know.

I: Yeah, it would be interesting.

R: Because then you’d get to practice understanding this is how we use technology, not oh I know how to do this stuff too. It’s like and I do photography on the side.

I: Well, I do think that having, you know, I like what I’m hearing, in terms of how you’re teaching. But the actual ability to jump in and start working in Revit, and in Revit at least as a contributor, Revit you have to know how it goes together, or you have to have someone telling you how it goes together. But Revit and SketchUp, having the technical ability to work in those is important.

I: At least Some familiarity with it,

I: it really does help. And it’s starting to become pretty standard, that even those people have great ideas, who have great minds, there’s enough of them out there that when we’re
interviewing, they have that ability and they have the technology behind them. And it’s like, we don’t have to make a compromise.

R: That would be ideal.

I: Yeah, but we’re seeing a lot of that. So it’s interesting. It’s evolving to the point, where a student coming out of UW, WSU, UO, really should have the technology piece. The one that is over here. Understand that technical ability so that they can be a contributor. I think that is important. The other part is, the model making piece. Using those software to be able to construct models, The tactile, building a model, and that kind of stuff, I don’t see the connector, that I do between sketching, but I do see once it’s built, the ability to look at it in a different way than on the screen. But there, I really hope that the 3D printers or other technology can come in an make it easier, save people from xacto knife cuts.

R: The end result of what architecture does is three-dimensional. We really, we’ve moved ahead by using software and technology to imagine the 3d virtual space, but it’s still two dimensions, on a computer screen, we’ve not moved away from that either. There’s balance in there somewhere.

I: the 3d representation on a 3d screen, certainly, it’s a lot better than is used to be you can really spin around, go above, below, zoom in, flythrough, but, that part of it is pretty cool. But we’ve taken a shortcut in not having the physical, hold in your hand, kind of model, that you can study, and often show your clients.

R: They love them.

I: and they understand them. We have one client, who, has it all modeled in SketchUp, we have no physical models, and he’s not getting it. He’s basically unconvinced that he’s getting what he wants. I keep telling him, you’re getting what want. Look, you know, here’s this view, here’s that view. Yeah, but it’s not rich enough, and that’s because the software can’t convey that actual feel of what it really looks like when the shadows fall on it. That it’s a very intricate design, rather than what SketchUp is making look a little more streamlined, clean lined. I think it’s a contributor, sometimes, to miscommunication with clients.

R: That’s most important in many cases, we don’t want any change orders down the road.

I: Well, we don’t want that, but we also want clients to make good decisions. You know, for design. Sometimes we have great design, but if we can’t convey them we end up with something lesser. Because they weren’t convinced.
Supplemental Material A5. 3012 Interview Summary

R: My background is in both design and education, so I’m going to go back along that, kind of the qualitative, and go through the recordings and align them with the transcripts.

I: Hey look at that, I’m supposed to be in a meeting with you.

R: Oh good, I’m so glad we made it. I have a bunch of questions, but I’m going to ask one or two and wherever we go from there, the two and half hours in some cases, and forty-five in others is fine, just because everyone has a different point of view.

I: Sure.

R: Um. Let’s see, are you far enough along, do you actually use technology?

I: Are you saying that I’m so far along that I don’t use technology?

R: No, but some people are almost strictly management, even though they know how to use technology, they don’t use it anymore, because there are other people doing it, in that sense.

I: I would say that I do not use it a great deal. Um, technology, being, if you’re talking about whether it’s Rhino, or Maya, I dabble a bit in Revit, I do a little bit of modeling, 3D viz, whether it’s SketchUp or -

R: That’s’ nice, that you can find the time to do so. Just based on your title, you’re far enough up the food chain that there are others-

I: My billing rate is such that it doesn’t make sense for me to actually do that kind of thing.

R: Umm, so in general, even though you don’t use it specifically, you obviously oversee, or work on teams, collaborate in teams with other people who do that sort of thing. Does the office umm, have numerous packages that they use, typically work in Revit, stopped using AutoCAD?

I: We have AutoCAD on select projects, projects that had started in AutoCAD, and they’re in construction so it makes no sense to. We also have certain clients that have requested that projects stay in AutoCAD.

R: So it’s almost client driven.

I: It’s almost client driven. Even when a client says they have no use for Revit, we ask them whether or not we can still do it in Revit and output it the files to CAD. We find that, you know, the 2 dimensional, programs that are strictly limited to 2 dimensional representation are probably numbered in terms of their usefulness.
R: Yeah, I think so. And really, it’s the collaboration and the level at which other people can function.

I: Yeah, there’s that and also there’s the sense that if you allow people, especially with older people and experienced staff, they’re always going to revert back to what’s easiest for them and what they know. The faster you know take the training wheels off and push them down the hill. (Laughter from both).

R: Throw them in the pool, in the deep end!

I: Yeah. That’s right.

R: On no. So in terms of when you’re looking at hiring, whether or not the candidate is early on, or a little further along, technology is a requirement at this point, or would you train the right person?

I: We train the right person. Nothing beats, you know, inherent talent.

R: Yeah. So that is still the foundation that everyone seems to be looking for.

I: That is.

R: It’s consistent, everyone I talk to. Technology or not, I need them to be able to think.

I: Yeah, exactly. I mean you can train people to use technology. You can’t necessarily teach people to think once they’re done.

R: One would hope that it can be done somewhere.

I: But by this time in their life, if they haven’t picked it up, they’re probably going to have a hard time.

R: I would think so. In addition to Revit and AutoCAD, assuming 3D rendering. Do you use rhino?

I: We use rhino a lot in our office, we also use SketchUp as an initial modeling tool. Umm, we’re starting to look at utilizing grasshopper more.

R: That would have been the next question. And then the typical Adobe suite.

I: Yeah.

R: Any 3d Studio, Maya, Vray?

I: Yeah, we use 3d Studio. That is widespread. That’s more for finished graphic packages. We also use several climate modeling programs, and um, environmental programs. So, one of the two big ones we use, you probably have it on your list there.

R: I don’t actually have it on my list here.
I: A ha. I can’t, I’m drawing a blank.

R: That’s all right.

I: But we use a lot of those statistically based programs for analyzation.

R: At this point, the way that the program at the U works, those programs are even more of an elective than even just Revit. Because Revit is sort of an elective, and AutoCAD would be as well.

I: We have people that teach those at XX. So. Especially in the some of the environmental programs.

R: The program that I’m in, I’m in the design computing stream, but I’m the weird one, who doesn’t want build something. ((Laughter)).

I went backwards to the other side, and said, great, we’ve got all this stuff running, but what are we doing to make sure that we’re teaching it right, or - we can’t add time to the education, you need to stay and learn these things too, but we have to find a way to be sure that the graduates still get, what they’re supposed to. Or what firms are expecting. My point of view here is really, what kinds of things truly expected, and with the anecdotal, hypothesis that something seems to be missing. Can we find what this is, and figure out who to make it.

I: I’m sure what most of the large firms that you’re talking to, or maybe not. Maybe not now, but within the next few years we’ll probably expect everyone coming out of school to know how important Revit is. We train people how to use Revit in house, because we customize it for our own purpose. But, what we found it takes, a person two or three projects before they’re really adept at using Revit, and so if they’ve gotten two or three project cycles out of the way during design studio, rather than learning on the job, then it’s just a matter of learning how we utilize it, how we customize the program.

R: That’s actually very interesting to me that you said that specifically, because that’s one of the things that I noticed, some of the studios will allow students to use whatever it is they’re learning, but they’re not currently integrated in them. And in education, if you have something you want someone to learn, you have them do it at the same time, and have an instructor who can scaffold, and model, and show, this is how you would do this, this is how you would do that, so it becomes inherent, in terms of their ability. Rather, that something else, and might end up being part of my thesis, is that we should be doing it this way.
I: I would say part of the issue there is that certainly most of the older faculty, but even some of the younger faculty probably aren’t that set up in the programs.

R: That’s true. Like you said, it takes two or three cycles on a project, on a real project. Not a we’re going to build a tiny little house, that’s not enough. I myself took the Revit class there, and I’ve used AutoCAD since at least [release] 9 or something like that, so it made sense to me and I understood it, but it was clear that at least 75% of the class, wasn’t really sure why you would do a detail at this scale or why you would do a section at that scale because they haven’t had to.

I: Exactly.

R: Or understand the reason it could be more efficient to do it this way, because they’ve not had to pound out a fifty page set or a hundred page set before. That’s part of the practical end of it, is something that’s a little more difficult to teach. But umm, I appreciate that you’ve said that’s something that’s probably gonna become necessary in the future, almost in the same way that AutoCAD, if you come out with AutoCAD it’s because you’ve had to draw sets in AutoCAD, and you get it. Do you think that anything besides Revit, do think the ability in rhino?

I: I think the ability in digital fabrication is becoming a crucial, almost everyone coming out of school, whether its at UW, certainly a lot of the east coast schools, whether its Columbia, Penn, I mean everyone has this ability to really utilize rhino and translate that from the screen to a physical model. That’s a crucial part of our design process. Umm, you know, it was physical modeling by hand, umm, but you know, it makes it easier, this is where limiting the software becomes handy, is that you don’t have to keep translating from one platform to the next platform, in order to get the physical object or to get the drawings out. So, you know we like the creativity that people bring to their desired platform, we are a big firm, and people gotta talk to each other, and we want to be able to work efficiently, too. So.

R: When a team starts a project, is it just based on whatever the preferences of the team members are in which to start, or does the office say you’re gonna start working in this software?

I: Well, I mean it’s one everyone is working in Revit, and unless there’s a reason not to work in Revit, umm, I think it’s partially, the desire of the team, but it’s almost always SketchUp, initially. Conceptual, because that has the lowest threshold for getting into, and almost everyone can work in it. Umm. But that being said, as more and more people know how to use Rhino, and they’re comfortable with it, I think SketchUp is going to go by the way side.
I would say so, just because, [ ]

It’s not as powerful.

It’s not as powerful, umm, in a lot of ways, if you understand 3d modeling, Rhino really is not that hard.

No. And even if you know AutoCAD, you can translate past the two dimensions,

Exactly. It’s far easier that AutoCAD in 3D would be.

Yeah, yeah, exactly. So I think it’s just what people are used to, and as more people as the gospel around, because, you know our 3d modeling, in terms of our, whether it’s CNC machines, or 3d printer, they run off of rhinocam. So. You know, right now if you’re in SketchUp, you have to translate it, which is another step.

Which can be a waste of time and occasionally translation doesn’t work as well as it could, out you in a place where it’s just easier, just learn the other one.

Exactly.

So, does sketching still have a place in the …

Absolutely. I mean, you know, it’s still the fastest way to communicate an idea. And I still think it’s the fastest way to work things out. Umm. You know. It’s also the most, I would say, this is the one issue I seen with technology is, until we learn how to work totally in the digital world, umm, or virtual world, it’s not ever going be or it’s not going to be as social as the physical sketching.

Right. I agree with that. I think in terms of education in the studio, when it moves to the computer like that, you’ve lost that process that most instructors are used to seeing

[ ]

Which is, oh, well you went wrong and, flip though all this trace, this was probably better. Or you have other people who pull things out of the trash doesn’t happen anymore.

Or if you’re talking to a client, you’re talking to a team member, you know, if you’re drawing on a piece of paper in front of people and working through the idea, anyone can pick up that pencil, or pen, and start drawing with you, and say what about this. If you have a monitor, whoever has control of the monitor has control.

Right. And you have this here, let me, kind of thing.

Yeah, yeah, exactly. It’s another step in the communication process.
R: So in terms of working in a team, is that something that would happen here, a group of people would be around a monitor, and one person would drive essentially, and other people would say things?

I: I would have team people do that. I have seen that especially with senior designers, working with younger staff, saying, hey why don’t you do this - and they’re standing there in the corner - and I cringe every time I see that.

R: Would you prefer that each team member is able to do what they need to do in the software?

I: I think that’s ideal. I think it’s kind of unrealistic. Especially for a lot of older staff. Senior, staff. But still, the idea, I would rather have them, rather than havening them say pull here, pull there, and standing behind the corner, you know, I would rather like the communication occur, if they can’t do it by computer, do it by hand. And then, it gives the staff member a little bit more ownership of the process, rather than just being a simple drafting …

R: I believe that with Revit, and with BIM in general, we’ve moved away from having production,

[I: yes.

R: essentially, like with AutoCAD. You could hire anyone who could run AutoCAD,

[R. Yeah.

R: and just draw redlines all the time. But you can’t do that in BIM, you can’t do that in Revit.

I: Well, you can, think of all the firms that use drafting services or model making services overseas. Right, I mean, you design to a certain stage, you redline it, you give it to them, they model it, they give it back to you, you redline it, you give it back to 'em. I know, [our] firms have not done that often, in fact, we rarely do that. But I know a lot of firms, that’s the model that they work from. But then again, [we] has never hired drafters, either. So.

R: Hire people who can think at the same time.

I: Exactly.

R: It’s more efficient that way. And at least if one skill set is greater than the other, then the other one will eventually develop to meet up. And then that one person is capable of taking care of it.

I: Exactly.

R: The reason that I asked about that, is it seems in terms of just research and articles, has become kind of a shift of many firms, certainly not all of them, where there is sort of this
junior and a senior, and the junior runs technology and the senior instructs as to which - not to say that they’re not learning from each other, but it’s slightly different in that sense.

I: I think that’s true to a certain extent. I think it’ll change, as the junior staff get more senior.

R: They will, that always happens, you can’t stop time. Mm, yeah, I think, a few of the other people I’ve spoken with, it’s inevitable, and things are going to continue to change, it’s just a matter of being sure that as less experienced designers get more experience, that they get everything they need, and not just one thing, I guess. Umm, does it matter in the firm in terms of visualization, whether one, somebody prefers to visualize in the computer, prefers to visualize sketching?

I: I think it’s just - it’s whatever’s appropriate for the project. You now, I mean, we don’t have a set design process, or set design tools. In fact, we encourage people, if they’ve been working almost exclusively in computer, to stop working in it for a while, whether it’s actual physical modeling, get out of it, just look at something from a different perspective. And same thing with someone who’s been sketching all the time, they can stop and look at something else.

R: That’s a nice way to sort of balance those two, I think. You really able to utilize the strengths of each.

I: Ummhmm.

R: And to somehow overcome, if there is the deficiency in one or the other, because you’re not visualizing it - I was looking at it this way or I was looking at it that way. Kind of a nice opportunity. Umm. It’s clear that everybody uses software, design packages in your, not anyone who wouldn’t.

I: ummhmm.

R: Essentially the office wouldn’t necessarily come to a halt, but would not be able to do without -

I: Certainly not as efficiently. We still have some old timers that can hand draft.

R: I was going to say, there are probably a few people that can still manage to draw, start to finish if they had to, it would take much longer, than before. Does anyone ever, in terms of that graphical representation to a client, is there a mix between hand sketching and

[I: Absolutely.

R: Not specifically just one or the other.

I: We like to show process a lot of the time too.
R: That’s nice, instead of just the finished - I would assume that most clients would prefer process anyway. There’s a point where they don’t’ want to see it finished quite yet.
I: Yeah.
R: Do you think that if necessary that people would be able to design without using a computer?
I: Absolutely.
R: I think that’s part of that foundations thought process.
I: I think, you know if you become too dependent on the tool for your process, then that tells you something about your process. Process should be - it might be more efficient using a computer, it might be more efficient using pencil or a pen or a model, but you know. The process itself should be ore independent of that. I mean, you should be able to design in your head. You’re just giving physical form and enabling process. [
R: and communicating to someone.
I: Exactly.
R: Would you have specific skills that you’d be looking for? I don’t know if [your company] hires [graduates] right out of school.
I: We do. We like to have a broad range of people, so yes.
R: That’s great, not always the case. For sure. Are there skills specifically, besides technology, that you would be looking for?
I: Communication is key. You know, we tend to work on big, complicated projects, umm , but regardless, because we’re a very team based, collaborative firm, whether it’s with the client, whether it’s with our consultants, whether its inside the firm, being able to communicate is one of the most important skills, that anyone can have.
R: I would agree with that. ((R laughs)). If that part is there, you can essentially train anybody on what they will be doing, on a computer if that’s the case.
I: Yeah.
R: Has anything in terms of process with the I guess documents, do you feel that the construction document phase has shortened because of BIM or is it about the same, or - ?
I: Right now, I would say that it’s about the same. You would have hoped that it would’ve have shortened, and I think that it will eventually get there, but since you know, I mean really, BIM is still in it’s infancy, any way you look at it, so there’s so many bugs. And that’s the problem.
I mean, you know. I talked to my colleagues, especially those that work at different sized
firms, maybe smaller scale firms that work in, and there, in small, medium sized firms they’re working on fairly straightforward projects, the process is absolutely faster.

R: Design development and CD?

I: Yeah. Because there’s less people to coordinate with, they can get their arms around the entire project, and they can understand it, so it’s really easy for them. And they’re not doing anything too bizarre. But we tend to do really complicated projects that have, they need multiple phase, they may have problematic issues, that change often, and because of that, and Revit, or any 3d program like that, BIM program, has a hard time dealing with things that it wasn’t specifically designed to deal with. Whether its a corner detail, there wasn’t supposed to be a mullion in the corner, or whether its a curving wall that has odd shapes in it,

R: Something that geometrically is different -

I: Exactly. That’s where a lot of the BIM programs that are different from say a nurbs based program, umm, rhino, or whether it’s 3d, where it’s, but they’re not exact, and you need to be able to produce drawings from those. So you know, somewhere along the line, the two will meld, and it will be come easier.

R: So that’s really what we should be concentrating on. Finding a way to connect those two.

((Laugher)).

I: Yes.

R: Umm, in terms of collaboration with outside consultants. Has that changed for you also?

I: Yes and no. I mean, The issue is that, the different disciplines are going to be interested in different things. There’s a general framework where the sharing the model is extremely useful. But once it starts to get to the granular level, it’s not that useful. Because everyone’s’ modeling for a different purpose. So you know, we don’t want everything that structural is modeling in their portion of it, because it ‘s going to crash a model. That’s doubly true, you know for MEP. Likewise, they don’t want everything in our model, they just want you know, the general framework. So, you know.. At this point, it’s more, we reference each others’ models more than anything else.

R: Coordination.

I: Exactly.

R: But do you trade back and forth, before you get to that granular level, and then you stop, and everybody starts referencing instead, making changes to their own model.
I: Exactly.

R: Does the ability to work in Revit ever effect who you can collaborate with at this point? You
to be in Revit or we can’t work with you, for an engineer…

I: I would say that could be the case, although we haven’t’ run into it yet.

R: for the most part, everybody is, if they’re not keeping up, they’re further along?

I: Especially with the consultants that we work with. They recognize that our clients demand that

kind of ability, so they all have that ability to do, or they claim to.

R: They claim to. How would you approach work if you were to suggest to someone, these are

the things that are best for you to learn, while you are learning in school, studying for an

MARCH?

I: what are the best things to do? Understand the design process, work on your communication

skills, ahh, you know.

R: We can’t teach them everything, obviously.

I: Yeah, I mean technology is great. We expect everyone has a certain amount of umm, technical

competence, in terms of programs, but it’s nor gonna be the decider, on whether we hire

someone or not. It’s just raw talent, and you know, whether we sense that the person is going
to be a good fit for the firm personality wise, I mean you can have the most talented person
portfolio wise, and if you think they’re not gonna work out well, we’re gonna have to pass.

Cause you know, the firm is larger than any one individual.

R: That’s understood I think these days. Unless you’re’ going to work for a small firm, then it’s

probably doubly important.

Because everybody knows everyone and all the business that they’re doing.

I: And that’s hard for a lot of students, because I think, especially for a larger firm like this, it’s

the collaboration of aspect of working on a design project is so different from studio work.

You know, its all about yourself, and all about your idea. Which you know, is good, because it
allows you to stretch your design learning, but. That’s not how the real world works.

R: There’s always a number of people and a number of opinions and ideas.

I: It doesn’t matter even if you’re working for yourself, because the client’s gonna always [R:

yeah, they’re gonna drive it. ((R laughs)).

R: That might be one of the most rude awakenings to have, which is, oh, you don’t like my

idea…
I: Yeah! Exactly. What do you mean we can’t do this. Can you see that’s the right idea? But can’t you see that I’m writing the check?

R: You do what I want because I’m giving you the money to do it. There has to be - I think it’s just something that has to happen along the way.

I: I think most people realize that fairly quickly.

R: You have to. For certain.

I: I think the jump from hand drawing to AutoCAD was easier than this jump from AutoCAD to BIM, because, you know, hand drawing and AutoCAD were basically two dimensional depictions of the same thing. Whereas, there’s a switch in how you work, When going form 2D to 3D. Which is really strange, because, you know, architecture, by nature, is a three dimensional field. And we’re taught to distill it down to or dumb it down, or translate it to a two dimensional field. And now we’re getting rid of that kind of translation now.

R: Do you think we’ll ever get past that documents - because construction documents are still two dimensional -

I: I think at some point they won’t be.

R: We won’t do that anymore? We’ll go straight from this to it gets fabricated that way?

I: Yeah. At least for more complicated projects.. I mean you think about some of frank Gehry’s work, that’s already what happens, right?

R: It almost has to.

I: it has to.

R: Because a 2 dimensional drawing of it would never convey.

I: Exactly.

R: I cant imagine what the two dimensional drawing should look like for the EMP, or if I would get the whole thing.

I: Exactly.

R: You have to look at it in 3 dimensions. Whether that’s a model or a virtual model. But - physical model building is still something that’s really quite used here?

I: Absolutely. It’s critical to our design process. Because, you know, we use a lot of process models here. So, in the great thing about an actual physical model, versus the computer model,
anyone can pick it up, and turn it round. And everyone together can look at it, around at the
same time. Again, communication is so key to our process here.

R: It’s nice to hear, certainly, it think I was somewhere else where that was the same comment,
as far as we go with BIM, and how much everybody is using it or using Revit, we can’t get
away from these physical models. And the ability to use them, even for the communication to
the client. Some people just can’t see past, for whatever reason that somehow sells it. But it
does seem, I have a fellow student, I am observing his class, he’s teaching rhino, if you put a
3d object in a room with a bunch of people that are that to talk about that, that’s always going
to get far more interest than any 2 dimensional anything you can bring.

I: Exactly.

R: They’re going to stop looking at all the fancy pictures as soon as that shows up.

I: Absolutely.

R: I don’t know what it is, building blocks, as kids kind of thing, you get excited…

I: Well, there’s less interpretation that you have to do for everyone. And if you’re not trained to,
you know again, translate from the two dimensional to the three dimensional, we can look at a
drawing and say, that’s what I think it’s going to be in 3 dimensions, where the layperson’s
going to have a harder time doing that.

R: Well, and they can interpret it from their point of view. Rather than I decided you were going
to look at this from this view.

I: Yeah, yeah, exactly. That’s also why we like physical models in our office, again, you can’t
control the view so you can see all the warts.

R: That’s the true. You can’t hide those things.

I: Yes, exactly.

R: I wonder where that’s going to happen in terms of a Revit model. You look at it and it’s all
complete and closed, but somehow there’s something missing in terms of what happened to
the extra three feet.

I: Yeah. That’s one of the things that’s scary about renderings, where are we going to pick the
most flattering angle. Which is great when if you’re trying to do a presentation, and you’re
driving a point, but it doesn’t’ tell you everything you need to know about what the design’s
actually doing. It’s such a controlled perspective of what the project is.
R: Do you think you can give a rendering the same kind of emotion and experience that you could do at one point with hand renderings?
I: I think you can. I mean, you know. I know for people there’s been a trend for the hyper-realistic, which is good, but I tend to like the ones that go in the opposite direction actually.
R: Interpretive.
I: Yeah.
R: This is how we’d like you to think about the space.
I: Yeah. That’s more evocative.
R: I think that’s the beauty of sketching was, just three lines and it already tells you something about the space without having to finish it.
I: Exactly.
R: So maybe that’s what we need to explain to students, it doesn’t need to be perfect.
I: Yeah.
R: You need to convey a feeling.
I: Exactly.
R: you need to get the individuality of the project and the design,
I: Ummhmm.
R: more than an absolutely perfect.
I: You know, early in my career, I used to do a lot of renderings, when I was first starting out, taking all these really early 3D studio, you know, people in my classes would try to model that person perfectly to put it in, and I’m going yeah, but what about the building behind you ((Laughter)).
R: There are other things.
I: Yeah.
R: Well, and I think that’s certainly, the sequence of teaching anyone when to be using this kind of thing, you want to know that they have a foundation, otherwise they get stuck trying to fix these things that are so close
I: Yeah.
R: The railing is really not that big a deal.
I: Yeah, exactly.
Supplemental Materials A6. 3052 and 3053 Interview Summary

R: [...] We’re now faced with training students for practice, with the same amount of years, in foundation skills, the kinds of things you need to learn, but we’re also faced with AutoCAD, BIM< rendering, Photoshop, SketchUp. The question is where do you slot it in, when should you slot it in, how should you put this in. I’m asking the question what is education doing now, no one has come upon a specific way that seems right in terms of learning theory. I got directed, to go ask, and to find out what the practice is looking for. Whether it is a large firm, or a small firm, or a large enough firm that can force others to use Revit. Every point of view is valid.

I1: The educational part of it is interesting, I’m not sure whatever any office is doing would determine how schools could best teach or prepare people necessarily. You will find a range, big, small, or medium range firms.

R: What has come out as a consistent type of practice, whether it is BIM, SketchUp, it has gone into the actual process of design. As long as you know how to design, now it has become something that people are using in conjunction with that process. Typically, at least at the U, instructors will allow students to use technology to create and produce, but it’s not integrated the way it’s integrated in practice. Where someone would say, here’s a best practice if you’re going to start with conceptual, I’ve run into some people that have mentioned that part of the trouble with new graduates is that they don’t know when to use what. Necessarily. Sketching is good, they know how to sketch, but conceptually, when do you start. So they might make a decision to start in BIM immediately, when it’s an as built and there’s going to be so many changes this might not be the best use of time yet. It varies.

I1: How would they know. ((Laughter))

I2: Right.

R: Exactly. You haven’t had the time to practice. And I’ve had people say its that simple, if it’s the right fit, we’ll train anyone on anything. It’s not a concern.

I1: Well, students probably aren’t’ too different from people that come to work in a professional office, you arrive with skills, you can do certain things, but you can’t do other things. You start where you are and you develop the skills that you need. Office can be a, need to be a little
more clear and decisive about the software that they work on. We were probably on four
platforms at one time.

R: So how long has the office, as long as you’ve been here.

I1: It’s a 15-year-old practice. You’ve been here seven?

I2: Yeah, over seven.

R: In an essence, all fifteen years, there’s been some form of - AutoCAD used to produce your
construction documents.

I1: AutoCAD, was t the very beginning. Even now, small projects, hand drawn, larger
institutional projects on AutoCAD. 3d modeling software was pretty primitive 15 years ago.
Even in the profession minimal use. You’re talking about the crossover where school was
ahead. There were relational database programs like BM r(oocaps) a big mainframe that no
office had. I think even students were ahead of the curve, form z was the popular 3d modeler.
It came into offices from the students. I was in practice, we saw people coming out with those
skills. No people who were in the profession went back and acquired them, for the most part.
That was an interesting transfer. And then SketchUp of course. People coming out of school
had certain mastery, and people in office picked up quickly, so it wasn’t a big commitment.
About that easy.

I2: The learning curve was really small.

I1: It seemed ideal, but that was kind of a golden age of ((laugher)) technology platforms. Now
I’m not sure who is leading whom.

I2: Regarding BIM.

I1: Well, you know the different platforms, or what you can do in terms of digital fabrications as
opposed to general documents. Design, and development of design.

R: Communication and which direction that goes. The U actually teaches a Revit class, I took the
class, but it’s interesting because its really taught, and Revit is a difficult one to learn if you’ve
not had any experience putting together any kind of set. There’s no correlation of knowledge.
You’re going to cut these sections and then decide on the granularity of that particular thing
based on what it’s going to be. It’s not an easy cut and dry, it should be half scale, but there’s’
only maybe 3 or 4 of us that say yes, I’ve had that problem, yes I’ve had that issue, but
everyone else would say I’ll do what you tell me to do. And learn how to use the software
because it’s clear I need it.
I1: Right, well you just described a documentation problem that’s really a professional problem, it’s not really a student issue. As so from a design point of view, no one asks that question of SketchUp. You make it like you’re making a cardboard model. Maybe I want to see the outside, so I’ll futz on the outside, or maybe I want to get in it, so I’ll make it hollow. So people literally just plow their way through it, guided by what feedback they needed to get about their design. And um, Revit just because it emerged as a professional interface between construction and design its all about the documentation that gets handed off to people that make it. And the team that coordinates and builds it. We thought when we’re trying to see how we can use it in the design phase, because it has 3 dimensional visualization capability, and has dimensional control and all this stuff, which you do need at different phases of design, it’s pretty cumbersome when you don’t’ need that. Early on, when it’s an idea about how people are going to sit around a table, BIM’s not helping you out too much there.

R: It’s almost too detailed.

I2: It’s so complex, where people should spend more time sketching using trace, and relying on those skills, and actually thinking out about creating the design with different models, and then actually going into the model and creating it form scratch. And we see a lot of people struggling with that because SketchUp was such an easy intuitive tool to go from you know a thought directly to the digital media. But there’s that additional stuff when you need to think it out, sketch it out, figure out how it’s going to go together before you step into Revit. So. R: Sort of going from concept to design development, you can’t go right into Revit for design development necessarily.

I2: True.

R: But people might try.

I1: [R2] is a young dinosaur but is still a dinosaur. He started out drawing first. Everyone in the office draws, really proficiently, by hand, and I think that that’s something I wouldn’t say is an absolute, but it been pretty valuable for us to have that capability.

R: And you’d look for that capability now. Would you?

I1: I think we would, especially knowing what we know about Revit and it’s limitations. And the value and ability to sketch quickly, and example of that is that your sitting down, at a table having a conversation, and if only one person can draw, it’s a one sided conversation. And because we’re trying to get more precision in our communication about space and form, I
don’t know how else to do it. Without wasting more words than I already wasted. I think it’s really important for me to know what other people are thinking, and there’s no delay. Are we seeing the same thing, that we’re imagining, or am I going to come back after 3 days of intensive BIM modeling and go no, that’s not what I thought your were saying. And we can work thing out together, and I think it allows us to do more because we can get full participation for people’s background and experience. People like [R2] with a lot of construction experience, digital fabrication experience, he can teach me what I don’t’ know, maybe I did something before, this worked before, we could try that.

R: It sounds like it’s become, especially when you’re looing at skill, a combination of two different sets of skills, if one person is more proficient in one and the other is more proficient in the other, that there’s an open communication, you have a level of communication here that’s consistent, and can take it in it in either direction and then bring it back and have it be the similar, this is what I was thinking and now it’s presented in a different manner, so visual representation is if its in SketchUp, now you can say, that’s what we had talked about.

I1: What I meant about [R2] and I both understanding a language of an elevation, or a plan or a sectional detail. So we know that is a cross section, and the vocabulary of drawing conventions where poche means something, and the line weights mean something and modeling is kind of a different thing, you’re building a model, you’re taking views of it.

R: But then you don’t necessarily, the construction isn’t necessarily part of the model yet.

I1: Well the construction of the model, I meant when we used to draw this stuff, [R2] used to set it up more like I did, you visualize the stuff in the conventional views, the plans, sections, elevations perspective, obliques, isometrics, then you build up a drawing that represented an idea, and none of the views are fully consistent because the idea was evolved. When you’re modeling, you’re essentially building this thing virtually. Or somehow, and all of the views are updated simultaneously. And you can view it any way you want. So you’re rally viewing something. You’re not really thinking in a drawing necessarily kind of (...) views. That seems to me one of the weird differences. And I don’t’ know how students now, if they’re introduced to modeling before drawing, how they understand the language of representation.

R: That’s a very interesting point, I had a discussion with one of the instructors, who said, it seems like we’re getting to the point where students don’t understand the point of two dimensional representation, when is it a plan, why do we draw elevations, we don’t’ ever see
buildings in elevational views, because, they’re building them in SketchUp or building them in rhino, and looking at them that way instead. This flattened out view that we’re used to imagining as an elevation, in two, not in 3, it doesn’t have relevance per se.

I1: What is the answer given? If I were to ask you why would you do a plan or an elevation, R: For me it’s communication.

I1: What do you want to communicate?
R: Essentially the construction or the concept of what that’s going to be. That’s an ongoing sort of question. If we’re not using them except to communicate the building side, do we still have the right answer to say to a student, this is why we need to do them that way?

I1: I have a really clear answer for that. Maybe it’s because I started drawing.
R: I’d love to hear it.

I1: When we’re designing, we need to know the relationships of the parts and the geometric organization. So, it’s only really in the elevation view that we can look at that and say, it’s wider than it is tall, that these 3 equal spaces, roughly, not only to dimension, the geometrical relationship is orthogonal, and the position of this in relative to that is real clear now and in a 3 dimensional view I might see all those parts, but I still can’t see the registration of all of those. Orthographic views are the only views that show you true length, and true geometry, so, if I want to understand the proportional relationships of something, I’m going to look at the elevation view, the plan view.

I2: But they’re important communication tools too. Contractors, or in a scaled drawing you’re conveying dimension,
R: That’s essentially the answer that came up, but that’s the question, proving it seems to be - well, I can look at it from this view.

I2: But it’s still a perspective view and doesn’t describe the relationship of the other objects.
R: To be able to function in this communication, it’s about knowing how to think about your design first, before just throwing it up there.

I1: I don’t know if people articulated these ideas to me. Because contractors have to build it, but we do actually in a limited way, if we’re building a table, we would have to do a plan view, but somebody would ship out the dxf file, and somebody would cut that, the contractor might never have to see and actual view of it. Probably good to show them a view, but when they cut it, that’s what I’m doing.
I2: That dxf view, that drawing view would basically be a plan view.
R: But experience is talking, wanting him to see it.
I1: But it’s not, the tradition of handing someone a drawing of scalable views, could change because you can just exchange the model file, and they’ll just extract the views from your model, but it’s a bit risky.
I2: The liability especially with that would be tremendous.
R: I think people would like to see that happen, but we have too much red tape too many other things in the way of being able to say we built this, we’re confident, here you go, and every consultant is going to have their point of view and what is important to put into that view. What’s important in mechanical, is not necessarily going to be important to someone that is working on structural.
I1: Right.
R: Far more detailed in this over this. All this technology of everything in one file.
I1: well, those external forces, are not really that serious, the construction industry has a lot of expensive tooling, and tradespeople that are used to working in certain way. I don’t think it can spin around immediately, certain industries in fabrication, specialists, that are using computer driven tooling, they’re like the easy first people to collaborate with, it’s kind of nice, more cost effective, limited fabrication options now. If people had to cut those things out by hand and finish the edges and do all that work it might not have happened.. There’s a really interesting opportunity of the craft application side for architects that can communicate digitally. So, we have some contractors, fabricators you could just do a sketch of something and they scan it, and create the file for you and make it.
R: There’s definitely some of the ability in the digital technology, it’s just easier. Students now they don’t run around with xacto knives making their models, they just throw it on the laser cutter, get all off of there, and then start. With the gluing, no one’s getting big callouses.
I1: I wonder if people making models with their files are getting a better sense of the relationship of the model and the physical thing? If they ever built your model. Are you getting-
R: Would you get the sense, because of the physical sense of creating.
I1: Is your understanding full and complete.
I2: I don’t know, I mean, I think its’ definitely a draw back to use the laser cutter to develop the model, because you’re spending so much time to create he cut paths, and not focusing on more
of the design, understanding the relationships of how it goes together, you’re more concerned about developing the design in AutoCAD and making it construable via the laser cutter. So.

R: That’s a very interesting perspective rather than having to struggle with this is quite the right size, if things don’t line up.

I2: And if you see something that’s an issue you can easily modify it, umm, I guess you could do so the same way with the laser cutter, but you’d have to revise the file and recut it, where an xacto blade and some glue you can whip it out in a few minutes an be done with it, it may be, I don’t’ know, a drawback.

R: I’m also observing a class at the U a friend of mine is teaching which is computers in architecture, intro to, and he’s combining the two, his background is very craftsmanship related, sort of physical making, and he’s back in school because he realizes he has to do the digital thing, too, but his point of view has really been, it’s not a button push.. You have to struggle with it, forcing them to get a sense of that, with the digital at the same time. A lot of them have said this is a lot harder than I thought it was going to be, I thought it was going to be simple.

I1: We could probably say that’s true about some of the software, instead of just drawing, we have to draw rectangles, drawing an extruded rectangle in Revit, it’s not like a hammer where you know which end to pick up. And so I think a certain amount of our RAM is occupied by trying to make the software do something kind of simple. So it consumes some of your time, and I think AutoCAD was like that too, some sort of learning curve to become fast and efficient and make it do stuff. At the end of the day its just sort of a digital etch a sketch, is what I’ve always thought, one view doesn’t necessarily relate to the next. Copy elements in, coordinate some views. It’s not a really intelligent data set.

R: It was just another tool.

I1: Yeah but not, I mean, they’re all tools, I’m trying to think of the advantage of some tools over other tools. Cause it had a similarly, graduated learning curve, I remember trying to draw things that we could draw so much faster by hand. The interface for AutoCAD for certain things was just toocumbersome.

I2: Linetypes, layers,

I1: It wasn’t WYSIWYG.

I2: Those were all new concepts.
I1: Things like absolute coordinates, for example on a survey, trying to get a survey to close, and that’s not a 90 degree corner, so it’s like a crap shoot. ((Laughter)). They’re just highly abstract, you’re not seeing it as it goes in. Like word processing, where it would be wrong, but you had no idea what was wrong in the command line, it would just keep saying reject, reject. You keep going back to the command line to figure out what am I doing wrong. It gets to the point where it takes you away from the task at hand. Which is how is this building going together, how does the space feel, are the proportions right, is that mullion slender or heavy, you don’t get to think about that, you’re so worried about the software trying to interpret your intent. You forget what your intent looks like.

I2: I think that’s an even bigger problem these days with Revit, and users not sketching out and trying to solve the problem ahead of time before using the software. I mean how much time do we waste on Revit, it seems like it takes an immense amount of time trying to get stuff in there.

I1: Remember why we’re doing this.

R: Are you switching over to Revit?

I2: We’ve been in the process for about 5 or 6 years,

I1: We last year, made the 100 percent switch, everyone on all projects at every scale. There’s just no more AutoCAD unless we have to open someone’s file to do something, I think we observed that trying to have a couple of people to do AutoCAD and a couple to do Revit, having to staff projects, not with the person that should be doing the library, but it if had to be done in Revit, having the Revit person. We got that people were off Revit for a while the, they’d get rusty, then they’d get off AutoCAD, and they’d be rusty at AutoCAD. Suffer some productivity, and we just didn’t want to keep doing it year after year after year. We do a lot of public work and Revit became almost a requirement, several public clients that we work for including XX. That same thing happened in AutoCAD when I was [R2]’s age. You have to be in AutoCAD, these layers these line weights, or you can’t do our work. We for the purpose of architecture, thought this is a great program, we should just get on board. The choice of software, is somewhat limiting, clients, big clients, they’re kind of big players. Even corporate clients.

R: I imagine there are a lot of developers that want it that way.
I1: There’s advantages for them. Not all bad though, there’s a silver lining somewhere. [R2]’s been sort of most advanced cross platform user, and I trust his opinion because he can also draw really well, it’s not like he’s going to do this because he’s a geek or can’t do the other thing.

R: That kind of ability demands respect. Because it will get lost. One company I talked to advocates cross training, and spending time in each. […] We have to be able to sketch. I1: I think that’s where we have to get with Revit.

R: Do you think we can?

I1: I don’t’ know, I’m not gonna.

R: I’m sorry, do you think we can? (To R2).

I2: Yeah, I think people can, but the learning curve for Revit is tremendous. Especially for new students, R: Because they don’t’ know how to build really.

I2: Exactly. You know it kind of requires that knowledge of construction to develop a model. So umm, yes, but I still think it’s very important for an individual to be able to sketch, to draw out the solution for the problem before going into Revit, the more complex the problem, the more important it is to sketch it. You’ll just kind of waste your time, spinning your wheels. Prime example is the gaming industry or the movie industry where they have these tremendous complex programs, and they spend a large quantity of their time sketching and drawing, storyboarding,

R: There’ a question I ask everyone, do you think anyone coming into the industry should be able to design strictly without technology? I can come up with a solution without having to go to the computer to visualize it.

I2: I would say yeah, technology is just another tool. If you don’t know how to process, or use another tool to solve the problem, then there’s an issue there. You’re’ just relying on one tool then you become specialized, and you’re not really a generalist anymore. I think of this firm, we prefer those types of people that are generalists, that are a board band of skills.

I1: We do know firms that do more repetitive work, come out of school, and feel real powerhouse Revit or cad users, can just crank out stuff, you’re not being asked to solve or work anything out. You’re more or less, reassembling information that’s already been conceived of by someone and transforming it, reediting it. Reforming it, I guess. So they’re
probably a lot of people doing that. I wouldn’t deny that’s possible to get a job. I’d say if you want to be a person that thinking of new things, you want to have those skills. Well fluency and transparency in whatever you’re doing, whether it’s writing or drawing, is the point you want to reach. So if you’re working with a modeling program, you want to get to where you’re thinking about the design, not about the command structure and the software. [R2]’s described a situation where modeling is a very different conceptual approach to design, not construction thinking, but I’m thinking about relational data sets between elements of design, maybe like an assembly, the roof structures associated with the wall tops because if you explore changing the height of the roof or the ceiling in these rooms, and if I haven’t really thought that through, that those relationships, then when I try to edit my model I have to raise every column. It’s not about it’s going to be built, it’s about how are these elements associated. Just saying all my columns are going to go to the underside of the roof, because they’re going to hold the roof up. So when I build my model, I’m going to make those associations present, you don’t have to know everything necessarily about construction, but you do have to start thinking more systematically in order to get the editing benefits rather than just using the etch’s sketch again. And you’re moving that thing, and that’s great, and it’s changed in all the views, but you have to change them all, and in AutoCAD you had to do that. There was no extend all or cut stitch, and trim, it’s ridiculous.

I1: There were a few things you could probably do. So that to me is more of a design thinking approach in how windows relate to walls, And that’s maybe about having a sense of the things you want to manipulate and explore in the design process, thinking of a room or a building form,

R: Just based on that you have to know where you’re headed already. Like you said before taking it into Revit, you need to know where you’re headed. You can make changes as you go along, but

I2: Right yeah, understanding those relationships is I think key, and then just basically mapping a path to construct a model. The more time you spend thinking about it, putting it together, it’s going to be save you time down the road,

R: It’s never wasted time., essentially. Well rarely wasted time.

I1: If you ever remodel it. Think this notion of grouping in editing is an advantage, and it was true in SketchUp too, how you formed relationships, made it easier to, harder to subsequently
remodel it or if you’re’ editing in InDesign or Photoshop. It’s easier to manipulate things. That kind of thinking translates to modeling if you’re lucky,
R: But if you were designing like that, this element is its own element, regardless of where it goes. It’s going to stay like this.
I1: Fundamentally, as a cognitive skill, that’s nothing that ever happened here. You might have thought that these things were associated, but when you drew them, ink on paper has no association, its all in your head. But the data set is a little more alive, and [?]. It has that to the advantage, I think, that you can exploit those relationships, once you’ve made them. Cause we all know that the editing capabilities of digital design software, like the adobe suite, is pretty phenomenal. Like erasing, or cutting and pasting stuff, but it’s not much fun to edit stuff underneath if the relationship isn’t’ there. You’ve used Photoshop, right? If you don’t create the appropriate layer and then you mix up stuff, and you try to edit one layer and undo it, redo it. It’s a thought process. So people coming out with digital, might be more aligned with the things that will make them better Revit users and the people you’re talking to, my age, they’re not really thinking that way, normally or only partially, so it’s a more problematic retraining process.
R: Essentially you probably don’t need to use that kind of software, all the time.
I1: That’s sort of a good question, what do you think?
I2: No. ((Laughter from the group)). Well.
R: I guess it would be an individual desire to learn more and be better at it, as opposed to the business demands it that you be capable of doing it. Because of where you are and the decisions and the level at which you make decisions.
I1: Well, the office needs to know it, but people at [R2]’s level don’t need to know it, I don’t think. It helps me understand it, like when I ask [R2], because we have a client that asks for all these visualizations, can we make a little lighting study of that thing, maybe what I don’t understand is not as easy as what he requested, it’s maybe an eight hours project, we can do it. Probably think we can do some magical thing, but is that realistic,
I2: But it would be advantageous, let’s say, to have the ability to go in the model, to review the employee’s work, or the status of the model. But, I think, our projects that are really small, you just ask the individual to print out, easily generate whatever.
I1: The collaboration thing is a little harder, cause it does happens on screen a little bit, but I
don’t know how those thing are related in the model, which I don’t do, otherwise I’m kind of
relying on the output, so I can look at this and if I wonder why is that gray, and - so I see an
anomaly there and I don’t know if that’s something that’s in the model, or whether…
R: But you still have had that type of experience of looking at something like a line weight and
wondering why this is different from this. I have been in the instance where someone says,
well that’s just the way it has to be, true but not true.
I2: That’s typically the answer that I hear, especially from inexperienced users. They would love
to tell the higher ups, that the way it has to be ((laughter from the group)). And it’s totally not
that. I mean, it’s -
R: Do you think that sometimes too, if you don’t have a built in - inherent ability to see why line
weights are necessary, because you haven’t’ used them the same way, it’s easier to let that
slide?
I2: I think it’s just a…it’s true about a lot of things. It could be line weights, it could be tags, I
could be titles, there’s any numerous things. Because in Revit, in software, three are millions
and millions of different options, and scenarios,
R: Right, I did have one friend who attended a Revit class - the question came up, they were
showing them how to do tags, well, what if I need to put the arrow in the other side? The
answer was well, you don’t. From the trainer. But when you’ve been trained more classically
in terms of drawing, there’s a consistency and a symmetry to the drawing itself that is
important, at that level, as a representation.
I1: I don’t like to be told that your tool can’t produce clear documentation. But I think that’s a
more professional level kind of thing, most office, and we have standardized approaches to
things. Like [R2] has worked out to save everybody a lot of existential questioning, like should
I do them to the left or the right, so we [R2]'s in to it and knows kind of what is possible and
like what fits the BIM, the Revit model more or less. So I think that saves a lot of that kind of
on the professional side. I don’t think we would expect people coming out of school to know
how Revit wants to do notes, anyway. But I would love people coming out knowing that clear
concise communication is essential to convey the sense of your design, first, and then second,
helps if you know how to build it right. That’s all they really need to know. So then we - I
don’t know, the training in offices is one of those questions that is more professional, like, can
offices afford to send everyone to BIM classes, how people in there offices work for some number of months while they’re only partially productive,

R: Trying to see if they will be a good fit later on.

I2: We’ve gone back and forth on that issue. Some people have gone to SCC, taken the Revit course up there, some people have just learned it within the office.

R: Because they have to.

I1: What’s out thinking on that?

I2: Well, our thinking on that today is that, ummm, I guess the class, at school is great, it teaches you basically how to use the software, but they can only teach you so much because each particular office will have standards, or BIM standards, they have a particular way of doing things. And they can’t reach you that at school. And sometimes it’s, you know, easier just to immerse the individual within the business standards. Pick it up that way. That’s my personal theory. I don’t know.

I1: Well, from an office point of view, there are firms in town that won’t hire someone with less than three years of professional experience because they want not only that you get your BIM experience somewhere, but you’re like, what’s construction, what are they all about, how do I behave in an office. Umm. We don’t think like that, but I know it’s more profitable to not invest in training and then have people go to another office. That’s happened too, literally, people will take a BIM class, for a thousand bucks, then it gets portable, and I think there are other questions about, I think it’s perfectly reasonable for people to get out of school and require more professional training, but the portability, versus the profession and the individual office’s responsibility to train people, no body wants to feel like they don’t’ want people to learn, but that’s really counterproductive, but it is expensive, and it’s more expensive for smaller offices than for big offices.

R: Everybody needs billable time.

I1: Well, it all comes out of everybody’s pay somehow, right? ((Laughter)). I mean, it’s not magical.

R: No.

I1: People have a certain amount of money you give it all back except what you need to pay your bills, and that just becomes a bill. So the faster you learn, the more productive everybody is, the more productive the better design, you can generate in the same amount of time, the more
successful we can be. So I’m hoping we can explore things quickly and get to better solutions more efficiently than we used to be able to and then, they can get to the documents more efficiently than with AutoCAD. I believe that the more elegant system but it’s certainly not a magic system.

R: Have you found a change in the actual time frame that’s required for design development, construction document? Some firms think that it’s greater on this end, less on this end now, or it’s all the same now, even though BIM is now the standard in the office as opposed to AutoCAD?

I1: Well, you probably have to measure your own project time start to finish in Revit versus AutoCAD, and then whatever else.

I2: I guess it depends on the client. ((Group laughter)).

R: What they’re asking for?

I2: Well, it’s a good point. There’s a variable, change…

I1: Late design changes.

I2: Late design changes, they’re extremely expensive with Revit, umm, just because they’re tied together. So. Umm, where in AutoCAD, if a change occurred you could usually change it in one drawing and you know, you kind of fudged. But,

R: But if the change is going to affect the whole model

I2: Yeah. I would say, BIM is faster but you need an experienced user to you know, produce it.

R: From what I’ve heard, this is consistent. The type of user for Revit is different from the type of user for AutoCAD, the way they it used to be maybe five to ten years ago, you could do redlines, with someone who didn’t know as much in AutoCAD, as opposed to doing redlines in Revit.

I2: Yeah, that’s probably true.

I1: Yeah, I found that redlines was kind of hard because you’re looking at in progress 2D plots that didn’t have all the background stuff turned off, or wrongly missing that, so you’re just thinking, is that missing, is that a mistake, does that person know that’s not supposed to be there. All I can respond to is what’s here. And we have to have kind of a little conversation so the red marking isn’t as good as, and maybe that has caused us to change how we work through the finalization of documentation. But, we do have some clients - our hope was - my hope was at least, that we would go on a project from quicker sketches to something that
would get clients to understand this thing is going to be kind of like this, and the we could show variations on that, and get to a design and commit to it, because they could really see and visualize what it was going to be.

And umm, so this is really pretty early in the design of this project.

R: And what is this in?

I1: That’s Revit but the model’s in -

I2: Postproduction is in Photoshop.

I1: Yeah, with no other. Well, how’d you light it?

I2: Revit.

I1: So that’s the Revit lighting. With some skillful kind of, you know, made up stuff, probably.

I2: I did the renderings,

I1: But you did kind of advise on this thing, this is actually XXX’s first Revit project. Kelly worked on the front end of the model and it was her first Revit project, so they got a lot of help, I think, but it came together.

R: It does represent though, in terms of a person looing at that, I’m sure they could say, okay, I get it. Certainly more here than say, here ((points to another sketch)), it’s still very conceptual.

I1: You deal with transparency and color in ways that are pretty close to the final thing. We think. A classic misconception is you know, the shelving, you know, this is a really early design, I don’t think we made them as families, so when we decided what the final design was, updating the model was a little cumbersome, and we created families, and the nice thing was that the client, when we need proportions to change, when we edit the families, of course, it updated, like all of this stuff, and all of the views. But that the kind of thing that could be really helpful, you know, those kinds of things, because they do 3 dimension edit or modifications. So I think if we get better at that, either we should get closer in the early model. It’s a late design decision for the client to tell you that these shelves have to be six inches high, and those need to be [...] inches high. While we might need to show that for the contract, I didn’t feel like we need to show them a new design drawing because the design will be whatever the client needs it to be,

R: So in this case, did that part of the contract include having the shelves made as well.

I1: We showed them these shelves, had these proportions, and an opaque part, and that was part of the design. I know in traditional 2d representation, it would have been really hard to explain
to the client well, this line here means that’s out on that side and I can see through it, where,
they kind of got this immediately. These are a bunch of library professionals who don’t look at
this kind of drawing. The good news is that they can understand, the bad news is they then will
have an opinion on it, and I think there’s a lot more trust, like if you showed a client a drawing
like this ((holds up a detail)) they go, well, I don’t know what it means, but you’re the
architect. So this actually invites clients to the conversation in a way that creates challenges,
it’s like, oh, if that’s how it is,
R: I’ve heard that. And I’ve read that research is noticing that. The level of collaboration is
moving in a different way, it didn’t used to be. This I’ll know it when I see it is really
becoming very prevalent I need to see it then I can tell you if I like it.
I1: The effect of a bright color, against the foreground, middle ground, background, we kind of
know that from experience, because we think about it a lot, but clients it’s harder. One of the
worst things you can hear from a client though, though, is you go into a space, and they go, oh
I didn’t’ thin it was going to look like that.
R: That’s not what I thought it was gonna be.
I1: Yeah, so I have, I actually really appreciate it when we take photographs of our projects,
some of these views that we’ve modeled are like eerily predictive. And um, I think that has
value for all of use, since, these aren’t the most expensive projects that we could be doing, but
people give us a lot of money to do this thing, and sometimes we do something that’s better,
but not the simplest cheapest way, and so at the end of the project, you want them to still
believe, well that was a good idea. And you gotta kind of convince them early on that well we
should really use frameless glass and round wood columns, with a certain kind of hardware,
and it’s like what are you talking about.
So we’re struggling with diagramming I think, which is that early design thing.
R: How you use technology?
I1: Yes, Revit isn’t’ really working.
I2: No, we actually don’t use Revit, in kind of the diagraming stage, we think the massing
features just because, personally, I feel as though our experience level with the program isn’t
there yet, so we have to build that comfort level. And plus our projects aren’t’ really that large
to accommodate those features. So.
R: How do you do it currently?
I2: Basically, by hand, doing diagrams,
I1: What I think of another. Turns out that the help of the diagramming doesn’t really get you um, further into your documentation or the 3d modeling. That 3d view that we got of that storefront has all of the things that were going to be part of the interior elevation, that the contractor needed to bid, so I guess if it looks like that, diagrammatically. Messier than that.
I2: We tried it on a couple projects, like we laid out in Revit I guess; it’s fairly easy to do it Revit.
R: I guess the question because of the sense of permanence that sometimes something like Revit, do clients tend to really relate to something like this better, oh yeah, I kind of like that, but there’s this sort of a wall that they hit if it’s done, and they feel like it’s done.
I2: Yeah, I think there’s a perception that if it’s in a visual program which is Revit, it’s hardlined, the architect has spent some time, and there’s this perception that they don’t feel like they can change it, it’s not fluid, so yeah, we have a tendency to go towards the sketch.
Supplemental Material A7. 3051 Interview Summary

R: I’ve talked to different people, management, production, etc.
I: Big firms, small firms?
R: talked to […] They have a very different way of working.
I: Yeah, right.
R: You have to sketch first. Where the software goes and how you use it is very different. But,
there’s a movement, that people are starting to think differently.
I: Yeah.
R: We still need them to think. We can teach someone anything.
I: I would agree with that.
R: I think probably one of the things we don’t currently do is teach students, you’re going to
learn AutoCAD, your going to learn rhino, but they sort of just creep in. We don’t let them
know exactly how to use what when.
I: I think there’s a lot of that in the profession, where people kind of
 […]
I: There is a partially budget pressure, the schedule, there’s a tendency to want to jump right in,
whether or not it’s the right idea. By the time a client decides to start, the deadline never
changes.
R: What I’ve found very interesting, in going in as a student but having been a professional.
I: it’s a very interesting perspective.
I: I think I have a very interesting perspective on whatever you’re going to ask me. I worked at
XXX for over 13 years. I was an architect for the first 9 years, then the marketing director for
the last 4. Then 4 of us left, had our own firm for 7 years. I have a perspective on that. XXX
acquired us 1-1/2 years ago. They’re a giant gorilla in the architecture world, progressive in
terms of technology. I’ve sort of been through everything.
R: I talked to XX - the history of where everything has been.
I: When I was in school at the U, I was applying for a job, and computers were not - at that time,
the mentality was that computers were so expensive, we had two in the firm, they need to be
working twenty four seven. Literally, we have an opening in our night shift. When I started at
XXX in the 90’s there wasn’t a computer at everyone’s desk, there was only 3 or 4, and they
were only used for floor plans. That was it. No details, no - one of the guys I worked with, was the first guy that made them understand - you’re still just drawing 2D lines. Computer doesn't care that you’re drawing a wall section. It was a real ah-ha moment, you could produce the whole set on the computer, but not everybody has a computer, and they were changing so fast - every month there was like another, and then when I started my own firm in 2004, Revit wasn’t where it was today. But we decided we were going to use Revit 100%.

R: Really.
I: Well it was a mistake actually. There’s four of us, pretty technologically savvy, bit also staring a firm, starving, no staff, and two really big jobs. A 24-story condo tower across from the library, we’d never done condos, we literally could not produce the work. We were mired in trying to learn Revit. At the same time, it was on a older building, and there were no drawings, so we shipped the drawing to India and had them build a Revit model, we had presentations every week, we couldn’t get stuff out that was any way graphically compelling, and still build a company we had to call time out, we’re committed to Revit, but not right now.

R: Well, it’s the learning curve, and everything that goes with it.
I: We couldn’t do it. We called a time out.
R: There’s some questions, to see where they head, we all have different perspectives. All the people in a room are going to learn the same things differently.
I: I remember, it took me a couple years, even when MS word, I couldn’t compose at the keyboard. I’d write it, then I’d input it.
R: I have difficulty teaching a CAD I class - I don’t know what I do anymore.
I: Yeah, yeah, you don’t’ think about it. But I think that’s a little bit in design. Some people generate ideas while they’re in the software. Other people have to think, then they get someone to input. But not everybody works that way.
R: That’s an interesting thing, I’d like to ask you about. Recent graduates, it almost seems like they are starting to think differently.
I: I also have kids, an I’m watching that. There’s a big knock on youngsters, well they can’t draw. They can draw, maybe they don’t.
R: I don’t know the answer to that. It’s maybe that they’re using a computer the same way we might have use a pen.
I: Is it important that they draw, or that they get to the right idea.
R: Being able to think, and the level of creativity.
I: That’s the value add of an architect.
R: That’s the question - you don’t want to be tethered to a computer. If you’re in a job site, you
want to be able to document that. The level of communication between senior and junior, that
you can collaborate.
I: It’s hard to see what’s in the box, when someone is in front of that.
R: I’m assuming that in your time frame, you’ve done that, stood over someone and sat in front
of a computer.
I: Yeah, I hate it. It’s really hard. I’m of the generation, that I have to have it on a piece of paper.
Look at it and get the scale, that’s another thing, kids they don’t get the scale. It’s not in scale.
R: I think it’s getting lost. There’s now an area of uncertainty, do they know this line is incorrect,
I: There’s’ nothing I can do. Were still in a world where we’re not yet using the model, we’re
still printing it on paper. The line weight has to be right, it has to be legible - you don’t’ know
that until you print it out, looks great on the screen. on the screen the lines are green, yellow…
R: I was taking to BRJ, students are asking why do we have to draw elevations, why do we have
to draw plans, that’s not how we see them in real life.
I: Right, yeah, yeah, yeah.
R: But there a lot of things you can’t see.
I: Right.
R: Photorealism isn’t how we see things, I guess its the same struggle.
I: I was at the AIA convention, maybe three years ago now, and […] gave a talk on integrated
delivery, and BIM, and his thesis was that over the last 20 years almost every industry has
advances and used technology to become more efficient. The architecture, design, and
construction industry is one of the only ones, that hasn’t, everything takes longer and costs
more, and he said that our industry is now just below farming. That’s not good but I think
that’s why there’s so much pressure on universities, and private sector, everyone is looking for
that magic efficiency.
R: There’s a button.
I: We’ve got to be able to go faster, and how do we do that?
R: The other industries have more or less figured it out.
I: The excuse is always that manufacturing can do it because it’s not a one off. They’re doing thousands, and it’s automated. But what we do isn’t automated. [...] Then I look at it, and I look at several projects we’re doing right now, and especially in construction and CA, and how inefficient the whole, you draw, we’re still in this mode where we draw, and it’s well thought out, then you send it to the fabricator, and he draws it, then you make sure his drawings match yours. We put all this thought into specifying ceiling tile, drywall, and the contractor takes it, and the we say that’s the one we want - why do we keep having to do this over and over? How about this - we put time into picking out the tile, then we put time into specifying it, how about we use that ceiling tile. I don’t need to see it again. How about we just use it!

I: I’ve talked to a few people. You’re going to take this model, and you’re going to send it directly, and they’re going to manufacture right out of it. We’d like to be there.

I: We’re not there. I think there’s a lot of talk- in the industry certainly at the scale of firm that Perkins Will is, that where is your, where is your value, added as an architect. There really no need for a firm to have the production capacity. What your value add as an architect is in the ideas, and what you care about is materials, and the critical details that you can see. The execution and documentation of it - that’s not really our value added. When you think about that in the whole architecture world, that’s a lot of people. Partition details, grid layouts. You could still do the same amount of projects, and keep doing [the thing that takes] creativity.

R: That’s a very interesting thought - the more people move into BIM, everyone wants to use it, where does the responsibility of when something happens. And architects care about different things. I was reading an article that was saying that it is starting to dilute what your core business is - because now the client is involved, and we have to keep producing, so that they can see the representation, make changes.

I: In my mind, as long as we, as architects still have the creative control of what it looks like, it makes no difference who produces it. I think eventually its going to go away, right now everybody is worried about who owns the model at what time and who is accountable, it’s all lawyers stuff they’re worried about that. I think over time that’s going to go away. I mean you look at, almost every major contractor in this town has hired architects on their staff to do BIM and Revit, it’s because they’re producing stuff, because they think it’s more efficient. They can go faster. They don’t want to wait for us, to do a half-baked model that doesn’t reflect how they’re actually going to build it. But we model it based on how it’s designed, they
model it based on how they’re going to build it. So they get someone who knows there business, and that is the challenge, with technology, and I agree with XXX or whoever, that the kids coming out of school, they can learn software in a day. They don’t know how a building goes together. We can find people who know Revit, who know how to lay out sheets, sections but they don’t really know what they’re doing yet, so that’s part of the internship, mentorship process.

R: It seems that there’s a change in the process, we use that software, in the process, you can’t put someone really new in a BIM model and not make a mistake, and in CAD, you could, say here’s the redlines, make it look like this.

I: Right, right. BIM is really hard to manage. I can’t do it every day. Go in and see what’s drawn, first of all I don’t know Revit very well, that’s my fault.

R: And at a certain point, you don’t need to be in it, you just need to know what’s happening.

I: Yeah, so if someone is working at their desk for a week, if what they’ve modeled is what I need, you have to really manage it, every couple days. Make sure that someone is not - we’re doing this condo building, and some young guy, he was modeling the toilets. I don’t need a perfect 3D toilet. I just need some sort of graphic representation of a toilet. Four days later we don’t have any wall sections.

R: I think there’s a need to know what part needs to be communicated. I took the class in Revit, and it’s very geared towards architects. How many of you have ever run into this issue? Maybe three hands go up. Because everyone else has never done that before. They haven’t had to produce a 50-page set. They learn how to do these faster. But they don’t know about the model, and what details, and then I’m gonna cut this section.

I: How much do I need to draw, and to what level of detail, and at some point do I just need to extract it, and draw it in 2D. That’s the other thing, you don’t need to model every single condition, probably just need to draw it.

It’s an interesting time. It’s interesting too, that, I’m on the board on the AIA, we had our retreat, there’s other people on the board that are outside of the architectural profession, contractors, engineers, other people. The topic came up abut, where are we in the profession, what are we trying to do, what is the, all in the context of what are the educational programs that we’re offering, and what are we training the next generation to do, and what’s our goal here. And there was a lot of push back for the contractor, and the electrical engineer, couple
other guys in the room who are not architects. Basically said, you guys, if you guys as
architects don’t wake up, and see how the profession relative to the amount of work that the
contractors are doing in that office, or the integration of contract, or whatever it is, you’re
going to wake up and find out that somebody else shaped your profession and you didn’t. So
you need to decide, proactively, what do you think it’s doing an where do you want it to go?
There’s a lot of that kind of discussion.

R: That’s a wake up call, but it’s essential, the people that work with you and mange the
profession, we need to do this together, so that one person is not behind. It’s that domino
effect.

[...]

R: I’ve read a few things, things don’t’ change, unless you A: explicitly choose to make them
change, or you allow them to change. If you don’t’ put up a fight, its going to change anyway.
I: One way or another. That’s right.

R: So there are those who like the idea of using technology to connect, and those that advocate
we absolutely have to do it this way, and then you get the other, most of the educational, well,
we’ll throw in a couple of classes and see what happens. We’d have to retrain everybody.

[...]

R: One guy is asking if can you create the same in accuracies in a computer that we do by hand -
its very conceptual.
I: Eventually. In theory that’s the next iteration of technology.

[...]

R: One of my other fellow students is teaching the computers in architecture class, we took some
surveys, we’ve taken a few, they’re learning rhino. Is software, or is sketching easier, there’s a
lot that are still saying that sketching is easier, this is a way harder that I thought it would be.
I: Yeah, yeah, yeah, because they’re trying to get something compelling out of it.

R: Well, they’re trying to fabricate too, you have something fabulous and then you have it cut
and it doesn’t work. It’s not that easy.

So over the years, you’ve see the design process, the deliverable process change, CDs are
changing, DDs are changing, is it speeding things up yet?

I: No. I think that’s the challenge. At the end of the day, you’re still making all the same all the
same decisions. What it made of, what’s the exiting, what’s the - the computer doesn’t make
the decisions faster. Ahh, but we’re trying to work with a tool that - we had a guy, internally, 
because we do a lot of analysis, what is the capacity of the lot, or the parcel, to try to find a 
way to automate that, it generates the maximum envelope with all the right set backs, the air 
rights calculated, very complicated - we’re not there yet. It’s not automated.

R: Is there anyone in the office specifically programming for some of the needs that the office 
has?

I: Not in this office, there are in [?] research group, like there’s this guy from Dallas that does a 
lot details, and then another group working in healthcare, and the data, that the clients have, 
you have 6 ORs and you have this case load, and the equipment and stuff, sort of a live model 
that can help make up their casework. There’s a lot of that kind of stuff, so we can track 
energy, and model, we have a lot of different. It takes so much time to get the work and do the 
work.

R: It’s difficult to make the time - like when you opened the firm. You’ve gotta get the job done.

I: Right, you’ve got to produce the work in a small window of time, within the fees, right, That’s 
what clients care about.

R: I think I’m not going to find the answer immediately, its like the AIA, we’ve got to make 
some decisions before it gets away from us.

I: But we have people hat are using rhino, and tons of people using SketchUp, and we have 
people drawing by hand, and everything. Depending on who get’s assigned - we as a firm are 
100 percent Revit, we don’t do anything in CAD, but we definably have different schools of 
thought on the skills set of the team that you sort of get. There’s still a lot of debate about do 
we use Revit or do we not use Revit, there’s still debate.

R: That seems consistent, across, everyone, even smaller firms that have made the decision to 
moves to Revit, its still easier to do it in many different ways.

I: Exactly. Unless you’re really, really, mentally able to dumb Revit down in your brain and not 
prompt you for so much minutia early on, you have to be willing not to fall into that trap. - Let 
me just draw a line for now. But I think it’s also people, its harder to study a bunch of 
alternatives when you’re entering a bunch of data in the box.

R: I’ve actually experienced, if students get into too early, or get into learning how to use 
technology, before they’ve learned foundation skills, they get into this and you pull out, and 
there’s nothing here, it’s just crap.
I: Right.
R: But it’s done really well.
I: It’s funny, I was in Alaska one time, and the CEO was in the meeting, and he noticed, the collective group was sort of advancing a particular approach or idea, too far before, and his quote was, let’s make sure we do the right thing, and then we’ll do the thing right. Which I thought was brilliant, everyone was mired in we might not have enough money to this, and budget, and schedule. An he’s like, let’s make sure, let’s do the right thing first, and then we’ll figure out how to go do it. Which was great, that he noticed, that the group had gone off the track, and was worried about the wrong stuff at the wrong time.
R: Well I’ve actually, wanted to ask, the idea, that when you’re sketching, you’re really problem solving, which one is going to be the right one. It’s problem solving, and problem analysis.
I: Yeah, it’s linear.
R: Here’s your solution, now let’s make sure this is right, instead of […] let’s do this, and then spit it out.
I: Yeah, that’s exactly what it is.
R: Now I’ve just got to prove it.
I: Right, prove it.
R: It’s a struggle, it’s interesting, maybe it just needs to be […]
R: I think that’s what it is, we’re trying to do exactly that. When we sit down and start project, we talk out loud, about what tools are we going to use, for what purpose, for what milestone. I can’t tell you how many times, someone got it in Revit, we’re early SD, pushing all bathroom stalls eight hundred different ways, laying out the toilet rooms. I don’t need to know where all the toilet partitions are right now. We’ll get to it. ((Laugher)) for some people that’s their comfort zone. We’re in document mode. Sometimes they’ll get it.
R: I think for people it’s the function of their level of competence. I’m good at this.
Supplemental Materials A8. 3141 Interview Summary

1. Started in practice when drawings were done ink on mylar, then moved to pin bar.
2. Feels that when projects moved in to CAD, and design was forced to think in layers, that
   a major transition occurred in thinking. People learned more 3D when sketching and
   visualizing in drawing. Breaking up the design into flat pieces has forced people to
   stop thinking in 3D. Now we’re trying to think in 3D again through Revit.
3. We rely on old expertise for QA and QC.
4. Architects are different in design after they’ve done CM. Once you see it being built, you
   understand every line on paper.
5. Scope and scale are undecipherable from drawing and representation. [virtual models
   cannot convey the same sense as reality]
6. ((Her son graduated from XXX, where the program is equal parts drawing and
   construction. The way that the curriculum there is structured, had Revit proficiency by
   the time he graduated.))
7. No matter the technology [ability] you still have to build it.
8. What skills do students need to start with? They have to realize you can’t be good until
   they are older. You have to experience [it].
9. Coming out of school - there is a conflict - between studio and the office - what it will
   be like. (The comprehensive studio project, and critiques, versus coming out and
   having to learn.) A humble attitude is the first step.
10. There are often to tracks that emerge. Design architects and technical architects. Those
    that are proficient in graphics and design, work with senior architects.
11. The challenge is that those with wisdom and experience have to rely on those with the
    tool ability to make this [architecture] happen.
12. Technology goes beyond the design software to management software, accounting
    software, etc.
13. Design professionals ask for equal competence, adaptive and efficient. ((Interviewer
    explains the idea of expertise as viewed through cognitive theory.)) You can’t let one
    of over the other.
There is a lot of tension between design and technical architects. A good manager is difficult to find. XXX worked in small offices of 15-30 people. Design is (harder) with technology. Comment on construction - [she] has not yet worked with a GC that is truly [integrated] - like XXX. [She is on a project where the] PE is building the building in SketchUp. He gives [the model] to the guys in the field. [While it’s good to have a stalled project back in process, it’s odd] to go to the site and we sit and look at his computer, not going to look at the construction. He’s just like a student, enamored with the SketchUp model. [She] sees it with students in the studio – they are captivated with the imagery. [But] they don’t know what they see. The best teachers don’t have the [technological] tools. They have experience and technical knowledge. Perhaps students need to start tracking as a young age. Will Revit eventually become like MS office, where everybody knows it and uses it? If that happens, will college then go back to theory? Are there schools that aren’t fighting that? Architecture is stepping back from using the technology because of a fear of liability. The GC becomes like a student in class, they make the model, the owner looks at it, and says they’ve built it. Clients can take software, then say, I’ve designed it. Construction and participation as an intern – what do you need out of school to do that. [She asks if I will be looking at this topic from] a gender perspective. Studios seem to be half/half, but the field is not the same. It’s closer to 10% female. Do women choose not to invest in technology and construction?
Supplemental Material A9. 3151 and 3152 Interview Summary

1 I1: Reimagining architecture. – Autodesk, Phil Bernstein. Possibly another book on technology in education. ((you should look it up. It might help in your research.))
2 R1 and I2: Technology currently used in office:
3 Revit
4 AutoCAD - rarely
5 I1: [The specific] Use is driven by consultants – to some degree. Survey information usually arrives in AutoCAD format. Manufacturer details are slow to catch up. Their blocks aren’t on Revit – some are producing neutron [?] files for use in house – for a 3d rendering. The blocks are smart enough to build it in, width to drop ratio – rare, but won’t allow you to use if it is too small for the space.
6 I2: SketchUp was used as recently as two years ago, don’t you remember when it came out 8 years ago. Building more from Revit more often.
7 I1: Autodesk has a strangle hold on things. Have made it difficult for 3rd party renders to do anything – no plugins for Revit. They have done - Maxwell for Revit. Revit, Maxwell – are the cumulative effect of changes.
8 I2: There are some users of rhino, 8 interns. A lot of time [software] use is directed by what the students are coming in with. Someone has a new idea, just learned in school – we let them run with it. True with rhino. Doesn’t rhino drive our 3d printer?
9 I1: Have always had a laser cutter. It has, I haven’t used rhino much. You can unfold things, there are some attributes that make it, like you say, more capable. There are some individuals that can model things very accurately. It has a lot more applicability that SketchUp. Much more worked out, even if you take it as far you can.
10 R: Rhino or SolidWorks?
11 I1: I have looked at SolidWorks vs. inventor, in terms of Revit to fabrication. That’s our mainstay. It would be an interesting exercise to see how that would be. Seems like that the industry will go that direction. Certainly headed that way for IDP.
12 R: Training?
13 I2: both in terms of hiring staff and interns,
Intern – 0-3 yrs. More flexible, decent amount of graphics, make sure it’s strong, we really like to see Revit. Functioning on that level would be great, it allows them to interface with the model. Capable on their own. Even coming from another office, we would still need to train [a candidate] in office standards. For full time it is becoming required to have Revit experience. [We] Evaluate each individual for strengths.

R1 and I2: Design and technical architects are the same thing [at XXX]. That is the strength of firm. Don’t; think anyone in the firm had Revit experience when we started using it. Some have been forced [to learn it], some have tried [to learn it].

I1: It takes a lot of time to be facile. You have to have an understanding of construction to use Revit. It has been an issue. Ideal scenario would be - We had an in-house education plan, [using] a legacy project to train [staff]. That’s quite time consuming and waiting till you have enough people to have a class – we will probably try to pick up people with experience, and focus no standards. We will use Lynda.com and online type training. Ideal scenario, teams of 2-4, sometime bigger, and they will be put with a seasoned user who could mentor them. Challenge is to find seasoned users.

R: Other than technology, what skills do you value?

I2: Looking for people to solve the problem, a design sense. Good presentation skills, abilities, a wide range of skills – full gamut – this person can actually draw. You want a depth in their work, so we can put them on any task that we would need to. Hand drawings, building models, computer models – careers (strong) people should be as agile as possible. We will also bring them up to speed in the anything we need to. We don’t have formulas in our projects. We know who ever we have, and their specific skills to complement.

I1: The first impression is what they send us. The production is amazing, with the production that is available – exquisite books, boxes. A general team player is essential. You don’t see that team [dynamic] in college. Can do attitude. A sense of humor. There are absolute requirements in terms of technology. You can see that [proficiency] in what they send [to us].

I2: [I look to see [that they identify what they did in a project. You can sniff out exaggeration.
R: Do see that the representation is more developed than the design?
I2: Change in the last few years - huge advancement in presentation ability, ability to make things look believable. That comes across more in interviews - do you know how to put this together? There has been such emphasis on presentation, [it needs to reign back because what is being done actually needs to be produced.]
I2: Just in being in student reviews – I was encouraging them to work on presentation.
   Now there’s almost an over focus – give me a section of what that meant, diagraming, how did you get there. [Show] the full range of the project development – don’t focus on the technology. There needs to be a base level of the understanding of these things.
   Last two weeks of a school quarter– different work flow,[now with technology instead of analogue methods].
I2: Design process – varies per project Seeing it go from diazo to now, the design process has not changed, just how we interact with the technologies.
I1: You can test things more quickly – building a physical model because of a presentation -[the shop manager said] you refit guys we never see you anymore.
I1: Physical models – [the impact] is so immediate - renderings leave room for interpretation – We don’t do as many [models] – I think there is a different way that we do things now – because we can do them now.
I2: It took a long time for the firm to become comfortable with ultra realistic renderings. [When representation is] Too realistic upfront, [it’s] too dangerous – process we go through, same thing with cad, hand drawings had to be done early in the project, because clients would be scared because it was “done” and the weren’t done making decisions yet.
I1: Trying to find ways to make rendered image more vague and hazy. [Those that sketch], They don’t use computers for their work tools. Others who still do them, present that way.
I1: You first sketch in pencil, then want to test in computer. It’s a back and forth.
I2: I think one of the most interesting thing about this transition is the way that you thing about buildings and the training of your architects will be indefinable in a while - we were trained to think in sections and details, it was a different way of developing a project- more incremental in the growth – to look at it as a model, then responsible for
doing this. Instead of 2D, it is imagining it as a model, rather than in section and in parts. I think its going to change the industry in the way that buildings are conceived.

I1: It’s inevitable the industry will think differently – I’ve never taken a step back to think about how my traditional training influences my 3d -

Contractors – some have not seen the value [of BIM] – seems impossible that thy haven’t taken it up.

I1: A good case in point – the 3d printing – there is a whole process to ready a digital model for printing on the laser cutter. Taking a step back to the question in the process – take a project from conception – a couple of years ago it would be SketchUp – Revit is too specific – but as people become more facile, people have become better at it.

I2: I’m realizing the value and quickness of things that I thought would take too long. Its kind of amazing what you can do with it when you are really good. It’s like you have to add in a whole nother year, to demand them to learn these things and to know the design. You don’t’ want to hamper their learning with too much technical detail – Teaching them the technology - we still try go teach them to be good architects first.

If you have no presentation skills, no one can se their brilliance. I imagine that’s the currency of bring a student –

I1: Even before you could tell the difference. A good presenter or a bad architect.

I1: The interface is everything - perhaps we’ll have drawing boards [again]. It takes time.
Supplemental Material B1. Classroom Observation 1

((Instructor enters class, students select seats as possible. Class is full – they look for seats that will allow them to see the dual screens at the front of the room. Some chatter. ))

((Instructor introduces himself, asks them all to take an online quiz that will tell him what their tech proficiency is.))

Teacher: Get off Facebook, and hop online to catalyst.

Student 1: I can’t get to the page? It says Internet Explorer cannot load the page?

T: Then you can sit quietly and put your head down. You got lucky.

Student 2: I just tried Facebook and it doesn’t work. I tried msn and it doesn’t work.

T: Are you registered for the class?

S2: Yes.

Student 3: It doesn’t work for me either.

T: Tell you what, how many of you can get to the quiz? Most of the class raises their hands.

How many of you are finished? ((Most of the class raises their hands.))

Student 4: What?!

T: I told you it was easy.

Instructor counts the hands up. T: It helps me figure out how to run this class.

T: No one asked me what Rhino is, that’s good. I don’t like this stat. 47% didn’t like it and went back to SketchUp.

T: Laser cutter questions...What is a laser cutter – good – honesty is important. All right, who fell asleep during the training that Jeff gave? Be honest.

T: Thirty-four percent not familiar with renderings. 1 ringer. I am confident and I know what I’m doing. I wouldn’t do that either.

T: All right, cool, guess what were going to learn this quarter? This stuff.

T: This class seems to be taught differently every time it’s taught. Some of you might remember I came to your classes at your review, and I think I can help you at this particular junction in your careers.

T: Basically we’re going to dive into Rhino. Who’s excited? One student raises a hand. All right, one person is excited.
T: What we’re going to do, we’re going to build one fairly small project and create renderings with it, then we are going to take that and make physical objects. Hopefully by the end of the class you will be able to use Rhino to inform your design and use it for your work. ((He passes out a number of 3D printed objects.)) Take a look at these, pass them around and hand them back at the end.

T: Does anybody recognize this? ((Instructor holds up a San Carlo model.)) Who took 350? Excuse me, 351? ((The class doesn’t seem to really remember.)) Instructor tells them.

Students: Ohhhhh. ((Teacher explains that it is a 3D print of a model. The rest of the items are also 3D prints.))

((Instructor takes attendance. He calls out the students’ names one by one, they correct him to what they would prefer to be called.))

T: [Student1], weren’t you in my 210 class like a long time ago? The class laughs, ((seems like an inside joke, perhaps because of how long it’s been.))

T: [Student2]?

S: [Student2].

T: Nice. [Student3]?

S: I go by [Student3]

((He asks if he pronounces names right one by one.)) T: Who did I not call? ((Two people speak up.)) T: Only two need to add this class?

T: Let’s talk about what this class will be. I didn’t print out a syllabus because I realize that no one reads them. I want you to jump on to a long term project.

T: Show up, participate, be helpful, help your neighbors. Anytime anyone is having trouble, email me, I generally get back quickly. I hang out in XXX, across the street in the basement.

How many of you remember where XXX’s office is? (2) Only one troublemaker got sent down? If you go past that, to the XXX. I don’t have office hours per se, but you can pound on the door and I’ll help you.

T: When do you have studio? ((Students say right before this.)) T: I am fully sympathetic to what you have subjected yourselves to, so I will work with what you have due in those classes. Do you know when your mid review is yet? If one of you, better yet all of you, will let me know when you have items due, I will fully support and work with you.
T: Who knows what NURBS mean? Who’s heard of NURBS? ((Hands go up of a few questions. Instructor continues to explain where fits Rhino and discusses how it came to be.))

T: Round curvy swoopy things that will allow creating these. (He indicates the images on the projection screen.) What we’re going to try to do is to take advantage of what it can do.

(He likens Rhino to a martini glass.) T: You’re at the bottom, just getting to learn, and then it opens up and goes left or right. ((He gestures with his hands)) Rhino is like that. You can go to the left, and do fabrication; you can go right and do design. Then you can use all the things inside. Through the quarter, you’ll do that.

T: The playground. I’d like you to experiment with all the shapes. Build slides, bike racks, (.) I’m not too concerned with design. I’d like to see you experiment with the tools. In your class last quarter I saw some really impressive work.

((He continues to read out the requirements for the playground assignments. He asks them to think about modularity.))

T: Does that sound good? ((A few students nod.))

6:56

T: How many of you guys built those models? You all built that model last quarter. How many of you used an x-acto knife? I’m old school, I like to do things by hand, analogue fashion, but laser cutters make life really easy. I’d like to give you that as soon as possible.

T: It doesn’t matter to me what the model is made of, I just want you to do a good job.

The last part of the project is a cool box. ((He gives an example of a conversation with a model builder and the story of putting a cool model into a wood box. He goes to the front of the desk and starts acting out the story – students laugh as he “shuts” the box and describes the importance of presenting the model well.))

T: Think about when you go to a critique, (.) you’re not ready, it doesn’t look so good. When you have everything ready, you go in and can do a great presentation. We’re going to do that with what?

Students: Rhino.

T: Any questions? ((Silence.)) T: Not a one.

This is a 3 hour class. Studies show that no one can go longer than 45 minutes. Now lets’ do a little test.

I would like you guys using version 5 because the rendering engine on it is completely different.

Go ahead and open version 5, I’m gonna have you guys try a little something.
((Students stretch, some are talking, looking around, as they do that and wait. Instructor opens an email on the screen. He brings up an image of chairs.))

((The back row is chatty – low voices, can’t hear what they are saying. Low murmur around. ))

T: You guys will find out about me, I really, really like chairs. These are not my favorite or my least favorite I just googled chairs to see what comes up. Why don’t you pick one and try and make it in Rhino. ((The class erupts in laughter.)) Who knows which one is the Verner Panton chair? ((No one knows which one it is.)) Who can make the swoopy red one? ((The class comes down until they choose the easiest ones in the corner of the image. They all laugh.)) T: Which one would you like me to show you how to make? S: the red one. ((The whole class laughs. It looks like the most complex chair in the image.))

T: Let me back up. Who can’t open rhino? Okay, why don’t we try something simple?

Let’s go back. Has everyone opened Rhino? How about I give you an overview of Rhino? How many of you haven’t touched it since […] . (inaudible)

T: What is Rhino(.) What should we use it for? What are these windows? Viewports, right.

((He shows the tabs at the bottom and how quickly a user can see the top/front/right/perspective views. Someone sounds like they think its cool.))

T: Here’s the most important thing you will learn from me today. ((He shows them the help button.)) I want you to click on that. It gives you a command help. What ever you’re trying to do, it will tell you how to do it.

T: There’s basically three ways you can tell Rhino how to do something: icons, command line, menu at the top of the page.

T: Let’s jump onto perspective, draw a box, circle, a tube…whose looks like that?

T: How many of you like models that look like that, just line. Does anyone know what that’s called? A few say wireframe. Right. No go to the views – I like ghosted.

T: Does everyone know how to navigate (. ) orbit. ((He shows them on screen.))

T: Anyone know what a control point curve is? No? You click this, you get these points, you hit enter. Now select, and hit F10. Tell me what happens. You get these dots. These are control points. You can click on it, it highlights it, you can then change the curve with that.

T: Do a selection window around everything, let’s just delete everything,

T: What’s the long-term assignment? ((They say playground.)) What’s in a playground? A slide. Let’s draw a slide.
T: Let’s do line, you type in 0, it will start the line at origin. Go down to the bottom ad select “Osnap”. Does everyone know what snaps are? ((Student answers.)) That’s right. I want you to go ortho – what does that do? Right. It makes you go in straight lines. Where it says end of line, I want you go to 10, 0.

T: All right. So you should have (. ) this. I want you go down here, where it says smart track, make sure that’s on. I want you to go to the control point curve, click on that. Go to the very bottom, and I want you to click “end”. Go to smart track, click on it so it’s bold.

S: I don’t have that end on the bottom.

T: If you don’t have that, click on ortho, it should how up. Everyone, please help your neighbors out. There’s many of you and one of me.

((He continues to demonstrate on the screen, then asks if everyone’s looks like his. A question comes up. )) S: My line just disappears. T: your line just disappears? That’s a pickle. ((He walks to the student’s desk to investigate the issue. Some students talk, others, are still looking and working.))

T: So if you click on it and it disappears, hit enter. When you get confused, read the command line, it will tell you what to do.

T: Do most of you have the lines? ((Someone says no.)) T: You two don’t? Then watch him.

((He indicates the student near the front he is talking to. )) T: See how this line won’t do what I want? Why is it doing that? S: Ortho. T: right. If I click it off, then I can move anywhere around. Goa ahead and hit F11, and that turns off the control points. Now go to perspective view. Now we’re going to use my favorite command, extrude. ((He describes what to do.)) T: Right up here, where it says distance/direction. See where it says both sides? Does it say no? Click it. Ooohh, ahhh. It’s like the fourth of July! The extruded line now extends both ways. ((He asks what a good length of slide would be good – he does one at 55’.) ) T: What can I do to undo? S: Control Z. T: Now if I wanted to do it again what do I do next? S: space bar, right click.

T: Now click on the menu (. ) yes layers, just like SketchUp. What do these do they make our lives easier. Who can tell me what layer I’m on?

SS: default.
T: How do you know that?
SS: Check mark.
T: How do I change that?
SS: Double click.
T: What color is my next line going to be?
SS: Red.
((Instructor continues to describe commands, and what to do. Every time he does something, he describes what it will do. Then he uses a piece of paper to expels how control points work – how it keeps things from moving like an anchor. He demonstrates creating the swoopy slide along the extruded curve. ))
T: Go back to perspective. How do I zoom in on this? This is zoom extents. Does everyone have something that looks like this? That might not make a good slide. I want you to type in project. I am going to see what it tells me. I going to select the red line, select, then the surfaces, and I’m going to select the wall, I hit enter, something happens. Jump back into perspective… You should have two lines. Does everyone have something like that? Does anyone not have something like that? S: I don’t have something like that.
T: What I like is honesty. ((Instructor goes to the student’s desk to help.. The other students talk to each other, some are actually working on the exercise, asking questions, others are checking their phones, one gets up and tries to leave the room.))
T: Wait don’t go yet! I’m kidding, it’s about time for a break. If you’re having difficulty, stay and I can help you with your slide.
7:39
((About 11 students remain in the class. Only a couple are actually still working on the software.))
7:49
T: Start up again – let’s get back to our slide. ((He asks them to make another layer, “keepers” to hide the things that don’t need to be seen. )) What do you think the command is to undo hide?
SS: Show.
T: You guys are good. I’ve tried to unhide. Whey you need to “untrim” later you’ll get it.
You just asked, what just happened? Does anyone not have a single piece of spaghetti floating in the air? Anyone? Back row okay? Befuddled? ((Class seems to be okay.))
T: Now go to polyline…How wide do you think a slide is?
S1: 15.
T: Inches? Yeah, wild waves. ((The class snickers.))
S2: Three feet?
T: I want you guys to enter one foot.
I want you to draw something like that about a foot wide. I’m hoping that what we do tonight is
not your final slide, but we are walking through the process.
T: Yes?
S: I’m kind of lost.
T: Okay, I’m coming back. ((The chatter starts up again as the instructor goes to the student to
help him catch up. The students in front of me are redoing the last sets of commands. ))
S1: Pick the light bulb. Yeah. Now, pick that. It’s this one here. ((There are some pointing to
their screens. As the instructor goes back, someone asks him a question. ))
T: That’s such a good question we’re going to share it with the class. ((Laughter.))
T: Continue to talk amongst yourselves, Help your neighbor.
So if you click on setting you can see what you did – if you click one thing, you can hide
everything.
((The students in front row, two others, are talking.))
S1: Why did he show us that?
S2: That’s kind of cool.
T: It’s almost slide time. ((Instructor returns to the front.)) What you’ve done is draw half the
slide, you’ll want to mirror it perfectly for the other side. Any idea [SS: Mirror. ((Instructor
reads off the command line and what the next steps are.))
T: You should have something that looks like that. You notice that you can click on one, the
other, but not both. I want a crossing window – anyone not know what a crossing window is?
((Everyone knows, but he describes and demonstrates anyway.))
T: Get both of those highlighted, click join. Everybody have that? Nice.
I want you to go into your perspective, see everything you drew as well as your curve. I want
you to type in orient…orient on curve. Select objects to orient – we want to take this part of
our slide, and stick it on our slide and then get this to follow. ((He describes this clicking,
entering, points, and reads the command line.))
((In front of me, one student helps the other to catch up.))

T: Who is having trouble with this? ((Some are, not all.)) That’s impressive. Who got it right?

Then help your neighbors. I will come around.

((One student moves from his seat and goes to help another. The student in front of me that was helping the other to his right is now helping the one to his left again. It seems that along most tables, one student works the software and the neighbor points out what they should be doing. Then they switch.))

((Another student who finished his slide, moves his seat across the aisle to help the other.)) S1: Ohhhhh, awesome.

((In the back, another student is standing and watching another as he works.))

((Laughter – many are done.))

T: Anybody else befuddled? S1: Right here!

((Some students that are done go back to their phones – ones that don’t seem to know their neighbors. Much of the class seems to know each other – possibly because of the studio class that is scheduled previous to this one.))

T: Okay, we’re moving on. This is the part where eight percent of you go, dude, and the other go what?!! Type, sweep 1 rail. Click one, do not touch anything. ((It sounds like a student has a problem. )) Someone touched something. ((Class laughs.))

T: Okay, who has a complete train wreck on their screen? Okay, quick show of hands, who has something that looks like a slide? Who has a train wreck? Help your neighbors! ((The class is louder – they’re helping))

S1: got it.

S2: hit enter.

S3: It’s like a free fall.

S4: I’m gonna do a tube slide.

S5: You could put a sphere in it and get it to turn.

S6: It’s not a slide, it’s like a mattress.

S7: You should be able to put a solid in it.

T: Oh we’re doing two curves. It tells us to select the object, base point is the one in the middle, up there where it says perpendicular.

S: I don’t know where that line is coming from - umm.
T: When you did your curve did you make that thing? How about a spiral one? You’re killing me smalls.

T: Surprisingly nice slides. S: A spiral slide. T: I want you to click the top, you should get a menu like that – if you can’t find it, I don’t know where I put it? Type in select – curve, click that, you get two curves. Move them out of the way.

T: Type in helix – they’re making a spiral slide. It’s not working for me.

8:20

((About half of the students are taking notes as well as working alongside.))

T: If I don’t like the size of this how can I change it? Anyone know what I would do?

SS: Scale.

((Instructor starts to demonstrate changing scale.)) T: If I do this right, you’ll know. Okay, how do I change that? ((No one answers. They’re working on each of theirs.)) Then I do sweep one, we got another one.

T: Anyone befuddled? ((He steps back out to the desks to help. It’s quiet. Most students are still working on the spiral stair.))

S1: Oh it’s sideways.

S2: What if I want to repeat it?

S1: Yeah.

S2: How do you do it? Like orient?

S1: Yep. It’s cause it started drawing on that.

S2: What is that?

S1: Try to get it to the top, see what happens.

((Most students seem to be waiting, with their screens open – little talking.))

8:28

Instructor walks around and looks at different students’ work.

T: You should render that.

T: Save that, it will make you famous someday.


T: What else would one find at a playground? Syringes. ((Laughter.)) Sandboxes? You can make a sandbox. A swing? Could you make a swing?

S: How detailed do you want us to be? Do you want rivets?
T: NO!

T: Two things I want you to remember from this class:

T: First thing. Lots of polygons take a long time to model. Like a chain link fence with every last detail will take a long time to render. I do most of my rendering during football season.

More polygons means a very expensive model in terms of processing. Make the most efficient model you can make for visualization.

T: Second thing. Fabrication does not mean just pushing a button.

T: Third thing. [There are infinite ways to make things.]

T: Back to my first question …what else do we find in a playground? A ladder? A spinning wheel?

S: What’s a spinning wheel?

T: Like a carousel. Let’s make a spinning wheel.

T: Draw a point, then a circle. Anyone know how to make this into something? Extrude?

T: Planar? How big should our spinning wheel be? Three feet, good! ((Instructor answers his own question. Laughter. He finishes making the disk.))

T: What else do we need?

S: Rails?

T: Yes! Rails, this is very dangerous without rails. It is going to end up on tosh.0 if we don’t add rails. ((Laughter.)) How tall do you think these are?

S: Two feet?

T: I’m going to go thirty inches.

T: I’ve got something that looks like this. Do you have something that looks like that? Do you have 1 or 2 lines? If you do, I want you to do a crossing window and explode. I want you to hit the outside and then click join. How’s it going, Vincent? You getting it done? How does this look – is it safe? Nope. How about this sharp edge? Would you put your kids on it?

How do we smooth that out?

S1: Fillet? S2: Fillet? T: Yes, fillet? Now if I hadn’t been an idiot and joined those, that would have worked. Get back in there and blow those bad boys up and fillet again. Mine looks a little small, so I’m going to make my radius bigger. Everyone have something that looks nice and round?
((Students are still working – looking at their models, trying things out. Others are starting to chat.))

S: I’m thinking about partitioning my hard drive.

((Some are checking email, there’s talking, stretching, phones – texting. The middle row where the instructor is are all working. One student in the back has his feet up on the desk, is drawing in a sketchbook.))

T: You’ve done the next step – put your head down on the desk. What’s your name? ((Everyone laughs.)) What did you do?

S: I swept a circle.

T: That’s a long way to do that. I am always finding there is more than one way to do it. I take lots of classes and I find there is a command to do what I’ve been doing the long way.

T: What’s the thing made of that they’re holding? A rail? A pipe. Type in pipe. Click once. ((Everyone in the back row is laughing, one of the students did something that turned out unexpectedly.)) Just make the radius the same on both ends. Everybody have that? Now we need more of those. Anyone know how to do that? S: Array? T: Yes, nice!

T: Everyone type in array. How about array polar? I don’t think 2 is enough. 8?

((Students seem to be working to master the spinning wheel.))

S: I believe they’re called merry-go-rounds.

S: 360 degrees ((More stretching, movement, appear restless.))

T: We can just use the same commands on other things, the tube thing, hamster wheel thing for children ((Laughter.)) You know what I mean. Can I explain what I’m doing? I just drew some lines and fillet. Sometimes it doesn’t work – we call that most times.

T: Take the next 20 minutes, experiment, ask me for help, I believe there’s homework on the catalyst site. ((He opens the web page. )) There it is, right there. I’m giving you guys something to start with. Take the site plan, start to create a few elements. I’m not sure what the deliverables are, but I want a model and some jpegs, we’ll talk about it.

T: You guys feeling pretty confident with this? Isn’t this more fun than drawing squares? Or not? All right, have it. Any questions? No? I set you guys free and you have no questions.

((A few students get started, checking the course website for the files, downloading to complete. Others are talking, trying out. Instructor and student are talking at the front, he’s trying to add the class. They agree, he returns to his seat.))
T: Oh, is that it? I wonder. Someone has a question. How would I make two exactly the same shape? Good question.

9:11

T: Whoa Nellie! That’s awesome.

T: That’s one way to do it.

S1: How would I tell it to pipe the two – is that a Boolean command?

S2: What?

S3: Its like you take an object…

((Interestingly, the whole class stays in the classroom – 10 minutes left and on their own. The instructor is still helping students. ))

S4: What were you trying to move?

S5: Fancy park?

S6: She’s making a waterslide.

S7: Fillet

S1: Oh here it is, Boolean.

S8: Have you heard of the gravitron? That’s what they call it – its like a big one of these, it starts spinning, you can walk up the wall. S9: is it dangerous? S8: The force is so strong just pulling your head up. S9: that sounds awful. S8: After a while you just start feeling sick.

((Loud laughter from the middle row.))

S10: I’m electric.

S11: I’m gonna make it like, kinda like a pipe, so they swing, like an octagon – make a pipe out of it, then twist it – how would you twist it? Is there like a twist?

S12: God! You’re like ruining it.

S11: Is that like twist axis? Yeah…oh! Oh wait. It won’t work for the z axis. You can go to front view and try to pull it up – it should work. Oh, it snapped to the end.

S13: That’s it right? Going home. ((A student gets up and shuts down his computer, another puts on his jacket. Computers are logged off.))

((Instructor is in back row, helping out a student. The others leave the room one by one. Lots of shuffling, talking. ))

9:21
S11: I really liked that spaceship he showed us. From one of my favorite shows. Really
detailed.

S12: Did somebody make that?
Supplemental Material B2. Classroom Observation 2

1 ((I’m late – traffic means I’ve walked in 45 minutes late))
2 7:17
3 ((Students have moved around in their seats in the room from last week. The room is still
4 full – I don’t see any empty computers. ))
5 T: While you guys open rhino, do you remember the two slash three things I told you to
6 remember about the class?
7 S: Just to make things simple?
8 T: Just that polygons are expensive. And the second that …(missed)
9 A few things I forgot to tell you last week – save your work? There is an autosave, but
10 save as often or unoften as you like. You can pretty much control z as far back as you
11 need to. Even if you have saved it, you can still go back up until you opened it. You
12 can go back pass where you save which is pretty nice.
13 I want you to go over here to this thing that looks like a piece of pie, where layers are. I
14 think I covered this last week, but I can’t tell you how many times I said I wouldn’t
15 need a curve and then needed it later. Take all of your curves and put it on that saved
16 curves layer. Don’t do what Johnny does, do what Johnny don’t.
17 T: yes?
18 S: How do you get that tool bar if you open it and it’s missing?
19 T: This happened over here last week? ((Student nods.)) T: Close it an open it and hope
20 for the best. That pretty much takes care of it.
21
22 When I see a view I like, you can go up to here, in named views, and do a save as, call it
23 Mr. Bigglesworth because I watched Austin Powers last week ((laughter)), and when I
24 want to go back to it, I can go here, oh what was it called? I can go back to set view,
25 named views, select Mr. Bigglesworth and go back to that view.
26 Does that make sense? Yes?
27 S: Oh, nothing. T: just scratching your head? How many of you had trouble getting your
28 views…yeah yeah yeah?
29 S: How do I get my points to oh, point click? Oh, never mind…
T: Okay, who had trouble getting your views out to me? Because I didn’t show you how
to do it? How did you do it?
S: Export selected? T: Like in Sketch up?
T: You can screen capture file, then you can save it to any file you want. Then you can
go right here to the desktop and get it. I apologize because I should have done that last
week.
How you guys doing? Do you need a break? ((No answer from class. Student on right
says no…. under her breath.)) T: You guys are ready to roll. All right, we’ll go for a
bit and then stop. What?
S: I lost my tool bar. ((Teacher goes to front to help. Another student’s phone goes off,
he gets it out to turn it off.)) T: That was very unprofessional. ((Class laughs)) That
was Wussie, singing Wrist rocket, in case anybody was wondering…
((Teacher continues helping the student up front.)) T: Ah. You must restart it, now
you’re good.
T: So how many of you work a little or just get a control point curve and mess around
with it? S: Answer two. T: See this is an easy class.
T: I want you to go over here and make a sphere, click more or less at 0,0. Can you see
where my cursor is? I want you to not leave it where mine is, say, 2,0, but go over here.
S: How big?
T: We’re just learning a process, don’t worry about the size. Then make another one, say
about this big, and move it over here.
Does everyone have something more or less like that? Jump to out of your perspective
view, make sure you have soothing more or less like that? Then go back to your
perspective. I want you to type rebuild. See how mine says 10 and 10? I want you to
type 8 and 8.
We’re gonna make a rubber duck. Who made the duck with springs on it? ((something
unintelligible. Laugher from a student in front.) I want you to turn on control points,
who knows how to do that? S: F10? T: Yes. That turns on your control points.
We’re going to take this sphere and flatten the bottom so it can sit. I want you to type in
set point.
S: What is it?
T: S-E-T-P-T. This sets your control points, were going to uncheck x and y. If you ever forget where your axis is, you can go down here to the right...

((Student requests help up front, teacher goes to help, students start talking to each other – seem restless.))

T: Then you can move this like that. ((He demonstrates moving the bottom up and down.)) Everybody have something that looked like this? ((waits about 2 seconds.)) Yeah, sweet. Now everybody turn their control points back on ((a few have it, not all)) I’m going to turn one of the lights down.

Now what I’m going to do is I’m going to grab – and you have to use a crossing window, since there are a lot of points behind it – and I’m going to grab this control point, and give my duck a tail. Did you ever see Hell Raiser? This point is like a pin in his head, and I can pull it out and make this. Then you can look at the perspective, my duck is starting to look good. Does everybody have something like this? Yeah? Great.

S: ((something unintelligible.))
T: You’re having trouble? Good. ((He goes to help him out. A few students have it complete, some are trying other things. A few don’t’ have it at all. Along each row, students are helping each other, some have it completed or look bored. ))

T: You guys have some good lucking ducks.(( goes to the back row to help another student. )) Now do a crossing window, now you’ve got the one...Now, these are some good looking ducks.

Okay, our ducks need a head, so turn on the control points, I’m gonna give my duck a beak. Since I don’t exactly like where the control points are, I’m gonna rotate it, so rotate, and I’m gonna turn on my control points again, that’s a little better. So I’m going to do this, take this, pull that out, give the duck a beak, oh that’s too much. And I got a duck.

S: How do you select the center, to rotate?
T: How do you select the rotation?
S: Well, how do you select the center?
T: Well, I sort of just guessed.
S: Can you add in more control points?

T: You know when we set setpt? We set the number of control points. We can add more. He draws a sphere. This one has 8, we can do less, it has more effect. If we add in more, like 20, it has a different effect. More control points means more polygons. If you were going to be an industrial designer, you want less points. Good question though. All right. How’s everybody doing? ((No pause, no answer.)) Okay, I want you to draw a control point curve, kind of like I’m drawing on the object itself, I’m gonna have you do it on another layer, like a beak.

T: Yes?

S: how do you turn the control points off?

T: F11.

S: What kind of curve?

T: A control point curve.

Now I might want to change colors later, Anybody know what the command is to split an object? SS: Split.

T: YEAH! Split. It doesn’t matter if the curve is on the object, as long as I select it, and then if the Rhino gods are with me, don’t laugh, there are rhino gods, I have two separate objects.

Why don’t you guys take a break, take 8 minutes, don’t take 10.

((Students get up, lots of shuffling, they are talking about other things and not the class or the project. Student exists the classroom, says, what the fuck? One students says quack, quack – another student looks back, laughs at him. Instructor walks around and helps out the students that have questions. ))

7:55.

((Students trickle in. Ducks are in various stage of completion, already set up in different colors.))

T: All right you guys, duck is almost done some of you have asked about getting surfaces to connect. I want you to draw a line, I want to be sure you use the same line for what we’re about to do. I want you to draw it so it goes across like that, then I want you to copy that – how do you copy?

S: copy.
T: Now we’re going to split, go ahead and type enter, the top one we are gonna split, select that line, then hit enter… etc, etc. and you should be able to delete the upper parts. You should have something that looks like that. Then you want to delete both those lines. Now I want to blend these two surfaces together? Blend? See how I do that? Type in blend, you’ll see the options, select blend surf. Now when you go like this, make sure you use select surface close together or your gonna end up with something that looks like a bow tie. Now all of you will have something that looks a little different, but see those arrows at the line? That’s the seam. Every blend has a seam. So back to that. I can use the control points to control the profile of the blend. I’m gonna go ahead and hit okay. ((Laughter from the students.)) Some of you screwed that up, I can tell.

T: Who’s having trouble? ((Hands go up. He leaves his desk and starts helping students. Most of the back row has a completed duck. Some are still trying to figure it out.))

S1: Join?

S2: I think I got it. For the most part.

T: It just looks like that because of the where the head was. ((He goes to the next students.)) Okay. Drag it, yeah, like that. ((Students in the middle row are talking to each other, huddled around the middle screen. ) )

T: I knew that would happen. No need to worry.

((Some intently looking at screen, talking to each other. ))

T: How’s It going guys? Having trouble? You guys are working in perspective you’re gonna have a very interesting neck. You’re not going to hear me say this often, but that is unacceptable. ((Laugher.)) Your duck is upside down… so rotate it…((Laugher from those behind her.)) T: They’re laughing with you. It’s all right. I’ll come back. Why am I coming back? ((He stays to help her.) You know why? Remember that seam? That’s why it’s like that.

((Two of the students in the back row discuss a movie.))

S1: What’s that bin laden film?

S2: I saw a part of that, I didn’t really like it.

((Teacher starts back up, asks about the different concepts.)) T: What were those?

S: Rebuild?
T: We had UV, but I didn’t tell you what that is, because I am a terrible teacher.  ((He draws on a piece of paper, shows xy on a flat surface.))  If you curve it, then these aren’t in a flat plane anymore.  UV gives us a way to determine where the points are.  And what is at each of those locations?  A control point.  What else did we learn?

SS: Blend.

T: Anything else?

SS: Split.

T: We’re gonna learn one more thing.  Make sure that your smart tracking is on, right down here at the bottom.  I want you to make a couple points.  Smart tracking is this – see these lines? Let me make one more point, we got this point here, so, if my smart tracker is on, then my point gets a white line when it’s in line with it.  I want you to go to your duck’s head, draw these points.  I want you to type in conic, and conic is a way to …that won’t work.  Lets try this instead.  Go to the arc command, open a flyout window, click those two diagonally, I want you to start dragging something so we have something that looks like a nice, semi arc.  Semi arc? That’s not a word. Does everyone have something that looks like that? Were going to make an eyeball out of it.

What should I do to make this an eyeball?  Rotate it or revolve it.  Try revolve, start on the axis at the top of the axis, bottom is the other, you should get – if we look at our perspective, something that looks like that.  Everyone have something that looks like that? Yup? Nope? Who has half a …

S: Could you do that again?

T:  Yeah.  How far would you like me to go back?

S: That’s good.

T: I’m gonna take this, ….and I have a little dome.  Everyone have a little dome?  So now….everybody caught up? Good.  I want you to select those two points we drew, and I want to set them at the z axis.  Does anyone remember how we did that?

S: Setpt?

T: Type in SETPT, and everything pretty much stays fixed , and I’m gonna move those points about a third of the way up and hit enter.  Now were going to use these points to orient the duck.
S: can you repeat that one more time?

T: Sure. ((He repeats the demo. A bunch of students are done, swinging in their chairs.))

T: Does everybody have their points about, yea? We’ll learn about coloring later.

Now this is a command I get wrong about fifty percent of the time, so I fully expect some of you to have trouble. I’m going to go down to orient, and I’m going to take this little ball, and smash it on to the face. Transform orient on surface, select object, we’ll select the eyeball, then we’ll select the other side, that is not the center, then the surface to orient on. And now I have an eyeball, stuck to my duck’s head – I can’t believe it’s working, I mean, it’s working just like it should.

S: Can you select it in that command?

T: yes, I can. If you discover that your eyeball doesn’t fit, you select the eyeball, type in scale, select the center, and you can scale the size. Because the duck is at the origin, I can select the eyeball, type in mirror, around the axis ((He has trouble with it – one more time – he gets the eye completed.)) Everybody have some eyes on their duck? ((Most of the class does not have the eye even on the ducks head. Lots of students rare trying to master the process. Teacher walks around the room to help. There is some laughers, some concentration, it just depends on where they are.))

8:24.

((Quiet discussion, most actually concentrating, on the lesson, lots of hands raise every time he moves on. Students have very specific questions for each of their models.))

T: Yeah, that’s what I’m talking about. I knew somebody would put forty eyes on their duck. ((He’s at the far end of the room now, front row.)) T: try it now.

((One student asks another what did the teacher say when the eyeballs upside down? Oh, I wasn’t listening - my eyeball’s upside down. Laughter in the middle row, where there are three girls sitting.))

T: Select the eye and then mirror it.

((The other student says to his friend across the aisle, select the eye and then mirror it.))

S: What does that do?

T: All right you guys, save your ducks, I’m gonna jump into something a little easier.

((He stops at the front row to answer a question on his way up to the front of the classroom.))
T: Well played you guys, good job. Okay, I chose this one because it has a lot of complicated stuff. The McNeel how to learn rhino has this at the back. If you took rhino training, this is about hour twenty, so you guys are way ahead. All right save your models, save your ducks, start a new model. I want you to draw a box, start your box at the origin, and I want you to draw something about like this. Who know what this is?

S: A cool box?

T: A cool box, check, done? If you want to know what this is, you basically type my favorite command, just type WHAT. It tells you its’ an extrusion, control points, … What do control points do? Select this, turn on the control points, what happened? There are more control points. It wont allow you to manipulate a polysurface, which is lots of things joined together. Type explode, and then you can manipulate separate things. Now undo. So you’re back to the polysurface. You can use extract, just to do separate ones. Select that one, that one, that one, type enter. Now if I select, I have three separate planes. Now just delete the others, and you should have a box with sides. Okay, hit F10, how many control pints do I have? One? Not enough. What do I do?

S1: setpt?

T: No.

S2: Rebuild?

T: yeah! I’m excited, we’ll do four, and four. Now use a cross window, and select those points, and we’re going to move these up so it makes a nice gentle curve. Does everybody have that? No? Okay, I’ll be right there. Can you guys see how this might be useful say, in a slide? ((Teacher goes to middle row to assist. Half the back row is working, a few others who have succeeded sit back, chat. Most appear to have had no problem with the commands or process. ))

T: How’s everybody doing? Easy? So, turn off your control points, F11. Now we’ve got these holes here, how do we close these?

S: Cap?

T: Did it work? All of you should say that. Why didn’t’ it work? Because we have one polysurface here, and one here. So join, and now try it. Did it work? Now we have one
big object, I want you to select that object, select any layer except the one that it’s on, and do copy to layer. You should have two of these you can move one over. Okay, do that again, copy the red one. Select the blue one, then turn off the red ones. When you’re working on a model, when you’re at a half way point, take all these flat planes and save it.

T: If we were to make this shape a candy bar, how would we improve that?
S: grooves.

T: Grooves, but that wasn’t what I was thinking, so we’re not going to do that. How many of you made playground furniture with hard edges? Ouch. We’re going to use a command, fillet, and select these edges…

T: I’m going to select the verticals, then show radius, and then type point five, and take a look at it, that looks too big, I’ll try point two, that looks better, hit enter, now it doesn’t look like a candy bar, it looks like soap. This is virtual, you can make it anything you want it to be.

T: Fillet is a command that only works on edges. You will bang your head against a wall trying to fillet a curve, it only works on edges. Does everybody have something like that?
S: Yes sir.

T: I want to try doing something that doesn’t work. Fillet using a radius bigger, and that shouldn’t work.

S: Whoa.

T: do you have something that looks kind of like spaghetti? How many of you have something that didn’t work. Learn from your neighbors’ mistakes. Now undo and try that again using a radius that is smaller. ((Teacher goes to other students to help them.))

8:48

((Hands in the air with questions. Movement, talking, experiments. ))

T: All right, good job you guys. Now, if I sad to you, you have this candy bar, and I said I wanted you to make a model of it. There’s a few things you could do. Anyone know what a developable surface is? A developable surface is one that you can lay flat. It is
made flat and then rolled, into a single curved surface. (He uses a piece of paper.))
This is a single curved surface, this is a double curved surface. See That?
T: You can unroll to get a flat surface. Turn off your blue layer, I want you to select your
surface, type unrollsurf, make sure it says explode. Woooo. Sweet.
T: Can I repeat that? Of course of course. (Students sound excited, see results of what
rhino can do as it takes a solid and turns it into a flat pattern.)
T: Listen to that! That is the sound of learning. Wait, wait, there is more learning afoot.
((Students snicker.))
T: Go ahead and select another one, and unrollsrf, when it says explode, then you get
something like that.
S: Wow….
T: See, a week ago you guys didn’t want to make models. Now you’re feeling really
good. That command again is unroll. Let’s add some ridges, what happened – error
message – may produce inaccurate results. Maybe you don’t care! You just want it to
work. And you get mad at it. What do you want to do?
S: Smash it.
T: What?
S: Smash it.
T: Type it in. Mine exploded, but it will work for you.
S1: What???? S2: Don’t hit that.
T: We are probably going to make something simple like this in the fabrication,
something to hold your ipod or something. Can you see the martini glass, the
representation and the fabrication.
T: Are there any questions?
S: Smash the duck.
T: Smash the duck? Don’t do that, that will hurt my feelings. What do you guys want to
do? I can show you more nuggets of wisdom or you can ask me questions and I can try
to get to you.
S1: Love.
S2: Nuggets.
S3: Nuggets.
T: Nuggets! ((He starts a new model, show them Distance.)) If I want it to be say 20.5, I can use the scale command, and while it’s scaling, you can type in the number.

S: You said you’d show us how to do windows?

T: Yes. Do you still have your candy bar?

T: Rats, I don’t. But I have control z. I’m going to go to another layer, a black one.

Who wanted it on their castle thingy? ((Hand raises.)) Right. ((He shows them how to draw two rectangle curves. )) If you go into perspective, you’ll see they’re not on the top where you’d want them. So I’m going to project them. So you type in project, and then select them, and then the surface you want them on, and they go to the top.

T: Now you can use split, there is more than one way to do it, but I’d like to use commands you’re familiar with, and then you can delete the one.

9:05.

((All the students are working, following along, listening, looking at the screen. At the moment no one is doing something else.))

T: Does everyone have something like that? Or maybe you’re just watching. That’s okay too.

T: So I select my surface, and it should work…or I could have screwed it up…that’s okay, it happens all the time. One more time. It’s always fun to watch people flail…extrude surface, then I pull it up, and then it’s wrong….wait, we did it. See, I knew you guys were losing faith in me. When it seems to be going all catty-wampus, you want to check the direction.

T: Does that make sense? Any other balloon animals that need to be made? We have 10 minutes. I know your brains are pretty full. We go fast and slow.

T: What are the two things I want you to learn? Number one is fabrication is not just pushing a button, number two is polygons are expensive.

T: What am I doing – I’m done with you guys and I’m going on Facebook (laughter). No, I’m trying to get to the class website. What are my friends doing? I’m at work! So basically what I want to see next week is the same thing. Look at the assignment, save yourself a file, a pdf of your views. Start working on your slide, you don’t have to make a merry go round.

S: Do we have to be sure every thing fits in the 25’ square?
T: It’s pretty small. If you need to stretch it out, that’s okay, but think about the final project. What are you going to present? Is it the whole park, a fabrication of your connection, a vignette…

T: This isn’t a design class, well it is, but it’s a computer class, I’d rather have you learning the software than worrying about whether your benches fit or not

T: Okay we have a few minutes, pack up your stuff, catch your bus, ask me if you have any questions, not just about this class, but anything rhino related.

((Some students immediately start packing up, others, sit and chat, they start leaving the room. A few get up and talk to each other.))

S1: what’s up brother? S2: I love this class dude. Computer class.

((Laughter, chatting, students continue leaving the room.))

S3: Okay, let’s ride.

T: Anything else?

S4: Just wait outside S5: I’ll use the elevator.

((Most students push in their chairs, all log off the computers. One student returns to the room to retrieve his phone.))

9:18

((3 students left at the front talking to teacher. All female. Two students at the back, looking at papers, two at the front, just chatting.))
Supplemental Material B3. Classroom Observation 3

T: All right you guys, let’s just assume it’s 6:30 or thereabouts. Why don’t the first of you guys bring your stuff up here and we’ll have an informal chitchat of what you’ve done. ((Students begin bringing up their items to the front table. ))

T: The first row? Everybody. Sweet. Shorter people up front. So you guys, pass these around. ((general laugher.))

T: Who’s is this?
S: This is mine, with the shelf on the bottom,
T: Cool. Did you do any field testing?
S: yeah.
T: Any issues?
S: The tabs never fit in first.
T: Who made the elephants? ((The same student raises her hand.)) T: Apparently this is successful. ((Students laugh, she is red.)) T: What is it? S: A iPhone holder.
T: So what you’re saying is you didn’t learn anything here, but you did here. ((She has 3 items.)) Never mind, I can see where you went awry. How did you choose your materials? Or did I specify?
S: Whatever was left.
T: There are a few material secrets I have.
S: I tried using plastic, it melted as it cut.
T: It will do that. Nice attempt though. Pretty nice bends, here. Did you try to work with the grain? It’s a 50/50 chance.
S: I just sort of did it.
T: This material has a grain, just like wood. You did well, along the grain here, then not so much here.
T: Who did the ( ______)? ((Students laugh.)) T: this could be a million dollar idea.
T: Any issues with the tabs? S2: […]
T: Gonna tell you a story. ((Laugher.)) The first time I did this, I thought I would use these tabs. About 75% of the tabs worked great, the others I had to use needle nose pliers to pull them through.
T: Who’s is this one?
S3: That’s mine. It’s pen holder.
T: cool.
T: Has anyone looked at the cool box project? You probably should in the next few weeks.
Nice. Any issues?
S3: This area didn’t turn out well. I did perforations, but it still didn’t.
T: All you guys are using pretty thick materials. Do you remember the example I brought in? Significantly thinner material. You should think about that.
T: Who did this?
S4: I did – it’s a tooth. It’s a toothbrush holder. ((Something unintelligible. Students all laugh. ))
T: V____, what do we have going on here?
S5: It’s the better one of the three in the studio.
T: Bring them all – I want to see all the failures till now. 5 weeks from now you don’t’ what to be failing. So what’s this? …..What went wrong?
S5: First I used […]
T: Do you guys remember when I said last week about testing little areas first? Did anyone do that first? This is cool. Valuable lesson learned. These are lessons I had to learn the hard way too. Go ahead and take these back, I asked you to photograph these and upload them. We’ll want to take a look at these again at the end.
T: Okay, next ten or twelve, go ahead and bring your goodies up here please.
All right. (Students laugh.) Sweet this one comes with a phone. So I can tell - whose is this. I can tell, of your choice of glue. So you used the section command and got it to work?
S6: Yeah.
T: any trouble?
S6: No, well, it took a few tries.
T: I can tell you put a lot of effort into it. I saw your model last week too.
T: Whose is this?
S7: It’s a paper holder.
T: Yeah, for flimsy. I can tell you use computers a lot. So if the drawing goes in here.

T: I like this one, it’s a DIY kit. Learned something about cardboard? What did you use, unroll or just smash?

S8: I used smash.

T: My concern is that you managed to make something flat, and you used the laser cutter. I love to see an epic fail.

T: There you go, it holds an apple product.

S8: And tissue, at the same time. Not a lot.

T: I see it’s useful, fold it up, put a new one in. Any problems?

S8: A lot. The openings were supposed to have speakers, it didn’t’ work out so well. The tubes were twisted, I couldn’t do that with chipboard.

T: Next week, the assignment is doing a rough prototype of the cool box. As we learned, trying to do it in one fell swoop is difficult. Next week we will try to learn from our mistakes. Like I said I like to see errors.

T: Whose is this?

S9: Holds phone, have to think of cords.

T: I like it, highly efficient.

S9: it has my name on it too. Your hand is covering it.

T: Is this one or two people’s? This is Gehry’s first attempt. No, I’m serious. What’s going on here?

S10: I tried it with […] material, became like a popcorn holder or something like that.

T: Any problems?

S10: I tried to […]

T: I applaud your scale, and your effort of doing it twice.

T: Whose turtle? Any trouble?

S11: At first I tried […] So I tried it like three times.

T: Who else has pieces swept away by the vent?

S11: And then it wouldn’t assemble properly. I sent you a picture.

T: I like to see failures as well

T: Whose going retro? This looks like my parents’ phone. Nice. I take it holds a iPhone.

Any trouble?
S12: Tabs.

T: Yeah, tabs are trouble. Use the calipers in the shop, test it, will it bend or break?

Figure what it takes to get these tabs through there. Cool.

T: Whose is the mickey mouse? What does it do? S13: […] Oh, okay, cool. So what would have helped is some holes here, for some other tabs. Other strategies, and I’m not picking on you, if its loose, ((T draws a pentagon and one offset around it)) – there’s no reason you can’t put another around it. Cool.

T: What do we have here?

S14: It’s the head of…I had trouble, couldn’t get it to bend. It’s curves.

T: Yeah, cardboard likes to curve, but it dents too.

S14: and the tabs don’t align.

T: Whenever you bend material, it doesn’t matter what it is, there is a distortion. You can’t get a clean corner without cutting pieces and butting the edges.

T: What do we have here?

S15: it’s a …paper holder. I used pins.

T: Let me tell you about pins. Pins are great, they’re fast. You weren’t able to work out the tabs idea, but mostly due to your choice of materials.

S15: yeah.

T: And that’s what this class is about, that you learn about materials, and that you will use metal, etc., but that you learn before it’s your money on the line.

T: Okay, next group. Someone is serious about his glue. Sweet. Whose is this? Nice. Any issues with this? This is a thinner material than last week. No? Pretty successful, looks like you got this to bend, this has potential to become […]

S16: I used the laser cutter, but the other one left burn marks.

T: Now you know which one to use.

T: All right. ((holds two pieces.)) What is this? Someone is an American with no regards for space. I live in the suburbs, dammit and can use all the space for glue.

S17: I even tried test cutting it, thinking how can I improve this? I ended up jamming all my tabs.

T: Wait a minute is that tape?
S17: Yeah, I forgot about, I had many different ways, so I had to bend it the other way, it ended up ripping.

T: I know were using all these digital tools, but sometimes digital tools aren’t the best, a knife would have been just as good. You can spend 45 minutes, or just turn it over and use the knife. Sometimes digital tools aren’t the be all end all,

T: Whose is this? Bendy?

S18: I couldn’t get it to turn. I could have used a rib system all the way across, but I didn’t have […]

T: No, nice.

S18: I had trouble with the tabs, shoving the tabs in that.

T: Definitely pushing the envelope on what is possible with the materials

S19: That’s […] Mr. J’s paint brushes. […] Construction management.

T: Judging from the response this is extremely successful. Something to think about when you’re kerfing the material it’s going to not break, but take the time to smooth.

T: Whose is this?

S20: It holds pens

T: I’m going to come into your studio and see if you’re using these. Any troubles?

S20: The holes are too small, the tabs, I mean they’re not even really tabs.

T: Cool. How did the holes not end up? I only ask because […]

T: Every hour is happy hour. And this holds a glass? Sweet. Any trouble?

S21: Tabs.

T: Always tabs. Tabs, cool. This must have given you a lot of trouble.

S21: I tried etching first.

T: I can tell you went through the second laser cutting…he told the second group about tabs.

S21: No, he told us too.

T: Cool, awesome you guys, these are great. We’ve learned al lot, and we’ll learn more.

T: So guys, I guarantee that were going to learn how to light your models. Two things: how to light your models and how to change and manipulate your materials. And then the other thing may be how to fabricate your things. For most of you it looks like
you’ve figured out how to get your things together. I’m going to shoe you strategies for fabrication, and while I do that, go to the 380 page and download the mouse, if not go back and download it. If people’s toolbars aren’t open I can trouble shoot that.

((PPT on the board – fabrication techniques.))

T: Are you guys starting to grasp the idea how this software can go more than one direction, and how what you want to do can change your way of thinking? I hope that’s working out for you. I want to talk to you about fabrication and how you can do these things. There are five ways to do that, I’m going to talk about four ways, or three ways to do that. It should take 10-15 minutes.

T: Sectioning. Who thinks they used sectioning in their models? Hold them up. The models, not your hands. Yes, elephant is sectioning, turtle is sectioning, ……yes.

T: Another way to fabricate things is tessellating. Very close to folding, but the geodesic dome is made utilizing tessellation. 381 – the byzantine mosaics. Mosaics can be considered tessellation. How many used tessellation?

T: Folding. Who thinks they used folding? Hold those models up. 1, 2, 3. Yeah, folding is one to the most common ways. ((Laughter at the right side of the classroom.))

T: Another way is contouring which is very old school. The old way, where you took things away, carving, the Hepplewhite, Chippendale. You either take away or add to. We wont be doing any of that, bit I wanted you to be aware of it.

T: Lets talk more about sectioning. ((7:17.)) Also called bi-lateral contouring. Putting things in one direction and then another. This one is sectioning, also contouring.

Sectioning doesn’t need to be a flat material, here Massey used the idea of sectioning using tubes. This is another piece using Shop. (PS1 sectioning). ((Dunescape on the screen.)) They used a model, dry fit everything and to build it they just changed the scale. This is the serpentine gallery, this is where they have a heavy hitting architect create a gallery that might stay up for a whole summer.

T: Tessellating, and shiny object in London is Norman - his work is all tessellation. I want you to thing about materials. Glass is a material, fabric is a material. Just because it isn’t wood or steel doesn’t mean you can’t utilize it for something. This is also tessellating, MOMA has young architects build these.
T: Tessellation, lots of little things that sort of bend together. These processes are not necessarily stand alone. Just because you’re using tessellating doesn’t mean you won’t use folding, etc. Most of this you can do on the laser cutter. Folding is a common way of doing things. Everyone know the Bauhaus? Yeah the coffee shop in downtown. No, they had a paper folding studio. Gropius would say that is not good ((he mimics a German accent and the students laugh.)) He folds a piece of paper) That is the most efficient use of paper.

T: Folding is an old technique that works. Folding is another, ah, efficient way to use materials, Who knows what oil canning is? That when you bend something and they start to distort. Who has been to EMP? ((Not very many raise their hands.)) All right, who hasn’t been? Who has been to Seattle? You should go, its important. The bending already sort of distorted due to folding. ((He changes the slide on the screen.)) Water cube is basically folded.

T: I can’t to put this on the site, this is Tom Wiscombe, it’s done in Catia, a more expensive version of rhino, well, not really, they built this all together, they knew exactly how it would go together, ended up banging it together.

T: Contouring is removing from - it’s labor intensive. Something like this we are used to seeing, even though it is contouring, we as architects. You can have this milled out, rather than stacking everything.

T: This looks like it’s sectioned, but its actually contoured and cut.

T: Again, this is a model. And this is the thing, you can learn so much more by using the digital tool and then fabricating.

T: Let’s go to 3d printing. This is something that I did for Stevens Pass, I took their little bird, I made the model in rhino, then printed. This is an iPod holder, I modeled in rhino, then had printed on the other side of the cage. It requires pretty accurate modeling. These are chairs that are 3d printed. This is basically animation turned into something physical.

T: That is it in a nutshell, the types of fabrication methods. We are going to focus on three of them. If you take other classes here, you might get to the others . We’re going to take a break and make sure you have the mouse, and then we’re going to work on lights.
7:31 ((Student goes up to talk to the teacher.))

T: I want to see the disaster.

S: I tried two different, tabs.

T: Like I said, I like to see the mistakes. Take a picture, I mean, more or less, you have the whole quarter to get this down.

S: Basically, until I unrolled them they were fine, but then I unrolled it and they were all overlapping. At two at the morning, right?

T: yeah, yeah.

((Most students don’t leave, but stay at their desks.))

7:38 ((Chatting, laughter, the back row is talking and looking at their screens. Others are surfing, working on rhino models.))

T: All right, everyone have their mouse open? Did anyone experiment with lights last week, or did you go straight to fabrication? Fabrication? Do you want me to start from the beginning, or the end?

S: the middle.

T: The middle? Tell you what I’ll go uber fast, and you can stop me if you haven’t heard something.

T: Up at the top here, there are tabs that open these huge toolbars, Most of what you need is at the top. Like I said last week, these blue guys are for rendering, we don’t need to worry about he mesh. What we need to worry about tonight are the lights, this is a spotlight, this is a sphere, this is a directional light, which is like the sun, but not because it is not far away. This is a rectangular light, which you can think of as a florescent light. This is a linear light, which is like the florescent light. This is spotlight. These are for editing the lights, these are for animation. Mostly well talk about these for lighting. (( He points to each of the buttons on the rhino toolbar with his cursor as he describes them.))

T: Go ahead and zoom out, go to the layers first, click on layer two, oh oh, awesome, I was hoping it would let me do this, and make that your light layer. All right, now we have a layer for these lights, we can experiment with them and turn them on and off.

T: Go to your […] , click, then go to your front view, this is the point where the light will hit, this is the distance, and this is the angle. Go ahead an go like so, go to your
perspective, go to your shaded mode, and you can see it like this. Go to your layers, turn on your floor, and you can see it more like this.

S: can you tell me how to see the lines?

T: go to you your menu on the left, make sure your lights are checked.

T: this is new in version 5. You can render and look the light and manipulate it a bit. You can rotate, you can pick a point you can choose another pint, and as you do that you can see the lights change. Go ahead and turn on your control points for your light, I f I click on my control point I can control the hard edge, the shadows look better.

T: So I want you to go back to that little circle, which is more or less the properties, once you get something that you like, oh I’m sorry I forgot to [talk] about this one, this control point is more or less the dolly, meaning if I click it, I can move this think back and forth. The thing it’s aiming at and the angle will remain the same. You can change the intensity of the light without changing anything else. Once you get something you like, I’m going to turn my control points off, just select my light, I can go to properties, I can use either the object or the light. One of ways that you can control how bright a light is by changing the color. If I click here, just like in Photoshop, I get this menu.

T: What?

S: On the properties thing, I don’t get the […]

T: It’s floating? ((Teacher goes to help the student.)) Just click on the thing. Oh. I love questions like that.

T: All right, you basically mess with color of the light. I’m going to brighten up so you can see what I’m talking about, now you can also see this looked pretty good here, but the shadow looks dark. You change the shadow on the shadow bar, but you can also mess with the shadow intensity. This one that says spotlight hardness, does just about the same thing as the control points. Spotlight can add a lot of drama.

T: Let’s go ahead and go got your top view, I want you to go to your point light, that’s the round one, drop it anywhere you’ like. Go back and now that we have a point light and a spotlight, now you can see I have selections. If I go over here, I can turn off the
light that I have selected. It basically projects to the construction plane, if I take this
light, in the perspective, I can move the light up and down, that’s a pretty bright light.
T: The last one had a pretty bright light. I can turn it down. Now the intensity, here, the
main light between 75 and 50 is pretty good. Let’s go to our perspective and look,
little dark, go to my other one, it’s a little light. As I mess with the shadow intensity on
one, the other side gets a little less.
T: Now just because it look good here doesn’t mean that it will look good in the render.
So we’ll go up to our sphere…and that was a pretty fast render. More than one light
will make that go slower. You can also make everything a block that will make it go
faster.
T: Now, I’m going to make this…I’m going to make sure that my near snap is on, and
then whatever I want to emphasize, I click on it, and the point of view is always going
to be where that arrow is. You can see it’s got some light on it.
T: Now because I can’t click on my light, and I know it’s the only one there, I should be
able to click on my properties, now I’m going to zoom it, let’s go post apocalyptic, turn
that […] and red. ((He changes it again.)) There we go, it’s like an old timey photo.
This gives a nice even light over the entire scene.
T: You can also, make a second one. The more lights you put in a scene, the more chaotic
things are going to get, but…
T: And then you can go back to your layers, turn the other lights on, you can see, as you
start turning on the others, its really easy to get hot spots. Really, the fewer the better,
but this is a learning experience.
T: Go ahead and go to the green layer, turn the lights off, and the last light I’m going to
show you, go into your top view, and go to your rectangular light, and its like drawing
a rectangle, go to your right view, I can actually say, this is the angle I’d like it to be,
and I can move it up and over. This is a really nice, soft, studio light.
8:01
T: That looks pretty good, lets go ahead and render it just for fun. There is a ton of trial
and error when it comes to rendering, it will take you as long as it took you to model,
to render. That why I like to do this during football season Any questions on lights?
Pretty self-explanatory.
T: Close this, go back to the website, I want you open the one called mouse materials. Its basically the same one, but we’re going to do materials. Have you guys done any texture mapping? Any? Okay that’s good, we’ll all learn together. We won’t start with any real materials yet. You guys are working on playgrounds, with lots of shiny stuff. Next week I’ll how you how to do grass, etc.

T: Does everyone have this open? Or you can’t get it on catalyst, just open the old mouse model and use that one. I want you to start clicking on these, is it a poly surface, and what layer is it on? I want you to click on the bottom one, what’s different about this one?

S: ((in front)) it’s a block.

T: what is the reason for this?

S: it’s a way to simplify the model.

T: yes, but you can’t manipulate it. I want you to mess with it for awhile, and then when you run across this, you’ll remember we did this in the class.

T: You’ll notice that even though there different colors in the model, they render the same. There are two ways to change the materials. You can put all the objects on the same layer and then change the material on the layer, or you can in a small model like this, change the material an object at a time. The best practice is probably to put like items on the same layer and then change the materials.

T: I want you to hover over this guy that looks like a crumpled paint tube, and you can change by layer, object, or parent. Nothing changed. Because all we changed was how it was going to render, not in ghosted [view]. I want you to highlight it again, go over to this, the GL is gloss, and the RF is reflection. Go ahead and change the GL, you can see the […].

S: what do you do when your tool bar disappears?

T: What would I do personally or do if I were you?

S: Personally.

T: Swear. ((Laugher.)) That was a trick question. While I trouble shoot, mess with the GL and the RF, and over here, you can mess with the highlights. You remember that this is 220, and then you can go to hue, and remember this was 220, and get a fairly
realistic reflection color.  ((Teacher goes back to the back row, they decide to restart.))
And you can watch your neighbor.

T: All right, now what I want you guys to do, start going to different parts and do the
same thing.  Make things a little glossy a little reflective, and you can see, it doesn’t
matter what the material is, the gloss and matte stay pretty much the same.  Now if I go
the bottom and change this, what happens?
S: nothing.
T: why does that happen?
S: It’s a block.
T: So I go to here, and use one of my favorite commands, explode, and then since it was
mirrored, I can join these, now it’s a polysurface.  I can change color by object, leave it
white.  I can go to my mouse cord, make it green.  I know that a mouse would never
look like this.
T: Go back into your properties, unlock your floor, let’s change that to something bright
pink.  Now, the lights are off here, go into your lights, turn them on, and hit render.
Guys getting an immediate render?  Takes a while, huh?  But this gives you a much
better idea of what the object is going to look like.   ((Students are staring at their
screens, waiting for the render to complete.))
T: So you guys, mess with this for a little bit, I’m going to walk around and answer
questions.  Mess with it for about five or ten minutes.  Start changing the gloss. And
you guys, if parts of your mouse looks really washed out, if parts of you mouse look
really washed out, check your reflections, the closer it gets to 100, the more light is
picks up.
S: Where is the reflectivity?
T: Where is your reflectivity?  It’ s at 0, yes.  Go to your layers, go to your lights, you can
go to your intensity.  ((student manipulates, as the teacher points to the menu.))  Drag it
down, drag it just a little – ah see that?  There is no easy way to do this.  Keep up the
good work.
T: I’m imagining I’m going to look at a lot of bright and shiny parks.
S: If I have my lights on, I’m getting a lot of shadows.
T: Is this a screaming machine? Yeah, that might be part of it. This is where you send an email to McNeel, ask them if there is a problem, you can’t be the only one.

T: yes. ((he goes to help a student in the black row.)) Is it still a block? Yeah, explode it, and then join it, there you go. Actually, you want to be exactly that color? I know, right?

((Goes back to front.)) So, we had a good question in the back. Things to learn, remember fabrication is more than pressing a button, you’re getting to understand that, and the second thing is that polygons are expensive. Lights are polygons. If you get that out of this class, I will be a happy, happy lad.

T: All right, another good question was, what if I want to get that green? I could write these numbers, but I’m lazy. So I click on the color, I go back to the bottom, I click match, and there it is. That’s all well and good, until I decide that that is a little glossy, or I decide to change it to pink. They both change because they’re linked. So up here, if I go to duplicate, then that breaks the chain. That will happen. Remember you can break the change with the duplicate command.

Now let’s decide I want this whole mouse red, but I want these two guys to be different. So what I do, is I have the same color red, if I go to render, the finishes look different. This render takes an awful long time, this edge looks hard, maybe I need to mess with one of my shadows a little bit.

S: I think its reflectivity, because the bottom is supposed to be green and now its kind of purple.

T: Ah yes, good call. Thank you for using my words against me. Yeah, reflectivity is way up high. Now I hesitate to show you this, but its fun - I haven’t done the wheel yet I’m going to the TR, that is transparency, this looks really good with balloons, in sure some one is going to do balloons next week. ((giggle in the second row.))

T: Now you can see, the wheel is kind of see through.

T: Now the last thing I want to show you, is that we’ve made changes to things as different objects, Go ahead and turn your lights off. Put everything on the same layer. Go to object properties, click on this, where it says assign materials, go to layers, now that you’ve put everything to the default layer, it all goes gray. You’ll see I gave you a bunch of different layers, click the objects, put it on the bottom layer, etc., etc., and
you’ll see them change.  ((Teacher continues to demonstrate assigning materials by layers instead of object.))

((Some students look like they are losing interest – rotating in their chairs, talking to each other, one student leaves the room.  Yawns.  One student in the front row leans against her hand. ))

8:35

T: Any questions about this?  I don’t want to overwhelm you all with these - I want you to practice lights, materials. Next week I want to see some attempts, not attempts, but efforts at your cool box. I don’t want you to run out of the class, I want you to spend some time working so I can go around and help you. There’s a chapter I will put on the catalyst site about planning a model, also do you want some tips on working with materials?

S: yes.

T: I’ll put another chapter on that on catalyst.  It’s in the library.  Any other questions?

Yes?

S: Can we do the same things with reflectivity, gloss, with other materials?

T: The nice thing about rhino 5 is that it has the ability to render.  Next week I will show you flamingo, nice thing is that everything you make in rhino will transfer to flamingo.  It comes with trees, grass, you can say I want a tree and boom.  You have a tree.  We have 30-40 minutes I want you to work so I can help you.

S: I have a question.  T:  Yes!

8:41

((Student in the back row packs up here things and escapes.  Student in the middle row shuts down her computer, goes to talk to another student in the back row.  One student in the front row left gets up, looks over the shoulders of the other two in his row.  He sits back down.  Two student in the left middle row look at each others’ models, discuss what they are working on.  Student in the middle row who shut off her computer packs up her things, goes to the other student in the front row, chats.  Three students in the front row chat, but not about the software or assignment.  None of them have the model up on their screens.  Another student in the back row packs up, gets ready to leave, middle row student also gets ready to leave. ))
8:45
(Teacher in the middle row, works with a student. Four students leave the room. student in the back row on his phone – texting? Three last students in the back row, are still intent on their screens, can’t see what’s on them from here. Student in the front left row says bye, leaves. Student in front right row runs out of the room. )

8:47
(Most other students left are still working on the assignment. Students in front and middle row are chatting. Teacher is still with the same student. She laughs.)

T: you got it! Yeah, colors, right. Any other questions?

T: yes – you have a question? ((He goes to the back row.)) Radius is point one two five. That was easy. Anything else?

((Another student leaves the room. One student in the middle row has his arm resting on his head, not unlike raising a hand in for a question. Not clear if he is trying to get help from the teacher. He stretches it out straight in the air, then puts it down. One of the last three students in the front row asks a question.))

T: Sweep one? Do you remember the bend and the twist command?

S: yeah, but…

T: umm. Go, let’s go – widen that…

((About half of the students left are no longer working on the assignment, but are still in the room, chatting from their seats.))

8:58
(The student that had his hand up has it up again. All the way up. 9:01 now its resting on the armrest, but still up.))

9:04 ((Teacher finally gets to the student who had his hand up.))

9:06 ((Four more students pack up. They leave the room. Another student leaves the room. Three more get up to leave.))
Supplemental Material B4. Classroom Observation 4

((Despite the fact that major projects are due in studio classes, the class is full and looks to be lacking very few students.))

T: So how’s it going out there, ladies and gentleman? I’m seeing squints from the peanut gallery. Hanging in there? You have a test in structures?

S1: Friday.

T: you want me to tell them to back off?

S1: It’s Tyler.

T: I don’t have any clout with Tyler. Do you know my name? uhhhh, the bald guy…. How’s the progress in this class? You all got that email. I understand that you’re under the gun, so we won’t have anything due, but turn in anything that you have, even a word document that states that.

T: Any problems, here or in the shop?

S2: I was making a site model, and the laser cutter wouldn’t go all the way through.

T: What material were you using?

S2: [seaflut]

T: you should be able to right click.

T: Any other questions?

S3: My file I was trying to make a surface, is there a way to make a 3dimensional point?

T: I’ll show you how to do that.

T: Anyone try playing with their materials? Was it more fun? I’m going to show you about a half hour of rendering tips. You can still use the Photoshop, your skills will serve you well. Does everyone have this open?

S4: Is the model supposed to be 4” in height?

T: Yeah, you guys, remember you’re making the cool box, for the final, which is due next week? I need to make a little bit of a design problem, they need to be 12x12x6, then need to fit in the under seat compartment. It’s a bit of a problem, how to fit an 11x17 in a 12x12 box, but I think that with 28 smart people in the room I’m gonna see something.

Enough patter.
T: So okay guys, were going to touch on the skills we learned last week, mess a little bit with reflections, mess a little bit with texture, mess a little bit with a thing called a bump map. How many of you have started your renders, and realized, man this is taking a long time. How many of you have not? ((A student raises her hand.))

S5: Oh no, I mean its happening to me.

T: remember the three things I told you? Polygons are expensive, you’re learning this.

T: So everyone have this open? The Jedi mind trick is that you can use the lights that are in this, if you like them, and resize them as you need to. Just saying.

T: We’re going to take the layers, and mess with them, were just going to mess with the color a bit, click on the color, we’re going to make this a nice deep red, so go ahead and click on the red. Go ahead to the gloss finish, select the red there, drag it over, that’s going to make the highlight just a little pinker. You’re gonna have something lie this.

T: Right now I’m happy with the gloss and the color, let’s test render, and see, it’s good to through our a test render fairly often, you don’t have to let the whole thing go, but as I’m looking at this, I’m not really happy with the color of the floor, so I’m going cancel out of this. I’m gonna go to the floor layer, unlock it, and take down the gloss a little, take down the reflectivity about 10%, and render, and we should notice…yeah. The color of the floor was washing out the color of the mouse. Everything making sense right now? This part should be review.

T: One of the most important things is a really good object will reflect all the things around it, not just the floor, bit the sun, the clouds, the sky, basically the environment. And rhino allows us to do the environment. I want you to click the layer, go to the environment, click on abstract, just open it, and click okay. You should have something that looks like that.

S6: Can you just repeat that?

T: sure! How far would you like me to go back?

S6: umm, the beginning? From the mouse top?

T: From the mouse top, yes. If one of you is asking me to go back, that means more of you need me to.
T: So go back to mouse top, go back to environment, click on environment, and then it
says empty, click to assign.
S7: We just don’t know where the download file is.
T: Is it in my documents?
S8: You have to unpack it.
T: Is it still a zip file? ((He goes over to the student to help her find out where it went.))
There you go, drag that to your desktop.
T: So yeah, they’ll probably be in your downloads, drag that to your desktop, you should
be able to open it, pull that entire folder to your desktop.
T: Did you get it? Who else has nothing? ((The teacher goes to the back row.)) Ahhh,
yes, click on that and drag it to your desktop. Hey, you’re learning on your own.
S: [unintelligible ]
T: So let’s go to…
T: All right. So I’m gonna go back to environment, click to assign, click on the abstract,
click open, click okay, does everyone have something that looks like this?
S: Yeah!
S2 …
T: You got it. Cool, cool, cool, sweet!
T: So basically what we’ve done is apply a decal to the surface of the mouse, and it looks
like a reflection. We have two different objects on the same layer, you’ll see that the
really nice flat rendering is gone now. Their reflections that are twisted, along the back
and the front of the mouse – won’t work. Go ahead and click out of the rendering, go
back to the layer and click out of the environment map, and your mouse should be flat
again.
T: So we’re going to do that again, go to the command line and type environment, and
environment editor should pop up, you’ll get a window like that. What we’re going to
do is put in a background, and everything should reflect off of that. I’m going to hit
that plus sign, and ask what I want to add to the environment. I want you to click on
environments, click on rhino sky, and go ahead an open that.
S: It says that we’re out of memory. Rhino says to restart after it closes.
T: Who is still standing? Half the class raises their hands.

S: They’re all on their own laptops though.

T: Okay, I was hoping something like this would happen. I’m gonna walk you through this and then we’ll open it and try again.

S: I don’t have an okay button.

T: I don’t’ have an okay button either.

S: Why do they?

T: Because they’re cooler than we are. How about this. Let’s close out of this and do the command again.

T: So you guys, once you get the environmental editor up click on that, select spherical, you should have the spinning wheel of death, you don’t have to click okay. You told rhino to do this, and you should have something that looks like this.

S: Whoa.

T: Does your floor look kind like the sky? Go to your floor layer, and change your reflections down, so that it doesn’t, and then hit render, and you’re going to have something that looks this, where the is a really nice reflection on the back of the mouse.

T: So you should all have something that looks like that. That you guys, is called an environment map. Throw that in to your model, it will be much, much cooler.

T: I want you to go to the mouse bottom, open your layer material, we’re going to do something called a bump map. I’ll go deeper into that in future weeks but I just want to introduce you to that. We’re going to make the bottom like it has a rougher surface.

Click on where it says surface, click on --- click okay, you’re gonna get something gross looking, but it looks like its textures. We’ve got something, but it didn’t really change the physicality of the model. So we’re going to make this look a little better.

Click the layer, reduce the color, the reflectivity, it’s going to look a lot better, when you render it, it will look better, in fact, let’s give it a quick render. You’ll see it looks better.

T: There’s a couple of different ways to make this look better. What you had was a jpg, and it was a certain size. See where it says 100 What I’m going to do is change the size, I’m gonna hit 30, and hit okay, and you’ll see that the nubbins got smaller.
T: You can pretty much go in and do this bitmap in Photoshop, you’ll see the menu we
can make changes, you can make changes so that the scale is better.

T: Who’s making AstroTurf for their playground? There’s your texture, done! Who’s
making a dangerous playground? Only three of you? For those of you, we’ll do
concrete next. That will also have other opportunities in architecture. ((Student
laughs)).

S: How do you save an image as a bitmap?

T: You can save it from Photoshop as a bmp, a png or a tif. So that’s a bitmap, I’m
sorry, a bump map.

T: Go ahead and zoom out a bit, were going to make our mouse a little bit ridiculous. Go
to the mouse top, go to the texture editor, where it says color, I want you to go right
over here, and go to 140 [arches], hit okay, hit okay, it give s you a nice chrome look,
basically the pacific science center. Go back to 1402, click on 1403 dark wood, hit
open, and hit okay and okay, basically, we have the most expensive mouse ever,
because this is hardwood. It doesn’t look quite right yet, because we have to do a bit of
editing. Click in the layer, and instead of hitting the highlight, hit the triangle, you’ll
get an eyedropper, like Photoshop, and select a darker part of the mouse, and we’ll
have changed the color of the reflection.

T: Let’s do a little more, we can mess with the color of the reflectivity, maybe I want to
change the color of the brown square, hit okay, hit okay again. Let’s go ahead and
render this, see what it looks like.

T: The computer is thinking. You can see we have a plastic, wooden and sort of rubber
mouse going there. If you want to rough up the mouse a bit, you can add a bmp map to
the texture map. Click out of the render, underneath the texture, find the bmp, select
that very same wood, hit okay, and on your rhino window it will look completely dark.
What has happened, zoom in a bit, what we’ve done is added in a texture that exactly
matches the wood, it makes it look a lot rougher, can you guys see the difference?

T: Now it’s sill a little shiny, I’m gonna bring the reflectivity down a bit, and then
render. You you’re gonna find that it takes almost as long to render as the model takes.
Go ahead and click out of that, my wood is sill a little dark. I’m gonna go back to the
eye dropper, find the lightest part on the wood, or maybe just do it this way, I’m gonna lighten it up a little, add a little reflectivity, I want you to go back to your dark wood, one thing we haven’t messed with, the grain goes with the mouse, lets say you’re working on something, and you want the grain to go a different way, go down here where it says rotation, I want you to hit 90, hit okay, then hit okay again. And that did nothing – mine changed! Yours did.

T: Well it seems that the guy who made this model in two parts, and then mirrored it, and didn’t make it as tidy as it could be. Let that be a lesson to you!

S: I have a question, there’s something on the mouse, down a little.

T: what is that?

S: It’s been there since the beginning,. It’s part of the mouse.

T: that’s when you fix that in Photoshop with our mad skills. You guys are seeing my flaws, but there’s still like month left.

T: Basically what you can do is to start looking for images – you guys have done a little texture mapping ?

S: nope.

T: none? I want you to minimize rhino, and go to a place called flying architecture,

S: Flying?

T: flying. ((students get online and go to site, as teacher does on screen.))

T: So you guys, where it says flying materials, go to materials, and go to vray materials one, and let’s go to wood. And what you have here are textures, you can download any of these textures, sometimes they ask for a little donation, you can download these and use them. I’m gonna dive deeper into this later, but I want you to know it’s here.

You’re welcome, that’s why I’m here.

T: Let’s do some […] with the bmp map. Go to the wheel, I want you to click on 1403 tubes, and basically what we’ve done is we’re trying to add some dents into your mouse so we can get a little traction. Go ahead and hit render, and see what a bmp can do – it will look like you have some geometry there, but its actually smooth.

We’re going to edit that, there’s a couple ways to do that, we’re going to change that to 50, that didn’t change much, go to where it says tubes, make sure you lock it, then hit 5, both the n and the v will repeat at 5, you’ll see that drastically changed it, do a quick
render, see how that looks. I look at this one, and repeating it at 5, it still doesn’t look right, I’m gonna go back to my wheel, back to my tubes, and instead of five I’ll go 12, that looks better. I think I’m pretty happy with my wood mouse, it’s the world’s most expensive mouse, and it’s not even wireless. ((laughter)) Forget about learning, let’s google wooden mice! ((laughter.))

T: Okay I’m gonna walk around, see where you’re learning, see what you’re doing, basically desk crits and work time. That okay? Cool, okay, take a break, I’m gonna ask you guys questions, sound good?

T: Oh wait, we only lost one person, we have a teacher’s assistant, this is XXX, she is in my department, the design machine group. She sits in my office, because you guys are in studio when I’m in my office, and when you guys are free, I’m at work teaching at a totally different school far away from here. When are you guys free for office hours?

S: MWF 12-5.

7:32 p.m. ((Students stay and work on projects, teacher and new assistant roam the room to help. ))

8:42 ((Approximately 3/4 of the class still remains. Not all are working on their class assignments. Teacher and assistant are still checking in with individual students.))

9:05 pm ((about 1/4 of the students remain.))
Supplemental Material B5. Classroom Observation 5

((6:30, the students start trickling in. Then a large group shows, then the rest.))

T: Let’s start with your cool box project. Why don’t you bring up your first four or five boxes and then the rest of you can go. Nice. Sweet! Why’s it wet?

S1: It’s raining outside.

T: My background is art, and there was a sculpture that I forget that was a Pyrex box that condenses water. You can argue about the importance of condensing water. I was impressed [by your box]. So what do we have here?

S1: A box.

T: A box. So the 11 x 17 stays there, what goes here?

S1: I had the pins here. Basically I tried to mimic an Xbox 360. SS: Whoa.

S1: The pins go here, that’s the hard drive, and then the external hard drive.

T: Did you do it on the laser cutter? Then you used […] Any trouble?

S1: At first it […] then cutting it too.

T: Yeah, cutting. How long did it take?

S1: A long time. And then melting.

T: Yeah, melting. No, I think your model just has to be smaller. ((Class laughs.))

T: Nice job. Sweet!

T: All right, where’s L__? What do we have here? It’s adorable. Let’s hope the contents match.

S2: So you open this first, then you stack it, it’s like…

T: And the model stays here? So when you present it, I’m you and you’re the audience? A how do you present it? And then you can literally stand there like this. ((Class laughs.)) And if things go poorly for you, you can go like this. It’s always great to be able to disappear. Well thought out. Any problems?

S2: The drawer wouldn’t fit when I first laser cut it. I used tape to hold it together, but when I took it off, it ripped off the surface.

T: Do you know what drafting tape is? How much is drafting tape?

S: About eight dollars for ½”. ((Teacher goes on to tell the student that regular masking tape works fine, as long as you put in on your jeans first. Then it’s not so sticky.))
T: Any other? You might want to think about putting something up here.

S2: Yeah…

T: And feel free to go ahead and keep working on these. Some of you while your working on your models might feel you need to change these.

T: Let’s look at J___’s top secret…

S3: Not really for your eyeballs.

T: Nice, so, show me. Pretend you’re smart about[…] your.

S3: And there’s (ht) mode, and then I can show you all my contents.

T: What I want you to think about is, the lighting that you do in your rendering. See if you can get this model lit the same way your model is. Maybe batteries.

T: So you guys had a structures class, and you told me about it, then you had a studio review, and no one mentioned it?

S: We’re the wimpier class. That was the other class.

T: Oh, there’s two classes.

T: So this has a theme that goes with your whole project?

S4: Oh… yes, it goes like this.

T: Nice. And you can, put the paper here.

S4: That’s just going to be stuck here.

T: Pins go here, and CD’s here?

S4: Yeah.

T: Nice! Did you find it helpful doing a full scale model first?

S4: No.

T: That is not the right answer. What did you not find helpful?

S: Well, this isn’t really the concept I was going to do.

T: so you made changes?

S4: yes.

T: So, the first one helped?

S4: yeah…

T: see? ((Class laughs.))

T: So….
S5: So, it will have front and back, and then I have cork board, these folded down, but I might just make them screens.

T: So where does the model go? And you can remove it?

S5: I was thinking that …

T: And where are the pins?

S5: Right here stuck on it.

T: I think… do I have an Andrew in this class? Nice. Just refine it for the final.

T: Nice job with these, hold on to these, I will do the final, final grading when we get the full package deal at the end of the quarter. Thus far I’m really excited by what we’ve seen. Okay, next group.

T: Is this V----‘s? So…Umm. ((Class is laughing.)) So when I see milk cartons, I often think of missing children, and then I think playground…((Class continues to laugh.))

S6: Missing children?

T: That’s a connotation, so be careful. It’s adorable. Walk us through.

T: And then the model goes there?

S6: Yeah.

T: Oh nice, nice, cool. Do you have a theme behind your park?

S6: It’s an orange theme.

T: Seriously guys, think about how does this box relate in some way to your park. When I told you about the cool box the model was made out of rich woods like the space. That is clever, nice job. Who is next?

S7: So, paper is supposed to go here, but I’m going to rethink that, these would have pins, and then this would be my model, and this would be the CD.

T: Cool. What’s the metal thingy o the end of the CD?

S7: I was just thinking it was a handle.

T: So you’re going to have a very small, tall model? You’re going to spend a lot of money and 3D print it?

S7: Yeah.

T: Mom, Dad, I don’t have time can I have 300 dollars to print out my model?
T: Cardboard can be a really beautiful material if you choose to work it well. The great thing is if you can use a simple material and craft it really beautifully. All the things you do with this can tell your future employer about yourself.

T: Who is next? Who’s got the chevrons?

S8: So the copier paper goes here, and the model goes here.

T: So you pull the model out?

S8: Yeah.

T: Will it hold it? It looks like you’ve sort of weakened it.

T: You’re the boss, you’re the architect. Entire model? Just part of it?

S8: I’m not sure.

T: That’s the next big thing. Your mode of presentation is going to drive the next step of the model. Cool cool.

T: Okay, who has…

S9: That’s mine. It’s pretty cool, it’s a box. ((Class laughs.)) Push it out, it has some symbols on it. Pull this down, paper, and then you see the inside, then you take that out.

T: Nice. Can you mount your model upside down and do this?

S9: Oh, yeah.

T: Bump it up a notch. There’s a huge chance this would go wrong, but if it goes right… Nice, really well thought out it terms of you’re standing there. You’re doing the walk of shame.

T: All right, leah, lay-ah.

S10: it’s not final, so model goes here, CDs go there.

T: Nice, so you don’t even need to pin up. Let’s see the walk of shame… Nice, nice.

S10: I’m think of doing a magnet.

T: It’s wonderful in it’s simplicity.

T: Let’s golf clap for this group…and let’s see the next four or so. ((Class reshuffles, some return their models to their seats others, bring theirs up.))

S: I’m excited

S: I hope it works…
T: okay, ummm. Let’s uh..Let’s start with this one cuz it’s colorful. ((Student opens it…

T: Cool. Where does, the model goes right in there? Is the model brightly colored?

S11: no….

T: no? You guys? Thinking about what does this say about the potential about what’s inside? You created a sense of mystery, but if it’s just this? A monochrome thing, this could compete with your renderings. You might want to rethink it if it’s just that. Model pops out, where do you put the model. Cool. Let’s see what you have inside…11x17, pins, CDs. So is this the final?

T: Whose is this one?

S12: Mine. It’s a simple design, where you have shadows cast by the design on the side, you can kind of see but you can’t see.

T: Nice. Now do you know what I want to see? I want another layer of this, so there’s a moiré pattern, and then you need a turntable. ((He spins the model.)) So you guys know what a moiré pattern is? If you just turn your head, you get a movement. So maybe you just need a turntable. Another layer would be great, I think it has some really great potential.

T: Who’s next?

S13: So the model goes here, the CDs go here, the pins go here.

T: cardboard is really hard.

S13: No, it lined up.

T: I would have just believed you… and what’s going to be inside the box?

S13: Some of my towers.

T: 11x17 goes here? Did you do a 1:1 test? No, I mean when the paper rolls up. It looks a little tighter than the paper wants to roll up. We don’t want our paper to get dented. Heaven forbid.

S13: Well, I think it can fit.

T: Okay, you’re the boss. Think about that you guys.

T: All right, who is, whoa, who’s is this?

S14: I started to play a bit with the three-dimensional model here. ((class giggles.)) Gonna be easier to bring it out, and then you have the papers, come out of here, and then pins on the other side.
T: Nice, nice job. Start bringing that up so you can make that work quicker. Very nicely thought out. So what’s the model?

S14: I am thinking of a very small scale of the whole thing. I was looking for a light that I can use…

T: So that is very cool. Very clever. Did you have issues getting it to line up?

S14: Not really, I had the files really organized.

T: One thing that will help if you’re scaling things, if you’re doing a ziggurat, if you just do an etched line…it make is it easier to line up. Took me about 5-6 years to figure that out.

T: Okay, who’s next?

S15: The CDs go here, and then this comes out.

T: And the model’s right there?

S15: ummmhumm.

T: Nice, so this is one of those cases where, because you have such a strong presence in the box itself, you ask your instructor if you can shrink your 11x17’s down. I give you guys these requirements, so you can decide if they’re’ right. You have to learn ho to make your client know why, they should buy your design. You have to convince me. And some of you have done that. We’re learning a lot of different things - if you can justify your request.

T: All right, whose is this?

S16: That mine. Pretty much the same thing from last week, the model here, the pins, the 11x17, and closed.

T: Nice. Quick fast, and if you get shamed, you don’t even put them together, you just stack and bail. Very nice. Okay, clap for this group. ((Students go back to return their models, next group brings their up.))

T: Uh, oh…Lights are always nice. Tell us, what do we have here?

S17: I found a box here, it can go vertically or horizontally. I was thinking of having the handle here.

T: Nice.

S17: This opens up like this, and you can have your model horizontal or vertical.
T: Nice, I appreciate that you have designed a box that allows you to be flexible, very
clever.
S17: And these are drawers and that’s pretty much it. I have my name here, and some
stuff.
T: How do you turn it off?
S17: I was thinking of having the switch off to the side. I want to keep it as simple as
possible.
T: Maybe it switches off when you pick it up. Think about that.
S17: Umm the lights, is there any kind of lights I should use? I found these.
T: Are these Christmas lights? Well, it doesn’t seem to be getting hot, oh, to diffuse it?
It can be pretty difficult; it plagues interior designers a lot. A lot of times if it’s further
from the surface… again I might forget that it lights up. It’s got a great sense of
mystery, nice choice of a paper that diffuses the light, does this tie into the concept of
the park?
T: A lot of times, the 2d objects will be forgotten if there is a 3d object on the table.
T: Who’s next? Who’s got the Brutalist box?
S18: This one? So I was going around, and I was thinking of presentation methods, Hey,
Roark you wan to open that for me? Yeah, open it? ((Teacher opens it, and there are
beers inside. ((Class exclaims.)))
S18: No model.
T: Who needs a model? I like the way it all fell apart though. I don’t think your model
will be as good as your mockup.
S18: I used a little weight.
T: And this is the paper?
S18: Yeah, I like to fold the paper.
T: That’s all right, to fold your paper, but it doesn’t come out…
S18: You have to yank it.
T: That’s quick, efficient, quite the attention getter. Did you bring enough for the whole
class? (They all laugh.))
T: All right, we got two more here…
S19: You got the C box…CD goes up here, model, and…
T: it makes perfect sense. Does the model go here, or does it go there?
S19: Yup. ((Class laughs.))
T: That’s a good answer. You don’t have to know. It allows for… Y---, help here.
Y: Flexibility.
T: yeah. It’s quick, simple, if I don’t like it you’re out boom.
T: I almost forgot about the lunch box.
S20: Yeah, paper goes here, pins here, model goes on the center.
T: Nice. I like the lunch box idea better than the mailbox. Where does […]
S:20 […]
T: Nice, simple, very nice. Sometimes things work, sometimes they don’t, maybe you
want to look for a different material. All right, round of applause for this section.
T: Two more boxes? Who’s next? Go for it.
S21: The box goes like this, pins, I’m thinking about switching the place for the model to
here.
T: Nice. Yeah, I think that works too, if it’s here, I can look around here, but if it’s here, I
can’t. You can be standing here, here, here, and everyone can be looking at it and each
other. If one person goes, like this, and the other like this, then you know, but if they
look at each other, you know you got to break out the silver tongue. Is there a handle?
S21: umm. Yeah,
T: you might think about that so it can just fall out. Really nice. You changed it quite a
bit from last week, huh?
S21: Yeah.
T: nice.
T: L----.
S22: So the CDs, the pins, right here, still working on it, if you don’t like it, you can
shove it back in, if you do, then you can pull it out.
T: this is another case of when you might want to talk to your instructor, and maybe you
put them here, you fold them.
S22: Yeah.
T: Convince me.
S22: Can we retrofit that?
T: Yeah, we can retro fit, you aren’t done till you guys get your first job. Nice. Are we done with this group? Now we can golf clap.

T: Who’s next? ((Three more are placed on the table. )) All nice, cool. Who should start?

S23: This might take a while. It’s not’s working right. ((She starts taking apart a circular model and then putting pieces back in a different configurations.))

S23: So that was the easy part. Can I get some help? ((A couple of students help her put the top on. She takes off the top and unfolds it.))

T: Nice! ((Class says, Oooh ahhh.))

T: I think this might be a case when you do your final presentation the bottom is already set up. If that part is done, I don’t think it is a problem, and the model sits in the middle there?

S23: Yeah, I think its strong enough.

T: And the paper goes?

S23: Yeah.

T: And how quickly does the top go back together?

S23: Ummm.

T: There’s zombies coming for you.

S23: I think I have to rethink this.

T: Definitely, you guys should be thinking about the zombie apocalypse. ((Laughter.))

T: Brains!!!!

T: All right, S------.

S24: All the CDs go here, the usb, and kind of thinking about a turntable.

T: Yeah, having a model that can spin is a great thing. The best place to get a lazy susan is to take it off a chair that you find in the street.

S: What’s a lazy susan?

T: It’s a round thing with ball bearings that allows you to spin.

S2: Like for condiments and things .

T: I like this because you have a geodesic dome going on in your park.

S24: I really wanted to change this, but I already had this made.

T: Who’s is this?
S25: That’s mine. So it goes like this, the model goes in here, then the paper.

T: Nice.

S25: But the structure is pretty flimsy, when you do this, it just falls apart.

T: I understand, we may need to rethink this, maybe we can add some tabs.

S25: Okay…

T: And what does this do?

S25: Well you have to take this off.

T: and then this?

S25: Well, you have to take this off too.

T: No, well thinking about what they had to do to build the Milwaukee art museum, does anyone know that?

S25: […]

T: No? It’s Calatrava.

S: The bird? Yeah, with the wings.

T: I think all of these with one vertical element, it will be fine. I think it’s got some great potential.

T: Is that? No, there’s this one.

S26: There’s a joint here, and the things go in there, the CDS, and the model, and the box can be two individual boxes.

T: Oh, look at that.

S26: And here, will be a cup holder, and a pen.

T: Nice, you’re playing the long game. And it spins? And the model can go on top?

S26: Yeah.

T: Real simple, and I like that you’re thinking of, ummm, cups and pens. Sooo. That’s this four, golf clap? Have we done them all? Nice job!

T: How many of you have never used a laser cutter before this class? Nice. Okay, take 5 minutes, then I have something I need you to do, then I can help you all individually,
Everybody here? Thanks you guys, these are pretty sweet projects for a few weeks of Rhino, and a few on the laser cutter. And you’re in architecture school. So you should be pretty proud of yourselves.

T: I have a survey I’d like you to fill out, at the beginning I told you I wanted to get you what you wanted out of this, so I’d like to know if I’m giving you what you need. It’s really short, about 5 questions. I’d like to do two things, open up your catalyst site, and at the top you’ll see the survey, and then open up the mouse model that we’ve been working on.

S: which one?

T: the latest one. Or whatever you want to opens.

((Students open up the survey, and start checking off things, I see one student fill in the “other” answer on number 1. Most finish very quickly. Some talking. The teacher gets up to turn down the lights, he has the shiny mouse up on the screen.))

S: R----, which one do we open?

T: It doesn’t matter. Just whatever we open should help you to see what I’m going to show tonight. Nice. Everybody have a mouse on the screen? Or are you still copying your neighbors on the survey?

T: How may of you have been experimenting with materials in addition to all the other things we’re having you do? All of two and a half? I suggest you start doing that. I want to talk about a few things that can expedite the rendering problem. First thing is going to be a render mesh, I’m not going to go too deep into it, but it can affect how fast your model renders, I’m gonna give you the keys to the kingdom. I want you to go the your toolbar, go to the [ …]that’s the render mesh. Everyone’s should be set to jagged and faster. If you guys start seeing empty spaces, you can go to smooth and lower. What do you think that does?

T: I’m gonna give you some tips,…..((he lists out what to do))….these will give you a cleaner model, but will go a little faster. What you’ll see is that the edges of the model will be cleaner, it goes a little slower. You might want to write this down, if you guys have a pencil…

S: It’s just me.

T: Great, one pencil, twenty-eight students, just pass it around.
T: Cool, I want you to go to the round sphere next to the mesh, this will give you some
more options, I think we’ve used this before. We can turn off the lights, but still see
the layers, this will help you to figure out your model.

T: Another thing up here is anti-aliasing, anyone know what that is? It’s kind of like
pixilation. You have a line, it’s like smoothing. The higher it is, it will be cleaner, but
its gonna take a lot, lot, lot longer. For this call, you can leave it at normal, and when
you work for Disney and work on toy story you can bump it up to 10.

T: Now in your viewport, when you render, it does everything in the viewport. What I
want you to do now is click it so you have four views, zoom right in the front view, and
then hit render. What you should have a is a much smaller viewport, and the render is
much, much faster. It’s about a quarter of the size. This is a really good strategy for
being able to set your lights and to see what you’ve got. Now go back to your
perspective, sometimes you want a bigger window, you can go back to custom, if you
like lock the viewport size, and then I can choose how many pixels, and it gives me
something really small, but it goes much faster. I just saved you guys an hour next
week. This is the sort of thing, when you start really digging into rendering should
make things go quite a bit faster. Any questions?

S: If you were doing a final, what resolution would you do it at?

T: It’s like you’re in my head. That’s the next thing I’m gonna do. For your final
you’re gonna think about the size you are going to present. These are 11x17. Do you
guys know what a book is? They used to sell them in bookstores? Before we had
kindles? ((Laughter.)) Well, when you used to go to print, your publisher would ask
for 300 dpi at 5x7 or something like that. To J---’s questions, we’ll go to this, at the
top. Every program renders at 72dpi, but that can get confusing when you’re thinking
about the size. In custom, you can select the size, and the dpi, and Rhino will do some
math and tell you what the resolution will be. Before this you would have to go back
and forth in Photoshop. I’ve saved you about 30-45 minutes. Any questions? Yes?

S1: Are you going to teach us Flamingo?

T: Do you want to learn flamingo?

S2: Yes.

S3: Yes.
T: I can give you a lesson in flamingo next week, or do you need it sooner?
S4: Next week is fine.
T: What do you want to learn? Trees, lights, interiors, etc.?
S5: All of the above.
T: if you really want, you can take a class called 481, modeling and rendering, and you’ll
dive really deep. I haven’t used Flamingo since last summer. If you want 3 hours of
Flamingo I can give you 3 hours of flamingo next week.
S6: Why haven’t you taught Flamingo?
T: Why? Because I figured, how many of you bought flamingo? That’s why. Because I
don’t think you guys would have bought it.
S7: What do you use to render?
T: Flamingo. I don’t know, not so good at Vray, but I know flamingo.
T: All right you guys, I don’t’ want you to run off, I know you need to sleep, but Y--- and
I are going to come around and help.
8:17
((One or two students pack up and leave, most stay. One by one Teacher and assistant go
around the room to answer individual questions.))
9:02 ((Eight students left.))
6:33. ((Teacher is at the front of the room. Students are chatting, waiting. Very few have the program open yet.))

T: Is that a question?

S1: How come Rhino render doesn’t…((inaudible))

T: because that’s the way rhino render rolls. If you wait a little I will cover something like that tonight.

T: ((To whole class)) So how are the 16 out of 28 of you?

S2: Tired. Can we go home?

T: So let’s take a look at what we’ve got going on this evening.

S3: There’s no drop box.

T: Put in the one for final and I’ll make another.

T: Who’s is this? ((He has turned on the projectors and is showing student’s rhino generated images on the screen.))

S3: That’s mine. I did it when I was a beginner and I want to do it again.

T: Well, you have all seven days.

T: Who’s is this? D----? He’s not even here.

S5: That’s flamingo.

T: Yes. Why do you say this?

S5: Because it’s in black and grey.

T: It could be, because of the soft shadows.

T: Is L----- here?

S6: yes.

T: Oh good.

SS: Whoa.

T: Nicely done. ((A very nice render and park are on the screen.)) What did you use to render this Lydia?

S6: Rhino render.


S7: That’s G----. She said she’d be late.
T: Who’s…what am I looking at here? ((class laughs.)) Is this V-----? Is he here? What
happened to the background? I don’t’ know, because I’m not here.

T: Where’s L---?

S9: She’s waiting for critique.

T: I can’t exactly compete with that.

T: Who’s Mushi? ((Student raises hand.)) All right we need to get some naming
conventions here. What do you have here?

S10: A spinning wheel… I’ll do more later.

T: You’re studio gets in the way.

T: Who…Beast mode! ((The image on the screen is a set of goalposts with swings
hanging from them, on a grass field.)) It makes football do so much more interesting
and so much more dangerous. We have to talk about the size of your grass ((Class
laughter)).

S11: That’s my Gatorade trash can.

T: Who’s is this?

S12: That’s mine. I need to put some grass.

T: Who’s (switamoy)…Wow. Who’s is this? You have some nice texture, and the
wheel,…what is this texture here?

S13: It’s metal.

T: Who’s is this?

S14: Mine.

T: It’s nice. That is the happiest bench I’ve seen all week. What’s…is that a model? ((It
looks like a physical model.))

S14: Yeah.

T: You built it already? I was looking at it and thinking that’s the nicest render…my
work here is done! ((Class laughs))

T: What about this do you feel is different about this image? ((He has a specific image
on the screen.)) Who know what a horizon line is? Who doesn’t? Okay perfect. This
is a more realistic view of a park. Most of yours have been god’s eye or bird’s eye
views. I want you to think carefully about your views, you’ll have two or three. Did I
tell you how to save your views? ((Class murmurs yes.)) Quick, someone tell me how
to do it all at once.

T: Who’s is this? Nice. You have a nice environment map in the back, some nice looking
shadows…

T: And who do we have here…a nice close up. Is that a hand in the air, S---?

S: Yeah, did you want us to email these to you?

S2: He said put it in the final.

T: Just put in the final, and I’ll make another.

T: You can be honest, who hasn’t touched this since…((hands go up.))

S: No wait, I did work on it.

T: Who has rendering due this week?

SS: This Friday.

T: Who has a rendering due this Friday? Who doesn’t have a rendering due this Friday?

Cool. Put your head down on the desk and sit quietly.

T: How would you feel turning everything in the week of finals? Who wants to turn this
in next Wednesday? The final for this is the Wednesday night of finals. Who wants to
get out of town next week? We’ll have a minor review at the final. You three, you
four come talk to me.

T: Okay. I’m gonna start off telling you a little about flamingo, everyone wants to learn.

I talked with Jim and he said you have a day rendering and a nigh rendering due.

SS: yeah.

T: I figure you know how to do a day rendering, and the night rendering is a little harder.

What I am going to do is tell you a little about what flamingo does, we’ll do a few
renderings, and some tutorial I pulled off the flamingo site, we’ll work through them
together.

T: All right. This is not my wonderful presentation, it is from a webinar. Basically it is a
plug in for Rhino, I’ll show how to use it. How may of you have used Kerkythea for
Sketchup? Vray for Sketchup? Basically it is the same thing for flamingo, the
difference between this and the other one is it does a multi-pass. Who asked? ((Student
T: Light never stops bouncing, in the real world. What flamingo does is try to figure out what really is going on. I want to talk about layhs questions ((class laughs)) I’m sorry, I am a star wars fan, and in some movies she’s leah, and in others she’s leeah, I’ll get your name right by week 11. What flamingo does, is with additional passes, things start to diffuse, and flamingo gets in there and starts changing things. (…) By the 45th pass, there is something completely different. This is something I would write down…about 12-15 passes is enough for an industrial design project. For an architectural exterior 15-20 will give you a really nice render. Interiors are the hardest, 25-30 will give you (…) there are a lot of things going on, a lot of reflections, a lot of shadows. I would write this down, www.flamingo3d.com this software is six months old, if you have a question lots of other people are working on this, your neighbor might know, but if not, we may need to go to flamingos 3d. T: Notice in this, we have clear reflection, and sharpness will allow you to choose between clear, or dull and scratch. See this? Anyone know what fresnel is? It’s pronounced “frenel”. There are different areas that turn white – there are darks and lights, we call that chiasscuro, if were going to Italy, right? Even your clothes are going to have a highlight, that is known as fresnel. Flamingo next, you can add transparency, if someone is studying architecture, and I think of using glass, that is the key to making your glass look good. Whenever you’re making architectural glass, you go to index of refraction and make it 1.35. if you’re making a diamond, it is 2.2. Air has its own, it’s zero, you guys don’t need to know that ((smirks)). Have you ever seen someone with a beverage, you basically have a diffraction for the beverage and one for the glass.

T: Who’s gone to flying architecture and gotten a bunch of textures and had a lot of things going on? L------. Basically flying arch does layered materials you will download three things: you get a diffuse map – that is the texture, you get a normal map, have we talked about normal maps? This class goes pretty fast. A normal is basically perpendicular to the surface. ((he draws on the board.)) If you have a sphere, the normal will be completely different. If you have something shaped like that, the
normals will be completely different. Based on the shape it reflects differently. What a normal map does, it tells flamingo that it wants to reflect in different directions, it is basically a way to get pretty nice objects without too much computation. A specular map, it’s black and white, it will control the reflection. The shiny areas, are white, the areas that a little duller, are the black areas. We don’t need to go to terribly deep into this, but I want to be sure that these are covered. I’m going to show you how to take all these things in one fell swoop, and make something.

T: Remember we took those HDRIs, and put them in our renderings, flamingo does that as well. When we take these environments, it reflects differently, This cup and saucer. This sin an important safety tip you guys, you go online, www.food4rhino, get some nice night images and you’ll have an evening scene reflecting on your model. Hopefully with the next couple days you can get a nice nighttime HRDI. We will talk about how to actually do that.

T: How many of you guys have been trying to put lights into your models? It’s kind of a pain. Basically you can just put an object in and tell it to glow. I’m gonna take a building, and tell rhino that I want the windows to glow and they’ll glow like lights. Another thing is you can take this channel, I’ll put the sun on this channel, I’m going to put the lights on this channel, and you can control these. Something that we are not going to cover, we would if you take the rendering class, its called caustics, getting refractions off of transparence or semi-transparence. You can get the lights reflecting through.

T: There’s a couple different engines in flamingo, there’s the default I’d suggest you use that, there’s also a path tracer. What the default does is on the first pass, you get a harsh shadows. With path tracer, you get a soft shadow, but the image is really noisy. If you wait for more passes, the noise goes away. If you wait four hours on either, they’ll be good. Block objects don’t count as memory, they take less time.

T: How many of you guys have done photography, digital photography, worked with a camera raw file? You can save your rhino file as a native nxt file, it’s just like a raw file. We won’t need to worry about that.

T: One thing you can do with flamingo is that you can pause a rendering. Then you can adjust from a day to a night and continue. There’s also a histogram, just like in
Photoshop. We’re going to do that all in 2 hours and 10 minutes. Are you ready?
We’re going to go to the catalyst site, do one rendering, and then I’ll give you guys a
break.
T: I want you to get the fishing reel on the catalyst site, and the we’re going to render
that. Oh, it’s not applicable to you what you’re doing but it’s a good start, and you can
get more a less an idea of what you’re doing, and then we can do an architectural
render and day render, a night render, I’ll show you guys some bump maps, and if
there’s time…we can do decals.
T: Make sure you pull it out of the zip file. ((Everyone is downloading the file from the
site. Instructor has some issues.))
T: All right, no I did not make this one. I’m gonna walk you guys through a tutorial you
can find on line, so if you get confused or befuddled you can go online and find this
tutorial. ((He opens the file…it looks empty.) Where is it? ((Students have theirs
open, they are looking around.)) T: Am I the only one that doesn’t have this open yet?
SS: Yup.
T: Seems we have a lot more people in here now, yeah? 1,2,3,4,5,6,7…
All right. Awesome. Everybody has this up?
S: Yes sir.
T: All right, my dad’s here. ((Laughter.)) T: Let’s get our flamingo on. Go the to the
bottom, see where you can choose form flamingo next, (….c)lick on that, got to control
panel, a nice big control panel should pop up, there it is…and there a lot of similarities
between rhino render and flamingo, that why I has us dip our toe into rhino render.
This will let us choose materials, textures, lighting, daylight studio lighting, it will
allow us to use backdrops, we can change our rendering, just like we did before. But
what we really want to do here is working on materials. Click on render front, and I
want you to click on the render tab.
T: Who’s been messing with flamingo?
S: I’ve just done some trees.
T: I know, trees are money right? No one else? Who’s been messing with rhino - oh
good, two students. You can see that this is rendering very quickly, because there
aren’t very many lights yet. ((He continues to discuss the different buttons.))
S: Can you repeat that please?
T: Ahhh, which part? Hi, my name I R----?, welcome to 380? Don’t worry I will go back over that again.
S: I was getting worried.
T: everything you hear from me tonight you will hear at least four times.
T: Let’s go into the materials, the very first thing well do make sure you go to the materials tab, there’s a little sphere, click the tab next to the sphere, you’ll get a whole lot of options. I’m going to make it simple, and make it gray, then I’ll go to advanced, and you can see you can select the highlight color, the intensity, it’s a bushing I’m going to make it (…)
S1: Roark?
T: Yes.
S1: It won’t let me change the highlight colors.
S2: it’s (..) the intensity
S1: Oh.
T: You good?
((He continues to demonstrate different steps by step.))
T: So what I’ve done is this part right here.
S2: It’s a good looking part.
T: What’s that?
S2: is a good looing part.
T: Yes, it is. Who was asking me about metal? This part here is metal. I’m gonna click advanced, and make this…
S3: What’s the difference between intensity and fresnel?
T: Fresnel is the highlight on the - see the bottle in front of you? See the white parts? That’s fresnel.
S3: Ohhh.
T: Check it out, now I have two materials. Do you remember how to assign these to layers? I can right click or I can drag it.
S: Whoa.
T: Yeah, I can do it two different ways. But wait there’s more! ((Students laugh.)) I can also take this and drag it on to the objects – in theory it will work, last night it would.

S: Is it cause it’s locked?

T: It is because it locked, good job. You get to go to Rome for your prize. ((She’s the student that had mentioned she needed to turn in work early because she was leaving for Italy.))

T: So you guys can take these materials and move them around your model. I’m gonna work on my grips now.

S2: Does this work better than importing materials?

T: Well, how long would it have taken to go into Photoshop and made a material. And if I send you this file, all the materials I made will be in it too. Not like InDesign when you open it an go, where are all my images? There are a lot of ways to do anything so you can decide what works. Does that answer your question? S

S2: Yup.

T: Yup.

(He goes back to making materials for each of the parts. He calls out each step, going back to the sphere, saving, hit okay, rename, etc. He does the handle, metal parts, the rod.) T: As you can see, we’re getting a nice looking fishing rod. ((He goes back to making and assigning materials.)) Now I’m going to go here, and this place is where you can assign bump maps. I’m going to go here to bump patterns, and I’m gonna choose rubble, and I can assign it, which one was I doing? Sometimes when you’re assigning, it doesn’t necessarily render. Go ahead and render and let’s see what’s popping up.

S: You clicked the wrong one. You have two grips.

T: I know. I’m glad you guys are paying attention. I’m too busy doing this.

S: You still did the wrong one.

T: Which one should I do?

S: down, down…

T: This one? I want to go home.

T: to answer J---’s question, is it better to work here or to bring in an new texture, let’s bring in the cork texture that they gave us. I’m gonna go here, and I’m gonna click the
first one, I think I stuck it on my desktop, it should be in the file that you downloaded, that’s the texture map you’re gonna put on the handle, hit okay, hit okay. I’m gonna assign it to a layer, cool. Once you get that on there, go ahead and give it a render, see what you have.

T: So you guys see how on the first one, when we did have material, we would have been on pass 12 by now. But it’s starting to look pretty darn nice. If we go to pass 15 it’s going to look pretty nice. I’m gonna stop it, and get out of it. How are you guys doing? All right? We can get to these later. There’s materials, lighting, a render tab, an environment tab, (….)

S: Is the refraction different for different materials?
T: We can go here and check the index of refraction, it’s 1.35, and if you did diamond, you’d do 2.2, glad you’re listening. And air is?
SS: Zero.
T: And it disappears.
S: What’s the difference between the “new glass” at the top and ones down there?
T: I don’t know I just started using this.
S: Well, glass is pretty important to architecture.
T: well, McNeel is really good about allowing three ways to do everything. This is probably one of those ways. That’s my final answer, I’m sticking to it. Now let’s add in the deck… ((he adds a few more. )) Let’s render. ((the class goes oooh, ahhh, because it looks so good.))
S: It has those lines.
T: Yes it does, it makes it not so cool.
S: How did you give it a ground plane? ((T walks him through the steps.))
T: We thought it was cool, but it wasn’t so cool because of the lines, it’s basically where the image ends. We can go here and do mirror, and it will take care of some of those. Now let’s re-render.
S: Can you go back to your materials?
T: Let’s go back to the ground plane. I’m going to go to environment and select ground plane, it puts the object on a ground plane, and then it lets’ you pick an image. So I go over here to material, and that basically opens my materials editor, ((he continues to
re-demonstrate the materials, texture maps. He draws on the board the idea of the tiled image that created the lines.)) So make sure that you select mirror tiles, and that will make the grain match up a little more.

S3: Is there another way to get to this window? It seems like the only way to get to this is to click on the desktop.

TA: You have to create a new material, and that allows you to select that.

S4: Will it reflect when you add lights?

T: Well, it doesn’t reflect the way wood would, because it doesn’t have a displacement map. If I went through the trouble of making a displacement map, then it would reflect like it should, does that answer your question?

S4: Yes.

T: Now let’s go to the lighting tab, let’s change it from studio light. Let’s pick exterior daylight. Go to sky. Seattle is basically a (...) the sun, it says 2, you guys are still in studio. Leave it the way it is and lets render. If I remember correctly, the sun is behind it. Let’s get this and move the shadows behind it, I’m going to the azimuth and attitudes – it’s got attitude - and I’m gonna move this, and then hit render, and see if I’ve changed my shadows a little bit.

S: It’s got no shadow.

T: I don’t like that. What did I do?

S: You put the sun underneath the ground.

T: I put the sun underneath the ground? That’s power.

S: You need to have a positive attitude.

S2: The altitude.

T: I can have a negative attitude if I feel like it.

S: It’s under the ground again.

T: Now, oh, the line is the ground. Good, you guys are paying attention. That’s much better, my attitude is more positive. Tell you what you guys, whose head is full?

((Makes exploding sound)). Take 7-10, when you get back we’re going to do an exterior rendering.

7:55
T: Okay, a couple of things, go back to the catalyst site, and download the exterior rendering.

T: Who wants extra credit? ((Almost all hands go up.)) Myself and another graduate student may or may not want to use your projects in a thesis. If you would like to give us permission, I have forms. And you can let me know if you want credit or not. If you want credit, where I can name you, I will, if you don’t want it, you can say anonymous. So once you get that thing open, go ahead and hit render, while you guys are filling out your forms. All right are you guys ready to roll? Y---, can you collect those forms?

T: All right you guys, anyone not have this open? Get on it. Hold up. Oh wait, you want extra credit? Yes.

T: Are you ready? Roark’s about to talk. You see we have pass 15, it looks pretty good. Go ahead and stop it, adjust the image, once it stops, it takes awhile to stop it.

T: Brightness and burn, that’s where you’ll make the change, for a good night, I’ll like to go to minus 65, I’m making it darker, darker, and darker, if I like it, I can go back to resume render, and it goes back to that brightness setting, and it continues to render.

T: I’m gonna go back, and go back to 0.1, and then aim gonna get rid of it. Go back to flamingo, go back to your control panel, most of the materials have been assigned, we’re going to concentrate on lighting.

T: I’m gonna right off the bat go to daylighting, and let’s give it a quick render. The first one that we did was studio lighting, this one is daylight render. I want you to go back and experiment a little. You can take these models, import your models, from your studios, and then use these.

T: Yes?

S: Can you remind me how to (inaudible)

T: Yes, you go back to the bottom of the render window, you can select flamingo next, rhino render, or (…) ((he goes back to the students desk to help her find the panels.))

T: All right you guys. So I don’t know if you noticed, but the last time we did the render, the area under the eaves was a little dark. I want you to go the advanced, and right under here under indirect, where it says method, hit exterior, leave the ambient the way it is, and do a quick render. You’ll see that the deep shadows will get a lot clearer a lot
quicker. But if you’re really struggling, with that, try to remember what was that trick the Roark taught me? Part of this is in the tutorial part of it is not.

T: Yes, from the peanut gallery.

S: can you do that again?

T: Go back to lighting. ((he repeats it.)) As you can see this takes a while, so let’s forget about that. Go ahead and go to your top view, I want you to go to your layers, I want you to go to your site, and I want you to unlock it. I’m going to show you how to do some trees, who wants to do trees? Come on, more than that. It’s 8:17 on a Wednesday, you need to party more. Okay, go back to your standard view, put some points down, but they’re on the construction plane, not the undulating surface. How do I get those down?

S: Project.

T: Yes, thank you for using applied knowledge. Select your points, select the surface, and you’ll see that the points are now on the surface.

T: Okay, go to flamingo next, go to plants insert plant, and you can select your plant. I’m gonna go for large, and why not. I’m gonna make sure my point snap is on, and I’m going to take these trees and put them on these points. It’s literally that easy. You guys are wondering why aren’t you teaching us trees? Because that’s easy.

T: Now, I want you to be leery of this, these trees are -

S: Big.

T: That’s right. You can either copy them, or make them into blocks so they don’t take up memory. If your trees aren’t the right size, you can scale them, go back to your perspective. I don’t like the snow, in this particular case I don’t like snow. Take the grass that is in there, assign to layer, assign it to your site.

T: Get a really good view, and hit render. Yeah you guys, please resist the temptation to get carried away with the trees.

T: Yes, J---?

S: People?

T: People, trees. Basically anything that is entourage is something that gives scale to your model. How many of you are planning to put a little person in your model? ((No one answers)). Oh, good all 27 of you, hint, hint.
S: What is your recommendation on grass? Cause ahhhh.

T: What is my recommendation?

S: Because it really doesn’t look good.

T: I’m still wrestling with that. I would suggest going on to flying architecture, see what you can find, maybe change the scale, mirror it…

T: Okay, let’s go back to your panel, and on background tab, where it says sky, and says solid color, make it black. So a quick render, what do you thing we’re going to get?

Anyone know why you would want to render in one solid color for the sky?

S: you can mask it?

T: Yes!! You can go back into Photoshop and then delete and add in the sky that you want.

So. Let’s go ahead and turn this into a night shot.

S: Yay.

T: Yay. Under the environment tab, and you probably want to write this down. I’m going to go to hdr, I’m going to look for the darkest one, and select it. That’s going to give me a good night shot. Right now I’m going to choose sky, and leave it at that.

I’m going to go to sky, select that, set our location to earth. We’re setting our location to earth, don’t get lost. I’m going to make it 1:00 a.m. I’m going to go to advance, make sure the sun stays on, sky level it at auto, and go down here to ambient, make sure it says exterior, and says lights, on, take a look at that, pull out your phones, take a photo of that.

T: So now, I’m going to go to windows, unlock the windows, right click on that, and say select objects. I should be able to highlight every single window. Now, with those windows highlighted, I’m going to go to flamingo next, go to lights, select tag objects as lights.

S: Can you do that again?

T: I will, but let me make sure I haven’t screwed it up. Because I’ve done this a lot of times. Yeah!!! It worked. I just saved you guys about three hours. I want you to work hard on your finals.

S: Can you take a picture and use that as a material?

T: Yes, you can. Did you guys hear that question?
S: No.
T: you didn’t hear that because you weren’t listening. Someone asked if you could take
your own picture and make it grass. You would have to take a really large picture to
do it.
S: Can you change the color of the trees? I mean if I wanted to make the trees dark or fall
like.
T: So guys, if you want to change this, you can take down your brightness and you’ll see
it become more like night. Oooohhh ahhhhhh.
So what I want you to look at here, each one of these windows is a 100 watt light, you
can change them to like a 40.
S: Can you select them all at the same time?
T: I’m not sure yet how to do that.
TA: you basically go to the object and (…) ((she walks to the student and talks to him
directly while the instructor continues.))
T: You can do it in other ways, with the walls with the floors, but the windows seem to
be a good way to do it. You can also leave some windows dark and work with it like
that. Do you want me to do that again?
S: I figured it out.
T: Does anyone want to see that again? Let’s do that again. We’ll control Z for a while.
You guys remember how to do trees, right? ((He runs through it again.))
S: My sky is yellow.
T: What? That’s not right. ((He goes to her desk to help.))
((He continues to walk around, students are waiting for their models to render, talking,
looking at their results. Some have done dusk, others have done different views.))
T: So, you guys are good for Friday, you’re good for your day rendering, you’re good for
your night rendering. Do you want to do texturing, do you want to go to flying
architecture and learn how to use those three images?
S: Yes.
T: You want to keep going?
S2: No.
T: Who says no?
What was the problem with the last 3 Star Wars movies? Well first was Jar Jar Binks. (Laughter.) They were too slick. The first 3 were gritty, they were dirty. I’m sure George Lucas thinks of me when he’s working on his movies.

T: Let’s go back to Catalyst and download the graffiti tutorial, we’re going to tag some things. Open brick starter. Yes, I did make this model. I don’t know why I gave you this model. Open Rhino and make a square. (Class laughs.) You can all pretty much do that by now. That’s why, make a cube that’s eight feet tall.

T: We’re going to take this and make an awesome brick building. I want you to go to a new texture set. Go to new texture material, and go back to your file and get bricks red. You’re going to get all the files, the texture map, the normal map and the diffuse map. The nice thing about Flamingo, you can select them all together, and it brings them all in. I’m not going to worry about anything else, I’m just going to hit okay, I’m going to name them red bricks, I’m going to assign them to a layer. Hit okay. I’m going to hit render, and you’ll see that the render will have a nice brick building. Now the temptation is to do this all over your model, but resist that, it takes a long time.

T: Click on the building, go to object properties, and you’ll have object, material, texture mapping, click on flaming next decals, and delete both those things.

T: Zoom back in and render it. Take a look at it. You can see there is still quite a bit of texture, you can see that everything looks three dimensional, L----, where are you? You were asking about the corrugated metal, this may be the way to do that.

T: Go to (…) we’re going to make a decal. Go to flamingo next decals, select the image, and then you’ll click three times, two at the bottom and one at the top. I’m going to turn on my ortho so it goes straight up.

T: You can do this same thing, and create your semitransparent people you’re so fond of and put them in your model, rather than in Photoshop.

T: Now let’s do the same thing and do some grunge. We’ll select the image that shows grunge, you’ll see the green, that’s where the regular brick will show through. It’s basically easy, you just use the corners of the windows.

T: So, while we’re waiting for this to render, is there anything else you want to learn for your presentation for Friday.

S: Can you put the presentation on the website?
T: Yes the presentation is on the catalyst site.

T: All the tutorials are on the flamingo next site. They’re all the same up until the trees. That’s not on there. The night rendering, the lights, that’s not on there.

T: Who wants to turn in projects the Wednesday of finals? ((Almost all the hands go up)). Who wants to turn it in early? ((One hand goes up)). Those of you that want to turn it in early, come talk to me. When are your presentations due?

S: Friday.

T: Tomorrow or next?

S: Next.

T: Okay, basically, don’t do anything - wait I don’t want to say that – don’t worry about anything until after Friday. Tell you what. I’ll open up a dropbox, start throwing things in, and try to make it to class next week. Otherwise, I’ll see you the Wednesday of finals week.

T: Okay, in 2 hours and 35 minutes, that’s flamingo 101. Thanks you guys for sticking with me. Y--- and I will walk around and answer any questions.

((About half the class packs up and goes home. T and TA start making rounds in the room, answering any last questions.))
Supplemental Material B7. Classroom Observation 7

1 S1: Some of the other students are still in critique.
2 S2: Yeah, she just figured out that we had another class.
3 T: You’ve always had class.
4 S2: Well, she just assumed that she could keep us late. She asked if they could do it tomorrow.
5 T: The other 20 students?
6 S2: No, the three in my class. So they should be coming in soon
7 6:35 ((Other students are coming in. One student comes up to the desks in the second row. He has been rendering on 3 computers for 11 hours.)) S3: Oh, sweet! 11 hours and 13 minutes.
8 T: 19 out of 28, that’s pretty good. Anybody have anything they’d like to show? Up on the big board? How is everybody tonight? Sweet? Let’s start with a sliding scale where bad is the best it can be. Who’s worse than bad? Who’s the best?
9 T: Your renderings are washing out? Did you get to the bottom of the speckled thing?
10 S4: Huh? Oh, I used the speckles.
12 T: I sent out an email about that.
13 S4: Yeah?
14 T: Did you read it?
15 S5: Some students are still having desk crits. Will they be coming in? Maybe, maybe not.
16 T: thank you.
17 T: Who can take responsibility for this? ((He holds up the survey envelope.)) You can basically just slide it under the door. ((Teacher passes out the student surveys.)) All right, I’m going to get out of your hair….pencils? I’m amazed at the number of students that don’t have pencils.
19 S: Can you spell your name?
20 T: write my name on the board?
21 T: I’ll come back in 10 or twelve minutes. If you’re done.
((Students are all doing the surveys. There is talking, but not really about the survey or the class. They are talking about the crits they’ve just come from. All heads are bent over the desk. Student in front of me is re-rendering his model. ))

S: It’s in our major. Right?

S2: Unless you’re in construction.

6:46

((One by one the students put the surveys on the table at the front of the room. In the back row there are students talking about data, about the air content.))

S: I thought AC meant air conditioning, but then I realized it was air content.

S: I’m like really nervous. Every time I use the laser cutter it (works?). This is like the third time. I’m gonna have to do it by hand.

((Getting louder.))

S3: Get some sleep A--! Go to bed. ((Giggles.))

S2: Whoa…

S: I don’t know if I need to change the color. Also, it should be darker. That looks pretty dark.

S5: Do I need to collect these?

((Teacher comes in. ) T: is it safe? Can I come in?

S:5 Yeah. ((He goes to the front and turns on the projector.))

T: All right, I wrote out everything I expect to see next Wednesday, it is right next to Waldo. We’re having trouble with this screen, so I will write down to the best of my ability what I expecting. Nothing should be a surprise.

T: Your cool box, your park model maquette, that’s a fancy word for model. Two pdfs,

S: It’s two?

T: It’s always been two.

S: I thought is was four.

T: would you like to do four? So you feel like you’re not getting your money’s worth?

We can make it four.

T: 11x17 park presentation. Two, a presentation of your park presentation. You all have mad InDesign skills. On your second 11x17, show me your diagram, the model, basically think about your box like a building. You had to think this through, explain
what the box does, explain the relationship between the box, the model, and the
presentation.
If I’m lucky enough to get to teach this class again, imagine that I use your presentation
to show exactly what I’m expecting. Bam! Then the next class knows exactly what to
expect. That’s an instant A.
Turn in digital versions of your PDFs, and your rhino model, CD. Again this is off the
top of my head.
S: Can it be a USB?
T: Instead of a CD?
S: yeah.
T: Next Wednesday bring your study models as well. I really like to look at the process
you went through to get to where you are today.
S8: Aww, man!
T: Who through away their study models? Show me what you have. Finally, the most
important thing, he writes extra credit on the board, at the very bottom there is room
for you to drop in anything else that you want me to see. Put that in there.
Then lastly, there is one more survey. I know you guys have just finished a survey, but
this will help me if I decide to make this class a thesis. It will show me that you’ve
taken it, but not who you are, so you can write anything that you want to.
Are you guys using these skills for your reviews?
When are your studio reviews?
S9: Friday 1-5, Architecture hall.
S10: There’s another one on Monday, 1-5:30 the studio on the right.
T: And Tuesday?
S10: Same place.
T: Do you mind if I come?
S10: Say good things.
T: thank you for your hospitality. All right guys, I know you probably will run off to
your studio, but I would really like the chance for me and Y--- to go around and help
you with your last questions. Who’s first?
((Student working on his 3 computer renderings puts his hand up. ))
((Most of the room is still full. Students keep asking questions, and also working. Both Instructor and Assistant are helping as the can.))