# Lesson 2 Notes

## Introduction to Conceptual Models

DON: Hey Kristian, want some water?

CHRISITAN:  Hey Don, yes please.

D:  Sure.

K:  That's a fancy teapot.

D:  Yeah, it's one of my favorites. Oh I'm sorry it doesn't have much water.

K:  I'd like a little bit more than that.

D:  Well here why don't you fill it and I will explain more about this coffee pot.

K:  Sure.

D:  So. This is a joke. It's one of my favorite jokes. It's sometimes called a Coffee Pot for Masochists, it was done originally by a French

artist and this was a copy made just for me, and I've used it for the cover of my books.  I love it so much!  You know, what's nice about it is it's obvious that you grab the handle, it's obvious that this is the spout, but it's also obvious that it's the wrong way, it won't work. The conceptual model is clear and it's clear that it, well, that it's a joke. It's impossible on purpose.  What's the matter?

K:  Well, it doesn't have a place to fill.

D:  Yeah. I know.

K:  So...

D:  I'm not sure I recommend that.

K:  Okay. Then the other choice is at the bottom.

D:  Hm.

K:  Which I'm going to try.

D: Uh-huh. Good. Seems to work.

K:  So far.

D: Hm.  That's a funny way to use a teapot.

K:  Yeah, that doesn't seem to work.

D: That's not the way I used it before...

K:  Why doesn't the water drip out?...

K:  Well, look at that...

D:  So, how do you think it works? What's your conceptual model for the way it works?

K:  It's a mystery.

D:  Hm, it's supposed to be a mystery. It's called a puzzle-pot. The Chinese invented a togo about 400 years ago, and this is a copy. And, you're right, there's no obvious way to put the water in you don't really want to put it in there, and you turn it upside down and there's a hole

K:  [LAUGH]

D:  You pour the water there, you turn it upside down, the water will flow out.  So if I do that, how does it work?  You're not suppose to be able to figure it out, that's the whole point, that's why it's called a puzzle-pot.

K:  So, this was designed by a trickster. A good designer, and this is the challenge for design. Will design things such that somebody can have an effective conceptual model and understand how it works.

D:  Or, go out of the way so you don't have a model, if, in fact, that's the goal, you know, to fool you.

K:  And the only way a designer can communicate is through the objects that they design. And there is the challenge, and what this lesson is about.

# Chinese Puzzle Pot Quiz - How Does it Work

For the Chinese Puzzle Pot, you can pour water in the bottom. And turn it upside down, and no water falls out. How do you think it works? Draw a picture of the inside of the pot showing how it works.  Now remember, you have to solve two problems.

First, if you pour the water in the bottom, it doesn't come out of a spout. When you turn it around, the water does not come out of the hole in the bottom.

But you can then pour it out of the spout.

So, your diagram for how it works has to solve both those puzzles.

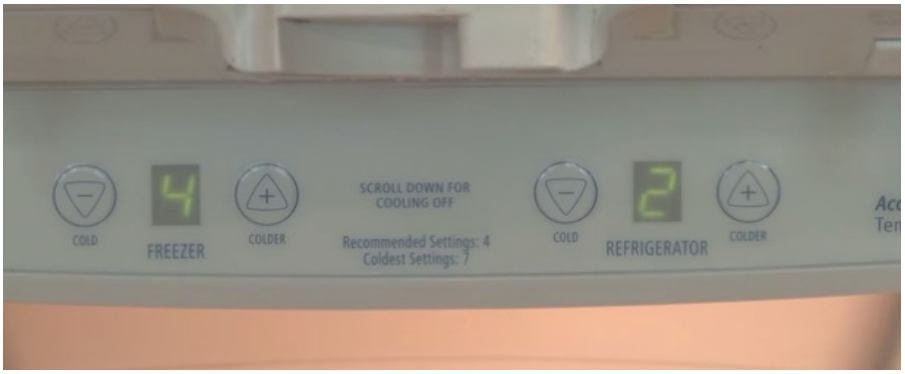
Post a link to your drawing or write your description:
https://design101-forum.udacity.com/t/what-does-your-model-of-the-puzzle-pot-look-like/44

# Chinese Puzzle Pot - Solution

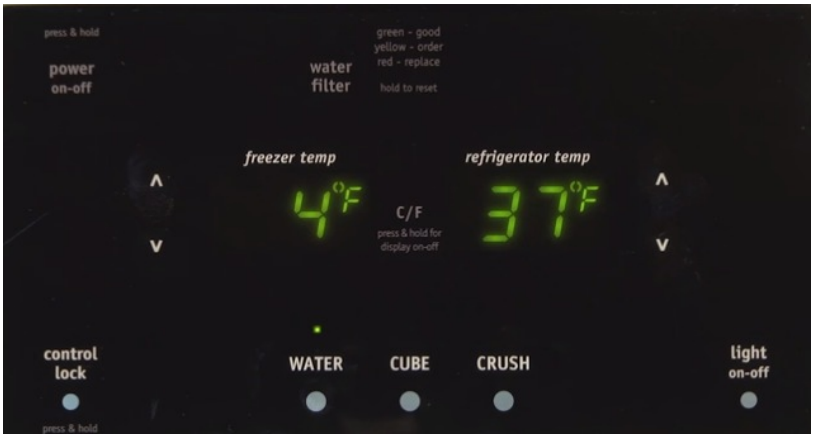
So, you want to know how the Chinese puzzle pot works? Well, I'm not going to tell you. It's a puzzle. I want it to remain a puzzle. You figure it out. You might even ask some friends to try it, and listen to their explanations. But go to the forum. That's the place where you talk about it. That's where all of you might get together . And maybe, the person who does figure it out might share the answers with you. They might also share some wrong answers. So, try the forum.

# Conceptual Model Tour - Refrigerator

This is the kitchen area of the Udacity. Coffee machines and two refrigerators...well let's go look at them. Look inside the refrigerator compartment, two controls. One labeled freezer, one labeled refrigerator with numbers four, two, what does that mean? How do you use it, how do you set it? It's a bad conceptual model.




Now interestingly enough, Udacity has two refrigerators and they have different models. The other one has the correct conceptual model. Here, let me show you. This refrigerator has controls on the outside. One marked freezer, with temperature at four degrees Fahrenheit. The other marked refrigerator with a temperature at 37 degrees Fahrenheit. Makes it really easy to set. Really easy to understand exactly what is happening. This is a good conceptual model which we also discussed in the lesson.




**NOTES:**

Pages 28-31 of the revised edition of Design of Everyday Things.

# Definition Conceptual Model

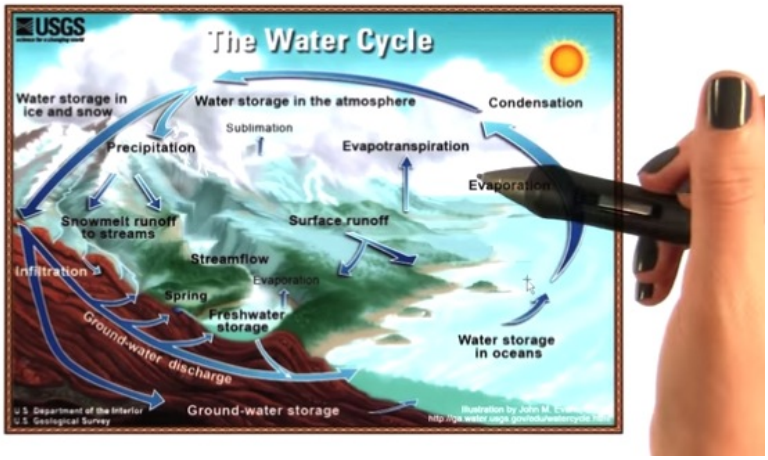
Don just provided examples of a good conceptual model and an ineffective conceptual model, using the two refrigerators at Udacity. We'll talk more about why the ineffective example, was ineffective in a moment. But first, let's step back and talk about what conceptual models are. So a conceptual model is an explanation usually highly simplified of how something works. Sometimes conceptual models are inferred from a product itself. Sometimes they're learned over a course of time. In other situations they're passed down from person to person. They're really good at helping people predict how something will work and what to do in case something goes wrong. I think conceptual models will make a lot more sense, if I provide an example.

**NOTES:**

Pages 25 – 31 of the revised edition of Design of Everyday Things.

# Find a good conceptual model

Here's the water cycle model. Which you were likely taught years ago while in school. As you can see, it explains that water in the oceans evaporates. Forms clouds. And then goes back to earth as rain, ice or snow. And eventually, through rivers and streams, the water goes back into the ocean. This conceptual model is a highly simplified explanation. But for most purposes, it's efficient. People form conceptual models all the time. And it's the responsibility of the designer, to help the person form a useful conceptual model. It doesn't have to be complete. It can be an approximation. But, it has to be usable. In the absence of clues from the designer. The person is very likely to develop an inaccurate model. Which means they will eventually be confused. For your next exercise, find a reasonably complex activity that you frequently




## Find a good conceptual model

Find a reasonably complex activity that you frequently do and explain your conceptual model for it using text and/or a drawing.

do. And explain your conceptual model for it. You may use a combination of text or drawings. Organization of your kitchen, how you sort things in your room. Or the operation of the equipment in your entertainment center. Are all good examples of everyday situations, that can be amazingly difficult to explain to others. You can use one of these examples, or choose one of your own.

Post a link or drawing here in the forum!

NOTES:

This diagram of the Water Cycle was created by the United States Geological Survey and can be found at:http://ga.water.usgs.gov/edu/watercycle-screen.html.

# Tog and the Bowl


DON: You know, one of the things we, both of us have talked about for a long time is the importance of a conceptual model.

TOG: True.

D: And, the fact that, you know, the designer has some model of what this thing is, and the person using it is trying to figure out what the model is, and the only thing, to go on, is the device itself. And, you said you had trouble with this. And it looks to me like it's a pretty straightforward bowl, so what's the story?

T: Well I, I came across this at a hotel in, in Stockholm, Sweden. They had a whole big stack of them jumbled up

for us to put our breakfast cereal in. And so, I made the mistake of putting my breakfast cereal in it. I happen to have some cereal here. I poured the the cereal into the bowl, and then I added some milk. And I do like my milk, so.

D: All the way up to the rim.

T: Yeah, because that's just the way I like it and then I put it down on the table. [NOISE]

[LAUGH].

T: Because, the base of the bowl is at an angle to where the bowl is. Now that does not require a warning notice. That requires a redesign.

D: So the conceptual model of a bowl is that it's flat.

T: Yes.

D: And horizontal. And that's what people expect. And as long as you're holding it this way, it looks like it is, right?

T: Yes, and particularly the way it was jumbled one bowl on top of the other.

D: You were, you were holding it in your hand when you filled it. If you had filled it while it was on the table, then it would have been okay.

T: Right.

D: Except, you maybe couldn't have put as milk in as you want.

T: Yeah, but this is a breakfast buffet, so you're standing there with the bowl in your hand. Now what it was intended for was to make a nice presentation for having the chef fill this bowl and then a waiter bring it out to your table. So they pressed it into a different service.

## NOTES:

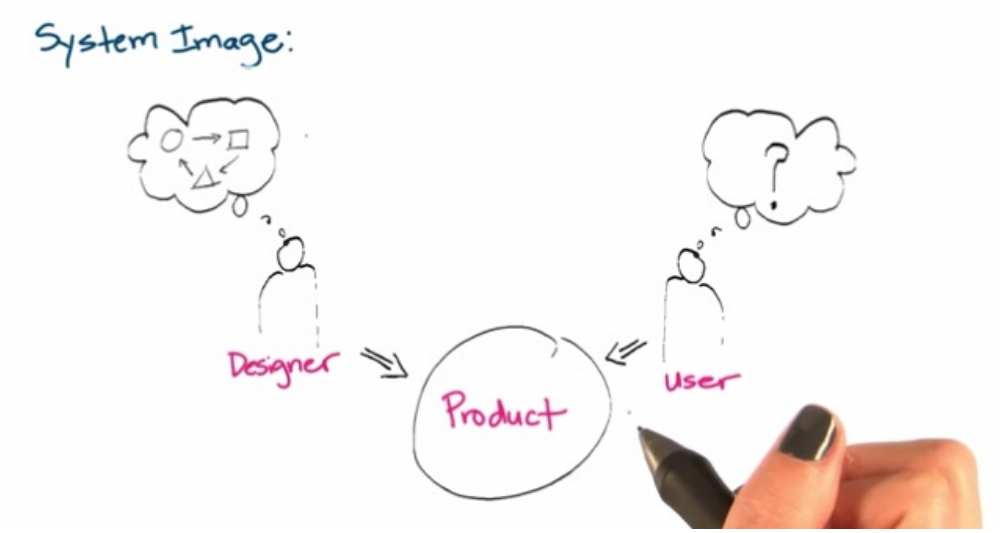
Here, I (Don Norman) am interviewing Bruce (Tog) Tognazzini, one of the very first user interface designers at Apple and holder of numerous patents (57!), articles,

and books on interface design. He works with me as a principal of my company, the Nielsen Norman group.

To learn more about Tog, visit his website:http://www.asktog.com/

or see his bio at: http://asktog.com/atc/about-bruce-tognazzini/

# System Image




The designer has a clear conceptual model of how a product works. But when users interact with a product, designers aren't present. Users have to get their conceptual model from the product system image. When interacting with a product, we can't talk to designers to understand their conceptual model. So we rely on whatever information we can find out about the product. From it's shape, form, signifiers, affordances and even instruction manuals. This information combined, is what we call the system image.

# Example of a Good System Image

Go out in the world and find a product, you think provides a clear system image. Share your example via the discussion forum, in whatever format you like.

Post your example in the forum!

# Example of a Good System Image

Here's an example of a product I think provides a clear system image. What if you were in a meeting room or cafeteria, where someone was having a heart attack? The room had a heart defibrillator on the wall, which you're seeing here. But let's say you had never seen or used one before. What would you do? Those who designed the device aren't present, no medical personnel or trained responders are around, and anxious helpers don't have time to read a manual, not even a simple one. Here's a product where designers have to communicate the proper model of operation quickly. So what you're seeing here is the solution the design firm IDEO came up with for defibrillators. The device walks users through three steps, each clearly marked and numbered. The screen, visible here, with the number two, gives specific instructions as users are interacting with the device. And as you can see from this diagram, two electrodes needs to be placed on the patient and the diagram clearly communicates where they need to be placed. It's pretty straight forward.


# Chelsey's External Fixator

DON: You know, Chelsea, I bet our students are very curious about what this device is that you're wearing.

Chelsey: Yeah.

D: An external fixator, that's what it's called?

C: That's correct. Yeah. It's kind of hard to miss. When I was a kid, I injured the growth plate in my arm. And as a result,

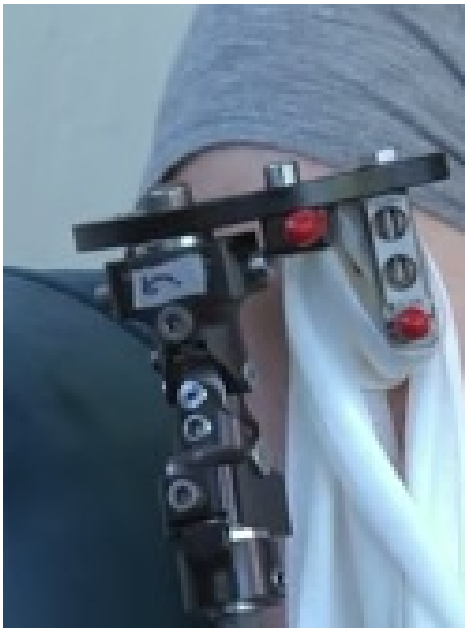
my humerus stopped growing. So I was missing two and a half inches of bone. And recently I had what's called limb lengthening surgery. Which involved an orthopedic surgeon re-breaking my humorous. I know, it sounds awful. Attaching this device, and then ever so slightly over the course of several months, would make adjustments to the device. Which would spread apart the bone and as it healed it, just filling in that missing two and a half inches.

D: So, you have to make adjustments to this.

C: Yeah.

D: And you know, one of the things we talk about is that whenever a design has to have external labels. Somebody has to put on special labels. That's a sign of poor design. And I see there are several labels you have, and what makes them even worse is that. You can't even see them.

C: I can't. So making adjustments is a very intimidating process. If I do it wrong there can be serious consequences, so I asked my doctor to help me out by adding these labels, but when I left his office I realized, oh, I can't see the labels. So, yeah, I sit in front of a mirror and look at the them, just to remind me which direction and which bolts I need to adjust.



D: So you have to take a hex wrench and put it in here.

C: I do, in this tiny little hole. And you can't see it as you do that. And some of the holes are so close together that I can put the wrench in the wrong one.

D: So, you know, this is a good example of some of the design challenges we face in the real world. On the one hand you'd say, well, why isn't that design so much easier for the patient than the physician? On the other hand, you know, if you're making a million devices, it's fairly easy to spend a lot of time and effort to make it easy for the people who use it. But I don't know how many of these are made. Not very many. And probably each one has to be specially tailored for the patient. For your particular problem.

C: You're right.

D: And so, there probably, there's no easy way to fix it. I thought about it and I can't come up with an easy solution to make it easy for all the people involved. External fixator is strange name. This would be an interesting challenge for you, think about it. If you want to learn more about this particular device, go to the instructor's note, it will tell you how to get to the website to the company that makes these parts.

### Readings on External Fixators

As we suggest in the video, it would be a productive exercise to design an external fixator that was easier for the patient and physician, both. To learn more about these devices, see these references:

### Chelsey's external fixator

Biomet/EBI Multiaxial Frame (MAC)

http://www.biomet.com/trauma/products.cfm?pdid=4&majcid=28&prodid=171

### The Basic Fixator

http://www.nlm.nih.gov/medlineplus/ency/imagepages/18021.htm

### An advanced discussion on the mechanics of the fixator

http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2504087/

# Conceptual Model of a Home Heating System Quiz

Suppose you've just returned to your home on a cold, winter day. The house is cold. So you want to get to a comfortable temperature as quickly as possible. What should you set the thermostat to?

[ ] Very high, like 90 degrees Fahrenheit or 35 Celsius to get it up there fast?

[ ] Or set it to what I really want it to end up with, like 73 Fahrenheit or 23 Celsius?

Explain the reason for your choice. In other words, what's your conceptual model of how the heater works?

Post your answer in the forum!

### NOTES:

Pages 57 - 59 and 68 - 69 of the revised edition of Design of Everyday Things.

# Conceptual Model of a Home Heating System Answer

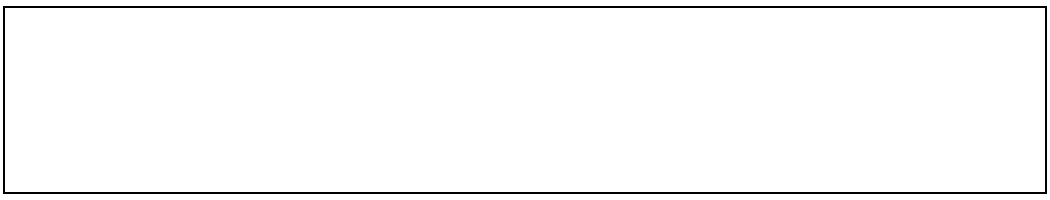
The answer as to which way you should work it is, well it all depends. There is no real correct answer because it's possible for your home to work with either model. If the thermostat determines how hot the heater is, then the first answer is correct. Set it high first. That'll get you to the correct temperature as quickly as possible. But, you know, that's not how most homes work. In most homes, the second answer is correct, because the home heater either turns all the way on, or all the way off. We call that bang, bang control, all the way one way or all the way the other. The thermostat turns the heat on full until it reaches the set point, at which point it turns it off. So, setting the temperature too high doesn't do any good. It doesn't speed things up and worse, if you forget to turn it back, well the house keeps getting hotter and hotter and hotter. Wasting energy and making it too hot.

# Fix the Faulty System Image Quiz

For this exercise, we want you to try to fix the problem with a home heating system. Design a system that conveys the proper conceptual model. See, existing home heating systems make it really difficult, or impossible, to determine the proper conceptual model for it's operation. The designers didn't seem to consider this important. They didn't provide an accurate system image. So, fix it.

Show how you would design heating system that provided the proper user model, conveying the correct conceptual model, so people would never again set their thermostats too high or too low, in an effort to speed up the process.

Post your answer in the forum!



# Fix the Faulty System Image Answer

What's the answer? How do you fix it? Well, it's a hard problem, and there are many possible ways. And the only way to know whether you provided a good one, is to test it, to show it to other people, and see if they understand how the home meter system works. That's what the forum is for. Post

your answers on the forum and discuss it. See what other people come up with. See how well your solution is understood, or what ideas you might get from other people.

# Wrong System Image Reflection

So here we are, at another reflection point. Now that you've learned about conceptual models. I want you to go out in the world. And find an example of a device, whose system image communicates the wrong conceptual model to users. Upload your example to the discussion forum, via photos or sketches. And provide a brief written explanation of why you chose it.

Post your answer in the forum!

# Transition to Project

As you have just learned, a key important property for design is to communicate to people how it should be used, how it works. So now it's your turn. Kristian is about to ask you to do a most interesting design project.

# Project 2

Alright. In this project, we're actually going to build something. So here's what we're going to do. We're going to take a box, any box, and do anything you want to it - so that the box, if you put in on a table and anyone passed by they would be invited, without any instructions, to rub it and turn it and grab it.

### Step 1

Find a box that's medium size and roughly 10 to 20cm on each side (6 - 12 inches).

### Step 2

Using whatever materials you'd like, transform your box into an interactive object that, without being instructed, people will:

- rub it
- turn it
- grab it

Remember, you are not allowed to provide spoken or written instructions.

### Step 3

Post three photos of your box on the course forum that demonstrate the features of design that correspond to the three exercise objects. Please label your photos as “Rub,” “Turn,” and “Grab.” Also discuss the features of your box, noting how you integrated affordances, signifiers, and conceptual models.

### Step 4

Review your classmates’ work and share feedback on their boxes.

## Project 2 Evaluation

Next, we're going to find out if people actually do, what you intended them to do, with your box.

## Project 2 Evaluation

CHELSEY Hey Kristian.

KRISTIAN: Hey Chelsey.

C: Your box is done.

K: Yeah.

C: What's going on here?

K: Well I, I've gotten some feedback and I was just wondering.

C: Yeah?

K: You want to try it?

C: Oh, sure. Wow. Where do I start? Okay.

K: You tell me.

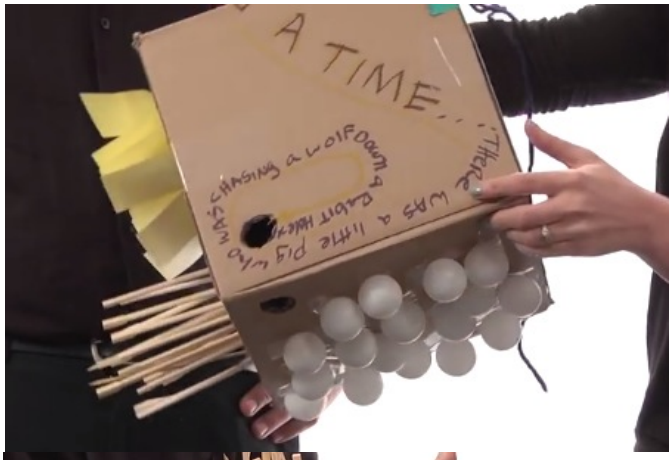
C: Well, the first thing that stands out is this guy here. And I immediately want to lift it. Okay. I'm turning this around. Oh gosh, this looks dangerous, but I still want to touch it, kind of turning this around here. There's some text here. It looks like it's telling a bit of a story. There was a little pig, he was chasing a wolf. It makes me kind of want to turn the box, here. Oh, and sparkles. Who doesn't love sparkles? Of course I want to touch this. Hmm.

K: Lots going on.

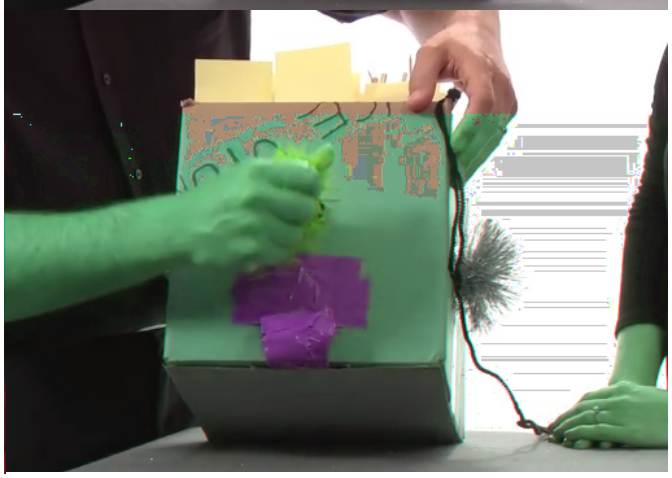
C: Yeah. And as we saw, people did various things with it.

K: Well, there was a few things that I did intentionally here. One is, that I made these finger holes. Just the right size, and you'd grab it, like a bowling ball. Well that's, human size. And here, it's a little tempting to kind of touch it. And maybe somebody would, want to, flitter with those. And the balls kind of feel nice and well somewhere, here's the squishy thing that you play with and you can even pick the box up from that, and there's a tail. So why do we grab this? It's got an affordance for, for grabbing. And there's one more thing. I'm using the power of story here, because it says once upon, and you turn it. Once upon a time, there was a little pig, who was chasing a wolf down a rabbit hole..

There's my box.







# Reflections on Lesson 2

DON: You know Kristian, I love that cube exercise, and and the things that the students came up with was just wonderful but, I mean, so what? I mean, you can't do anything with it. What's the use of it?

KRISTIAN: Well, the use is in helping students understand what it means to be a designer, what it means to actually design these affordances and signifiers.

D: Yeah, but I'm worried. So many designs I see are wonderful, but actually nobody can understand them when they don't function very well.

K: Well function is only part of it. I mean you, you've gotta bring in the other human elements too. I mean of course there's meaning and function, and then there's usable, it's also delightful.

D: So the real trick is to combine them. So we've been talking about things like affordance and constraints and that makes it very functional and usable and understandable but it's not necessarily interesting.

K: And conceptual models, like how do you actually know how to use something.

D: So what you're trying to tell me, the cube model is about making it more than that.

K: Yeah, and we're living in an era when this object, the phone, ten years ago wasn't much to talk about. It did things for you, it made phone calls, but now it's become a big part of your life.

D: Is the enjoyment of using it.

K: Yeah, and designers have made it even delightful at times.

D: So what we have to do is we have to manage to combine the wonderful fun with the cube, with the functionality of the other principles.

K: Yeah, and that's how you do design. It's about all these things, and you've now taken the first steps at designing the world yourself.