

A DESIGN WORKSHOP AT INDUSTRIAL TECHNOLOGY RESEARCH INSTITUTE

# Design Thinking Foundations

January 2nd -17th, 2006  
Hsinchu, Taiwan

Workshop Instructor: Hyun-Yeul Lee  
Ph.D. Candidate in the Media Fabrics Group  
E-Mail: [hyun@media.mit.edu](mailto:hyun@media.mit.edu)

Copyright 2006 MIT Media Laboratory, Media Fabrics Group

### **Acknowledgements**

The success of this workshop was possible with the thoughtful interactions and advising by Glorianna Davenport. The new design approach and theory behind the workshop originates from my dissertation work in the Media Fabrics Group, thus the workshop is named after my thesis.

This workshop was a fruitful and a learning experience as a former mentor advised me that teaching is a vocation not only about expanding and learning knowledge and skills through theory and practice, but also that it requires a big heart and patience. I have realized and learned the importance of these four qualities in teaching from my academic advisors.

The workshop participants were respectful, inquisitive, patient, self-challenging and self-motivating. As it was a learning experience for them, it was one for me as well.

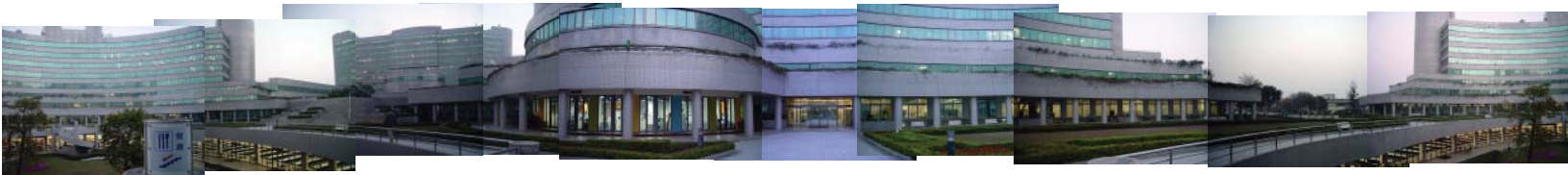
The Design Thinking with Time workshop was possible through MIT Media Laboratory and ITRI NEXT Consortium.

*Up Front*

People - The researchers at ITRI are very considerate, helpful, and interesting. Be proactive and be interactive.

Work - Have an agenda. Know what you want to gain and offer during your time at ITRI (i.e. consulting, teaching, etc.)

Food - If you do not like oily food, there is a little store where you can get bread, juice and some chocolate! You can also take oatmeal and instant noodles since there is hot water on the floor of the guest house.



Weather - Hsinchu is a very windy city. You may want to have a jacket as the weather drastically changes.

Travel - If you are a NEXT fellow travelling alone, I can recommend that ITRI Creativity Lab consider as part of their protocol to plan a trip with guidance to Taipei. My host was helpful in making reservations and one of the engineers who lives in Taipei kindly offered to tour me around for a day. If you do not know Chinese, in my opinion it would be pretty difficult getting around since English is not the country's first language. You can also join tour groups offered through hotels. If you have time, visit Taipei since Hsinchu is an older city and you may gain a different perspective on Taiwan.

Design Thinking Foundations

Food that I managed to capture.



Design Thinking Foundations



Sights that I managed to capture.

### **The Workshop Abstract**

The 3-part design workshop will expand our understanding of the theory of design methodology as it relates to the practice. We will be discussing the process of idea generation, research, and creative development; the workshop will allow us to reflect on the interrelationship between humans and objects that help define contemporary behaviors then and now. More particularly, the workshop will develop our understanding of time and feedback as these apply to idea generation and object construction. This is a hands-on interactive workshop; therefore expect to get your hands and minds busy with work!

## 8 Day 3 Part Workshop Outline

Part One: Design Thinking as we practice through Form and Function

Part Two: Objects, Time, and Perspective: Design Thinking with Time

Part Three: Experience Design: Form, Function, and Time+Narrative

### Introduction

#### Icebreaker:

Your eyes and hands working together!  
2D and 3D Formal Vocabulary

#### Monster Me!

Your Responsibility as a Designer

Your Voice

What is your Design Methodology?

What is Design?

General Design Thinking and  
Design Practice

Ecology of the Designer's  
Mind and Participation

Making Sense of Things

Designer's Stance

**On Form and Function:**  
**Designing a Doorknob**

### Presentation and Design Critique

Media Fabrics Group Research Overview

Conveying Structure

How We Think About Structure:  
Social Presence in the Networked World  
Objects in the Physical World  
Nature

### On Structure

#### Team work and Communication Skills

Conveying Significance and Value

Designer's Stance

An Example of One Designer:  
Dieter Rams' approach to 'Good Design'

How We Think About  
Meaning and Value:  
Objects  
Story  
Art and Design  
Sustainable Environments

### Mind Stretching in Design

Designing Objects with Time

Designer's Stance  
Object's Stance

What is Time?

On Narrative Theory

Perception as it Relates to Narrative

Present Time:  
How We Identify  
How We Perform  
How We Capture  
How We Physically Aid  
How We Communicate

### On Present Time: A Controlled Vehicle

Past Time:  
Beyond Form and Function  
A Hero's Journey  
History  
Breaches in Canonic Forms  
Horizon of Expectations

Objects and History

An Object that is Socialized:  
Crossing Cultures  
Meaning of Things  
Hierarchy of Needs

Time-Lapse

Sensing Technology

Feedback Loops

**On Past Time: Two Doorknobs**

**The Art of Constructive Criticisms**

#### *Legend*

**Black Text: Theory and Discussion**

**Orange Text: Practicum**

## The Workshop

The Design workshop consisted of two groups of approximately twenty people. I taught each group for three hours everyday for two weeks.

The workshop was intended to be communicative and interactive as is the practice of Design. The course of the workshop included lectures, discussions, Q&A, and undergoing the doing of making, presenting, and critique.

The workshop participants were very interesting and self-motivated. They came from different job posts and backgrounds; the group consisted of a mix of engineers, scientists, designers, economists, public relations, and managers.

My goals of the workshop was a two-fold: the role of Communication in Design and articulating the new approach of Design Thinking and Theory with Time. Communication skills are essential in Design - I tried to help them voice their thinking from both sides (designer and audience) by helping them realize a designer's intent and responsibility, presentation, and the art of constructive critiques. As for design thinking with time, it was a challenge for the participants to realize the intricacies of the temporal form as it relates to story and design. At the end of the workshop, the articulation of time as it relates to traditional design proved to be a groundbreaking mode of Design Thinking.

In retrospect, the workshop seemed to be a great success although I only had a limited amount of their time. I had great feedback such as I saw them becoming more communicative as the class progressed; the design thinking with time portion of the workshop changed the way they thought of objects in our environment; and lastly but not least, regardless of their diverse backgrounds they were all on the same page of understanding the theoretical aspect of how we may ask questions to make sense of things. Hopefully the workshop bridged their experiential gap closer between design theory and practice. Furthermore, I hoped that each student took away the newly acquired and revisited aspects from the workshop into their own settings.

*Note: The following pictorial descriptions are captured moments in time and therefore do not represent the workshop dynamics. It does attempt to show the exercised events through the course of the workshop.*



The Workshop Participants



Abe



Kit



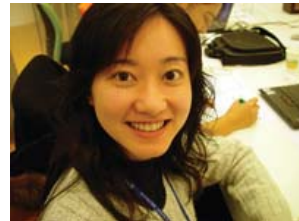
Rita



Carrent



KP



Serena



Eugene



Lydia



Shawn



Hubert



Maria



Shu-Wei



James



Monica



Smile



Kipling



Pin-Chou



YingZ



Randle



Yu-Mei

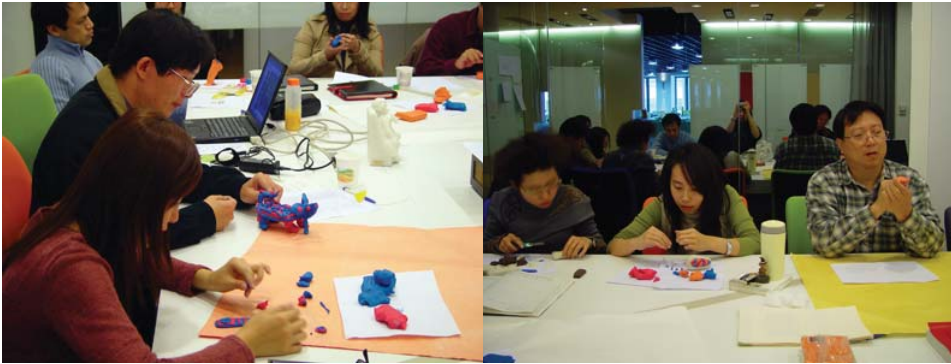


**Icebreaker!**

Use your eyes and hands to work together to visualize an object using the 2-dimensional and the 3-dimensional vocabulary.

Object of interest: a remote control

## Design Thinking Foundations



Actually this exercise was the second part of our Icebreaker! At the very beginning of the class, we went around and introduced ourselves - such as our training, background, current affiliations, and what we liked and disliked.

Talking about what our likes and dislikes can help others quickly capture a general sense of character and cultural exposure of how we present ourselves and interact with others in a closed setting.

I recall one student named Randle professing, "I hate serious class" (his English was his second language). He continued talking about how he has a dog and how he loved racing dogs. He remained quiet afterwards.

When we broke into the core of this Icebreaker exercise, I was quite delighted to see Randle's expressions and vocabulary through his making. The exercise generically asked the students to visualize first in two dimensions, then in three dimensions of the remote control setting in front of them. Throughout the workshop Randle showed us the importance of having a sense of humor.

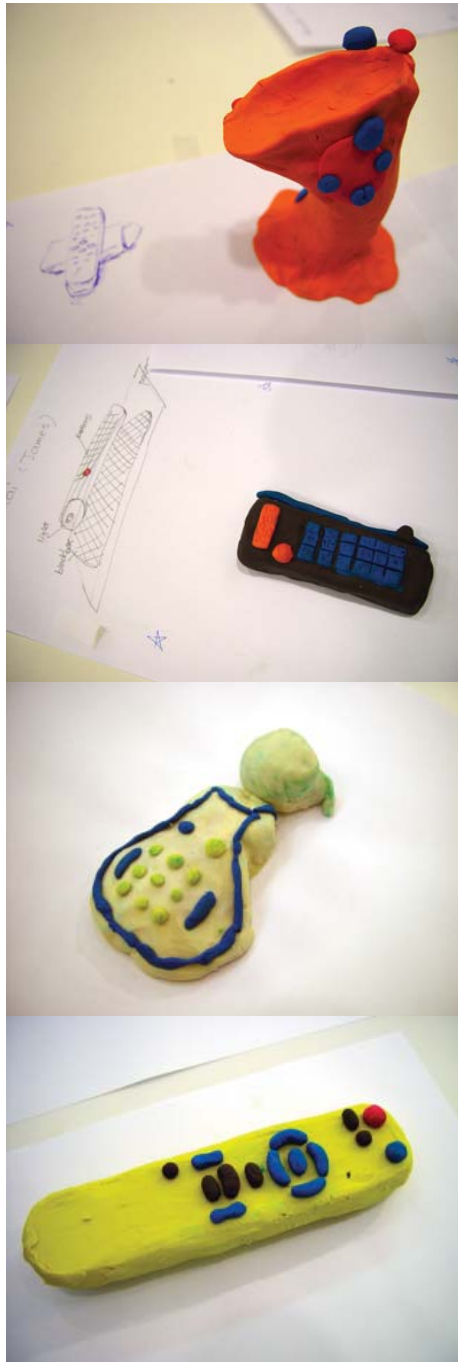
Randle was able to go beyond the 1:1 replication of what they were looking at, and incorporated his passion of a dog into his visualization. Furthermore, the other students saw his work and further pushed their expressive vocabulary in their work, in how they were seeing and making what they were seeing.

Design Thinking Foundations



*Note: Examples from the Icebreaker.*

Design Thinking Foundations





**Monster Me!**

What is your responsibility as a designer?  
Imagine your monster and tell us in writing  
about your monster!

## Design Thinking Foundations



As design communicators we cannot rely on others to realize what we are thinking and imagining. The exercise entails three parts in allowing the students to realize the responsibility as designers in communicating their ideas. I uncovered the task in each part as we progressed through the exercise; students were clearly informed of what their tasks were at the given moment.

The first part asked each individual to imagine their own monster. Then they were asked to describe this monster with much detail in written form.

Following the first part of the exercise, each student received someone else's monster description. They were then asked to translate this monster from written form to pictorial form.

In the last part, the monster visualization was returned to the original owners - the ones who wrote the monster description in written form. Once it was returned, they were to evaluate how well the other person visualized the monster in pictorial form. After the final evaluation, each individual was informed that the scoring that they just made was a reflection on how well they had originally communicated what the monster looked like in written form to the other person.

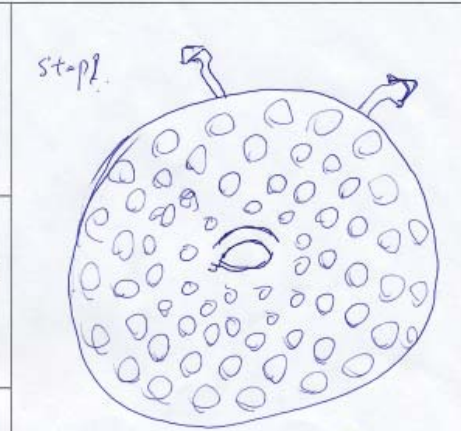
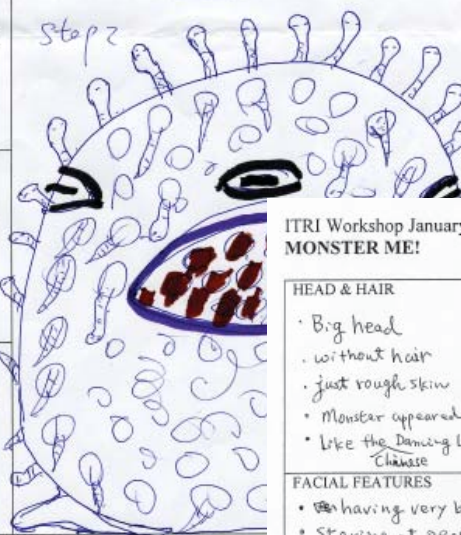


What was interesting here was that the students were initially too polite to give the other person a low score (meaning they all did well). After my pointers on how to be critical, there was a range of low and high scores. Some realized that the other person did not really translate the monster image as well as they imagined and some realized that the other visualized the monster in more creative ways than they originally thought of. This showed the class that as designers we have a responsibility in being effective and communicating as clearly as we can, and that we should also value our interactions with others.

Design Thinking Foundations

ITRI Workshop January 2006  
MONSTER ME!

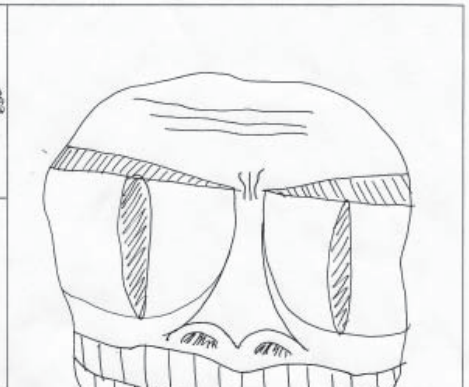


NAME: shuwei

|                                                                                                                                                                 |   |                                                                                    |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|---|------------------------------------------------------------------------------------|
| <p><b>HEAD &amp; HAIR</b><br/>each hair is a snake, which moves forward and backward all the way.<br/>head is full of holes, where the snakes go in and out</p> | 5 |   |
| <p><b>FACIAL FEATURES</b><br/>four eyes on the face.<br/>No ears<br/>No nose<br/>No mouth</p>                                                                   | 3 |                                                                                    |
| <p><b>BODY</b><br/>A huge mouth right in the middle.<br/>Inside the mouth, there are many hands.<br/>No tongue</p>                                              | 3 |  |
| <p><b>HANDS &amp; ARMS</b><br/>No hands outside the body.</p>                                                                                                   | 6 |                                                                                    |
| <p><b>LEGS &amp; FEET</b><br/>Four legs, like jaguar.<br/>So it can run very fast</p>                                                                           | 2 | 19                                                                                 |

Note: Examples from Monster Me!

ITRI Workshop January 2006  
MONSTER ME!

NAME: Yu-Mei

|                                                                                                                                                                                    |   |                                                                                       |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|---------------------------------------------------------------------------------------|
| <p><b>HEAD &amp; HAIR</b><br/>• Big head<br/>• without hair<br/>• just rough skin<br/>• Monster appeared in the movie<br/>• Like the Deming Lions' head<br/>Chinese</p>            | 8 |   |
| <p><b>FACIAL FEATURES</b><br/>• having very big eyes<br/>• Staring at people, making people<br/>• big mouth, feel scary.<br/>• Serious face expression</p>                         | 9 |                                                                                       |
| <p><b>BODY</b><br/>• very strong brest<br/>• square shaped</p>                                                                                                                     | 8 |  |
| <p><b>HANDS &amp; ARMS</b><br/>• Strong<br/>• powerful<br/>• can grasp the things very tight.</p>                                                                                  | 7 |                                                                                       |
| <p><b>LEGS &amp; FEET</b><br/>• Strong &amp; powerful<br/>• without shoes<br/>• resistant to any kind of Environment &amp; chemicals<br/>• Moved slowly, but firm &amp; steady</p> | 6 |  |

38 = 76



Design Thinking Foundations

ITRI Workshop January 2006  
MONSTER ME!

NAME: *Kyle Huang*

10

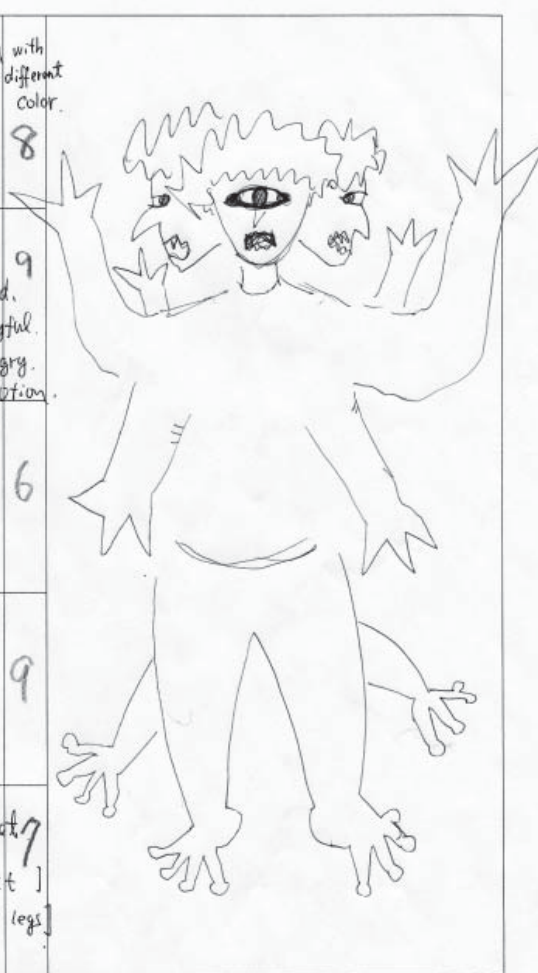
|                                                                                                                                                                                                                                                                          |    |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
| <p>HEAD &amp; HAIR</p> <p>Big head with <sup>long and</sup> Red and Green hair,</p>                                                                                                                                                                                      | 10 |
| <p>FACIAL FEATURES</p> <p>his face isn't smooth, just like a moon, <del>the</del> and full half <del>width</del> of his face was burned. his eyes <del>were</del> <sup>are</sup> green, <sup>and big</sup> no nose. have longer <del>teeth</del> teeth and big ears.</p> | 8  |
| <p>BODY</p> <p><del>he is</del> he is taller than 2 floor, his body is also full of hair, and <del>there are</del> some <del>that</del> didn't smell good.</p>                                                                                                           | 10 |
| <p>HANDS &amp; ARMS</p> <p>Hands are bigger than a <del>... ball</del> and <del>... nose</del></p>                                                                                                                                                                       |    |



ITRI Workshop January 2006  
MONSTER ME!

NAME: *Shawn*

|                                                                                                                                                     |   |
|-----------------------------------------------------------------------------------------------------------------------------------------------------|---|
| <p>HEAD &amp; HAIR</p> <p>Multi-heads 3-5 head with different color. curly <del>snake</del> snake like hair</p>                                     | 8 |
| <p>FACIAL FEATURES</p> <p>3 <del>to</del> Faces for each heads one for each face with sad. eye joyful. one mouth for each face. angry. emotion.</p> | 9 |
| <p>BODY</p> <p>sting body. (black) with spikes and small pox</p>                                                                                    | 6 |
| <p>HANDS &amp; ARMS</p> <p>3 finger for each @ hands. With 6 arms. very <u>wrinkle</u> skin..</p>                                                   | 9 |
| <p>LEGS &amp; FEET</p> <p>w:th frog web on the foot. Four Legs. [ Like insect ] spiders legs</p>                                                    | 7 |





**On Form and Function:  
Designing a Doorknob**

Re-design a doorknob. Visually outline what steps you would take to arrive in redesigning the feature you have changed and developed. Why is it an interesting problem? Be prepared to discuss your general methodology and solution.



By now, the lectures have touched on the theoretical understanding of the relation of the designer's mind, designer's activity and responsibility, to how design relates to the physical world. Understanding the designer's stance is essential because it allows us to understand the importance of our interest, concern, and responsibility of a designer.

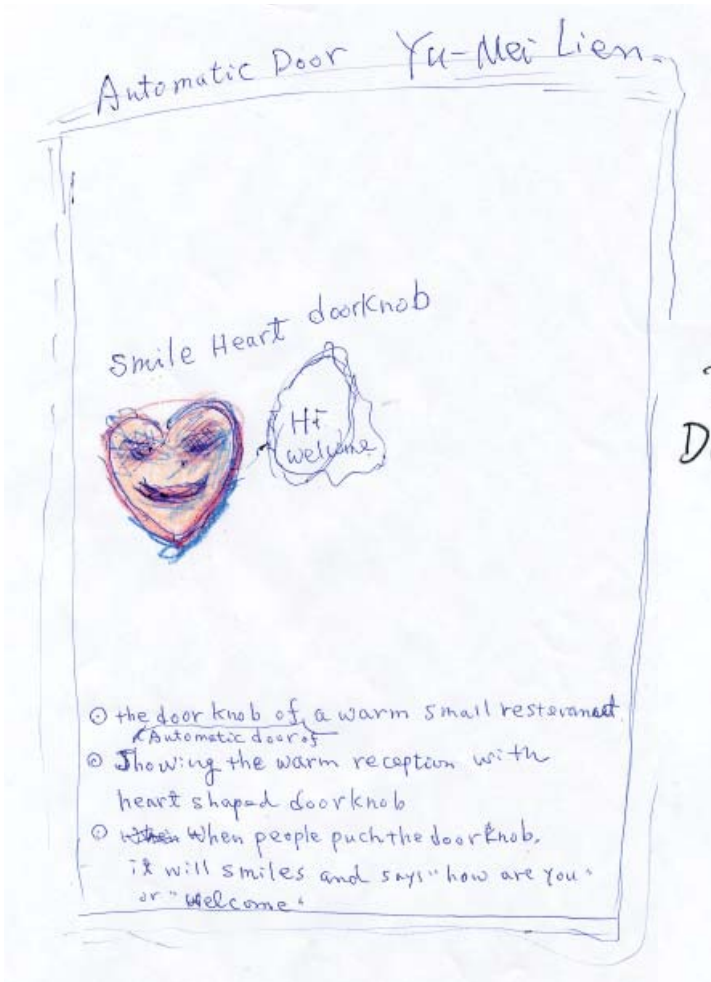
In this exercise, students were asked to re-design a doorknob. The workshop setting did not allow means for students to go out into the real world for qualitative observational studies, and therefore relied on our familiar knowledge of the doorknob, which we saw in the space. The doorknob was the object of interest for its simplicity, our familiarity, and its provocative presence.

Through different design proposals, the following aspects became salient in our discussion and related to most of the student's designs of a doorknob (in alphabetical order):

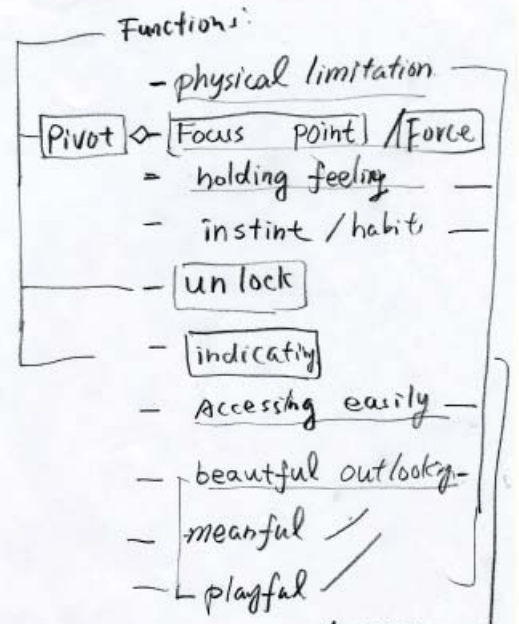
- Audience
- Beauty
- Context
- Dichotomy between digital and analog ways of life
- Familiarity
- Flexibility
- Form
- Haptics, physical interaction (i.e. touch)
- Human factors
- Human understanding (i.e. emotion, ego, warmth)
- Mechanism
- Security
- Usability and intuitiveness
- User need



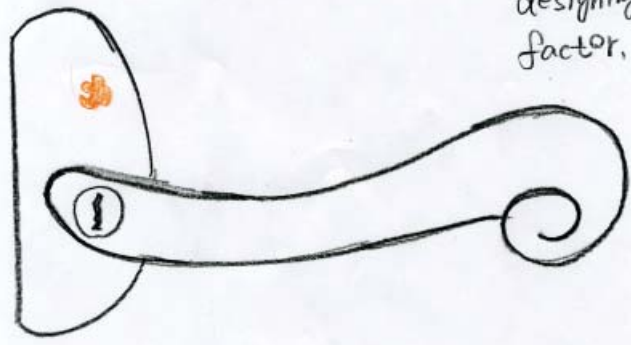
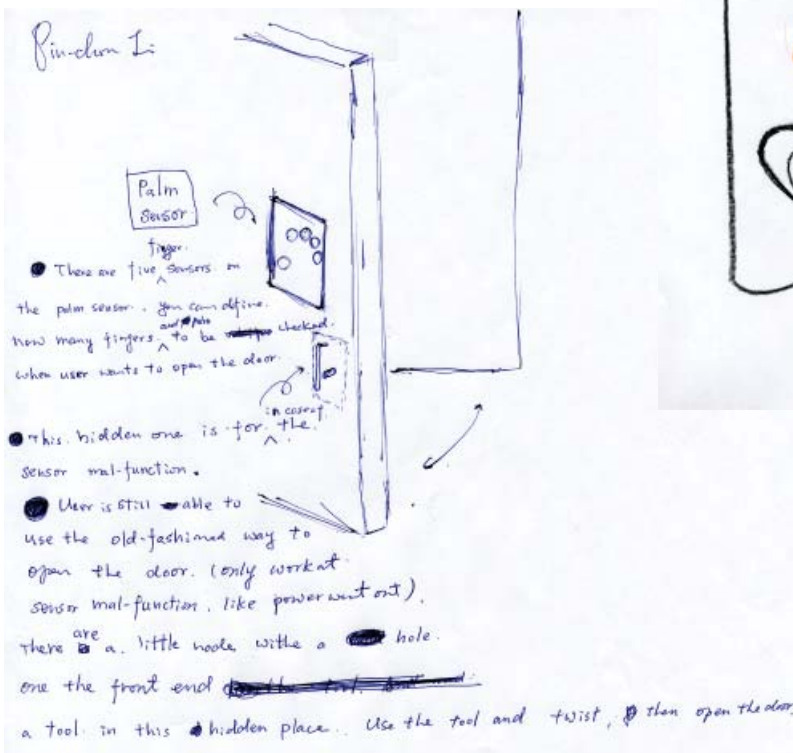
It was evident that the design proposals were concerned on improving and developing the doorknob along the formal and functional aspects of the object, and that related it to the context and the audience participation.



Design of Door knob



designing factor,



Shawn  
2005.01.05



DOOR KNOB

Go in & Go out

door knob is

- a exit
- a entrance
- a direction

Inside the room / door knob is a way to go out.

① dark in the night . door knob & emit cozy light

② outside the room , the door knob project a foot print outside the door  
it indicates someone is inside the room



### **On Structure**

Design and build a structure that will hold a full soda can spanning between two tables. This structure is to be made using straws, pins, and thread only. The structure cannot be affixed to the table. Attempt to use as the least amount of straws in your structure.

## Design Thinking Foundations



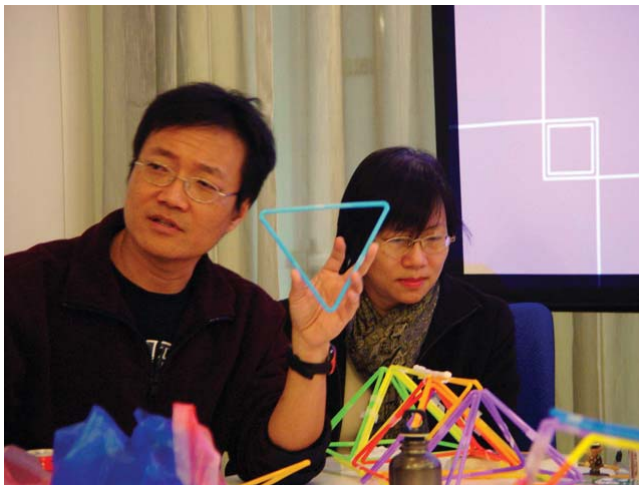
*Team work*

Teams were asked to design and build a structure to support the weight of a soda can between two tables. The success of the exercise was determined by the originality of the design, the least amount of straws used, their overall process, and team work.

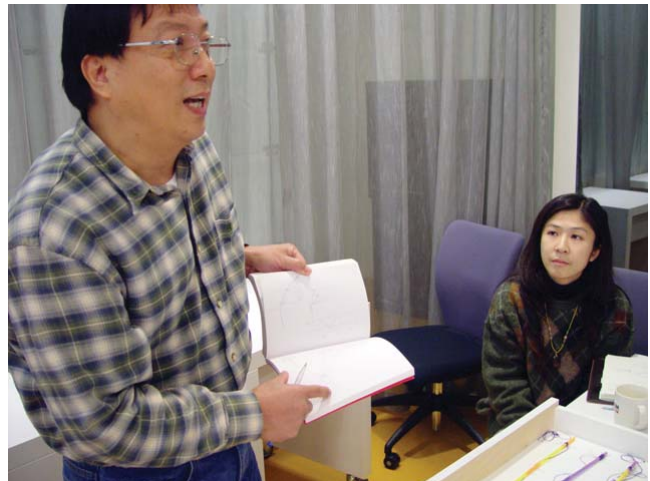
It was nice to see teams that looked for and took advantage of non-specified criteria in the assignment.

The critique and discussion brought attention to certain points that were salient:

- Ways for team collaboration.
- Everyone can bring something to the table.
- Understanding the design problem.
- What do we know and don't know?
- What is the underlying concept?
- Care for time and planning.
- Simplicity in structure.
- Form in structure.
- Re-iteration in design process.
- Presentation skills and a sense of humor.

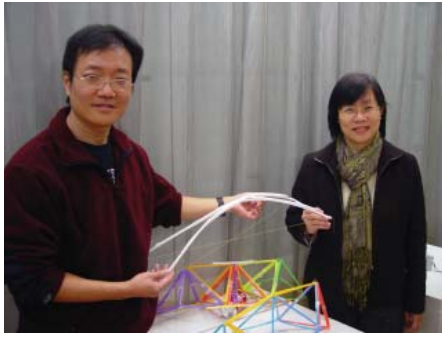


*Concept, ideation, and design process*

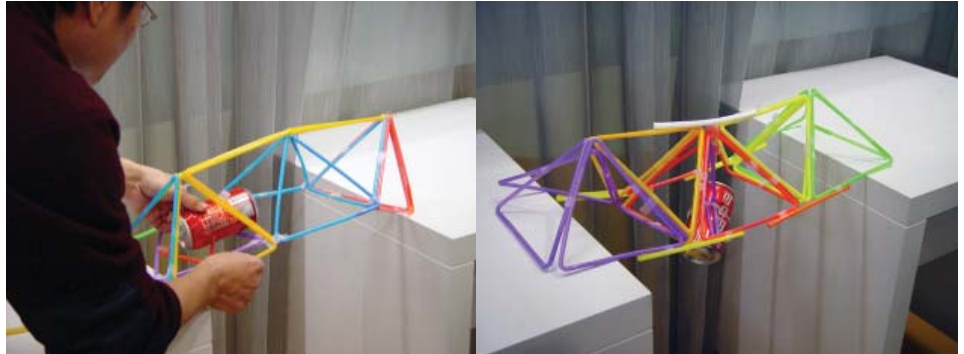


*Presentation and communication skills*

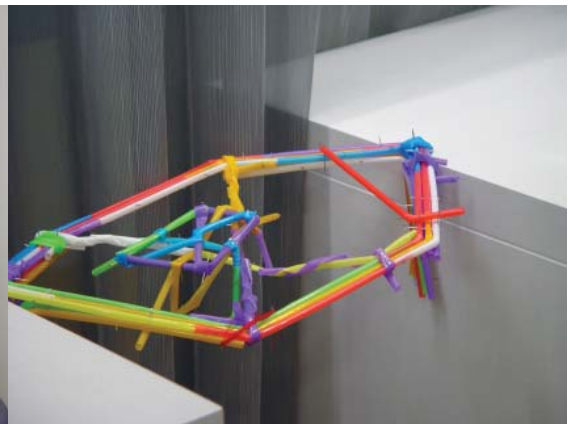
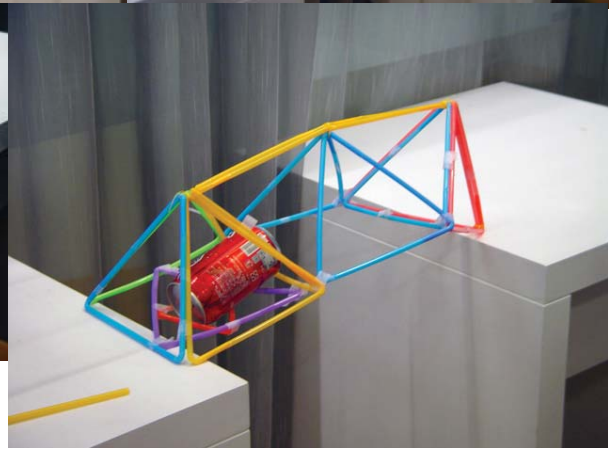
Design Thinking Foundations



Using triangles to form structure.



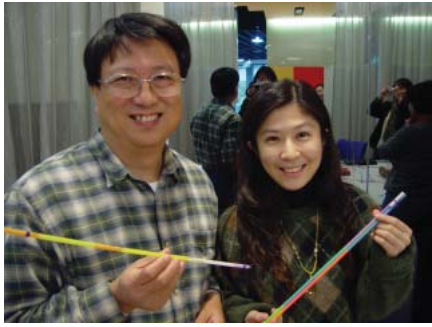
Their cheat solution was incorporated into their final solution.



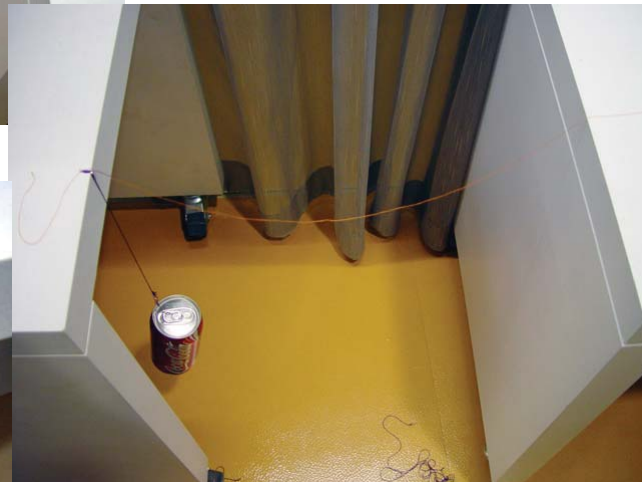
Honeycomb concept



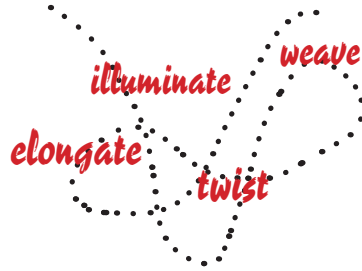
## Design Thinking Foundations



Fishing rod concept.



They simplified their efforts to using zero straws and the pins were not affixed to the table! At the end, they put a string across two tables to satisfy the requirements of the assignment.



### **Mind Stretching in Design**

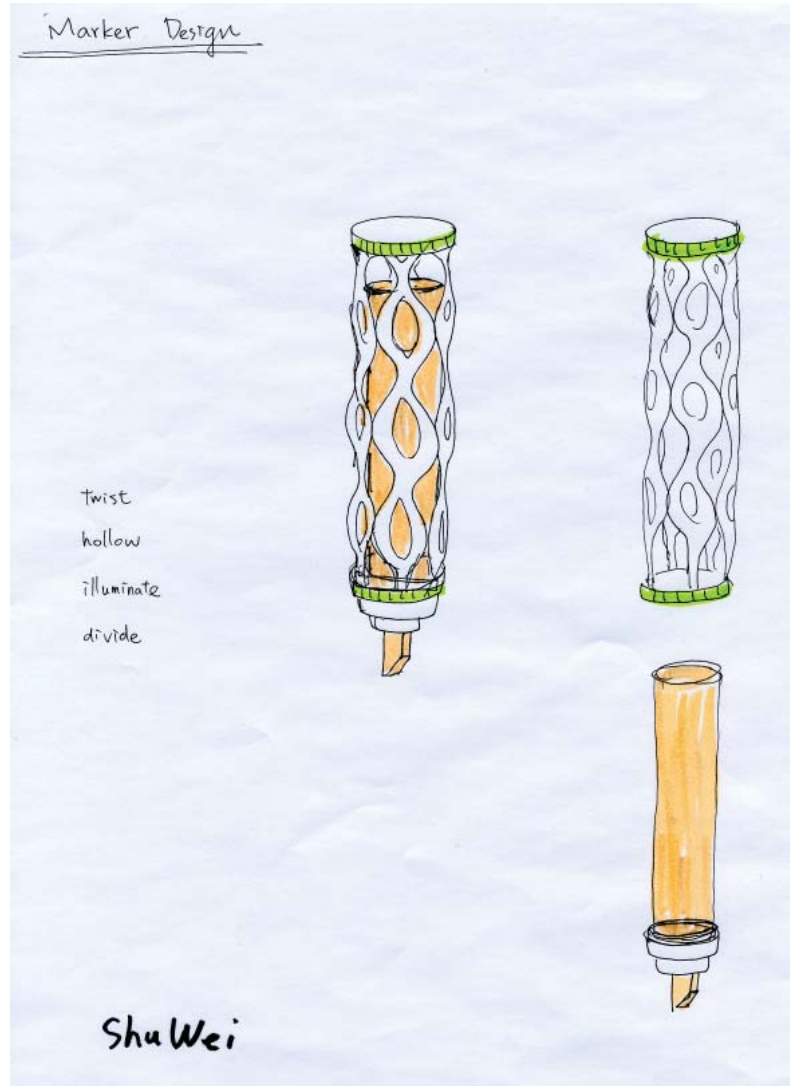
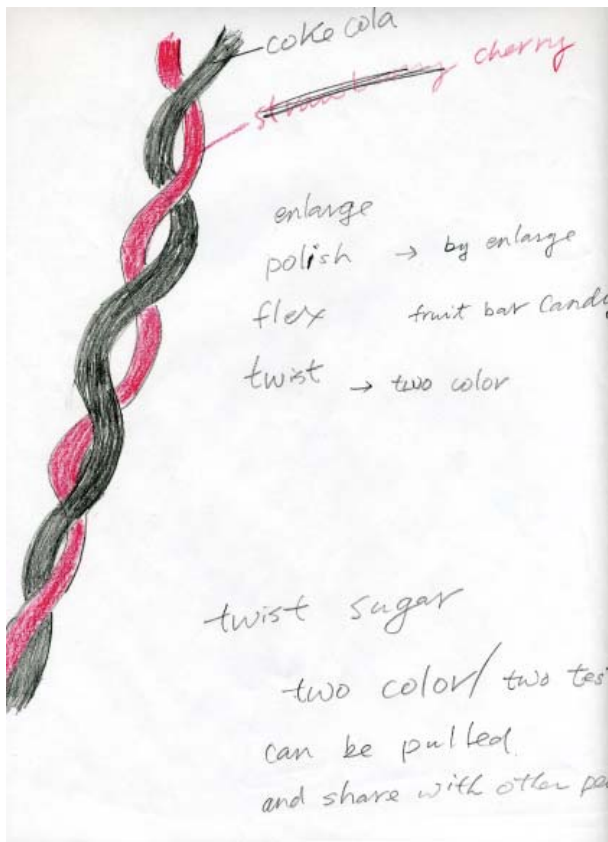
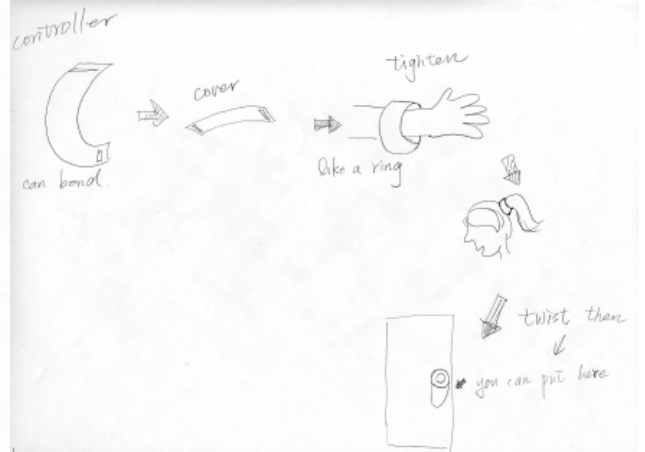
List words and phrases describing one object with value that is significantly attractive and meaningful to you.

Then find other objects (3 or more) that also carry these qualities and characteristics.

Continue on by selecting one object from your list. Draw it on paper and choose four words from the list. Try to incorporate the chosen words into the object you drew as abstract as possible to create new experiences and design features.

RT III >

Y:IT  
Divide.  
Electrify  
Draw.



This is an exercise trying to flex the mind in new ways and challenge what we already know.



### **On Present Time: A Controlled Vehicle**

Design a vehicle to move down a tightly stretched rope. The vehicle is to navigate from top to bottom in 30 seconds. Design it so that the vehicle comes close to the specified travel time.

Materials are limited to metal wire and clay. The vehicle must not damage the rope and must be portable so that you can install it repeatedly.

## Design Thinking Foundations



This was the first hands-on exercise in thinking about the notion of time: present time. It was quite interesting to watch the students problem solve.

The students come from a diversity of backgrounds from engineering, sciences, arts, and the humanities. It was interesting to observe that a third of the class had a difficult time thinking about time, and made their vehicle as a static object to look at. The second third of the class was keen on solving the engineering problem so that the vehicle would ideally meet the requirements of the travel time. This group would generally measure and calculate on paper first. The last third of the class focused on simply following their hypothesis while closely resolving the problem by trial and error.

In this exercise, Shawn was an exemplary case when it came to his final presentation - he was able to show his thought process and how he explored his ideas. He first had an understanding of the physics behind the problem. Then he tapped into the natural world and associated the vehicle problem to what he had seen in his past. For example, he thought of a pendulum, the way a monkey climbed a tree, and the manner in which dragonflies whispred through the air. He attempted to incorporate the ideas separately and together.



One of his final solutions was the dragon flies; it was simple and personal. It was made with one piece of wire, and shaped as two symmetrical dragonflies with tails. Once attached to the rope, the dragon flies travelled down the rope with such lightness and beauty almost mimicking the motion of the flapping wings, and the lightness of the ones we see in nature.

Shawn's example helped the class realize the value of a well-rounded approach and an understanding of different perspectives needed in Design.

## Design Thinking Foundations



Working in the same space is important for classroom dynamics and learning from each other.



Students testing their vehicles.

Design Thinking Foundations

Pin-Chou presenting and talking about his successful trials.



James showing us his concept using a weight control mechanism.



Yu-Mei and Eugene talking about their collaboration.



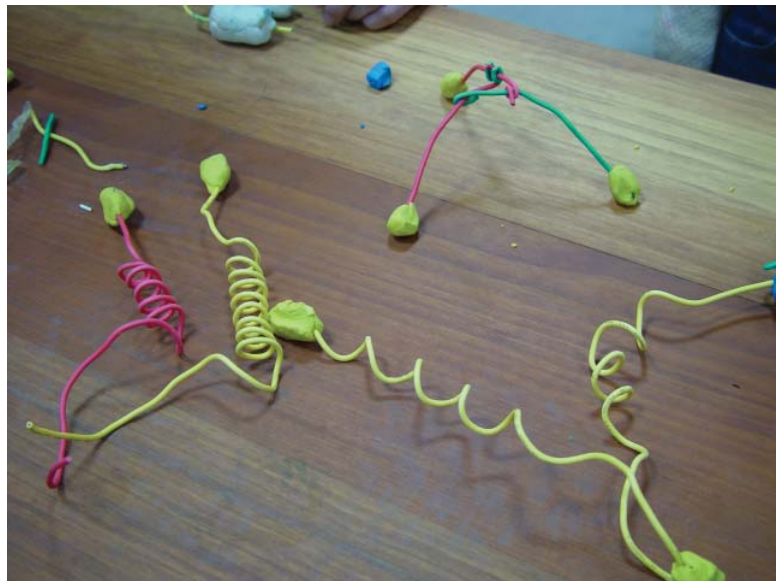
Randle talks about another student's solution and how he applied it to his by pushing it further and incorporating his ideas to make it his own.



Design Thinking Foundations



KP and Monica talk about refining their solution through trial and error.



Versions of trial and error.

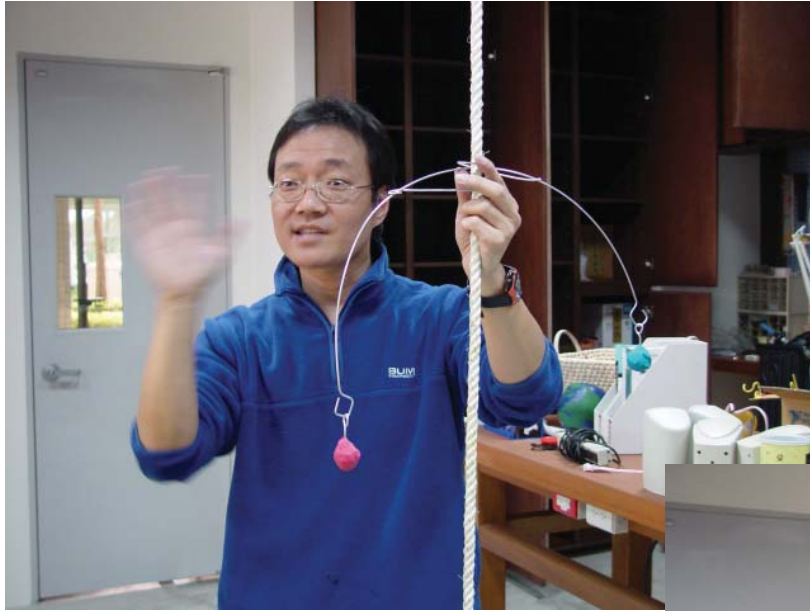
Design Thinking Foundations



Shawn presenting his thinking process.



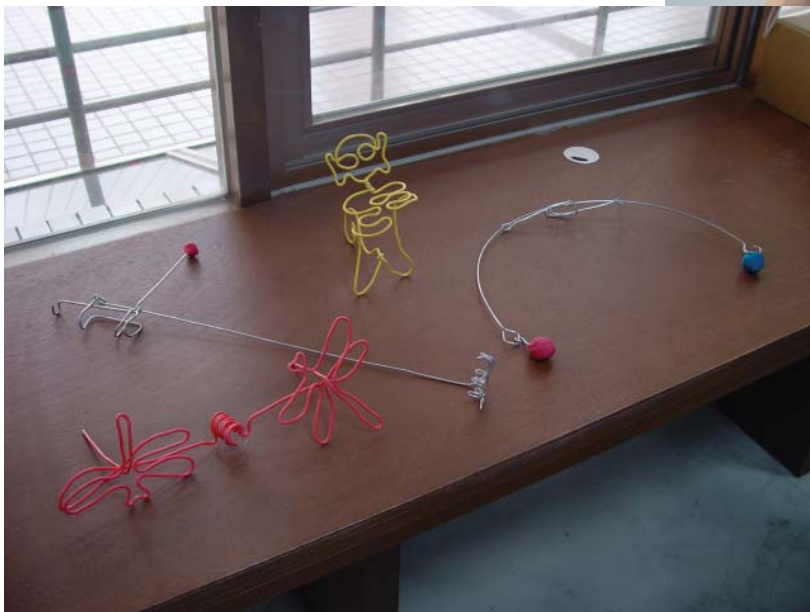
Monkeys climbing, dragonflies flying...



Pendulum concept.



The hand grasping the soul concept.





### **On Past Time: Two Doorknobs**

Design a scenario that includes 2 doorknobs that incorporate: form, function, and time+narrative.

Prepare a scenario through drawing in detail and other media if necessary. There will be a final presentation, so be prepared to use all the aspects of design thinking that we explored in this design workshop.

We want to hear your story!

## Design Thinking Foundations



The interworking mechanism between teams allowed for an awareness and a perspective of how to participate and generate a helpful and relevant discussion in addition to effective ways of presenting their design concepts.



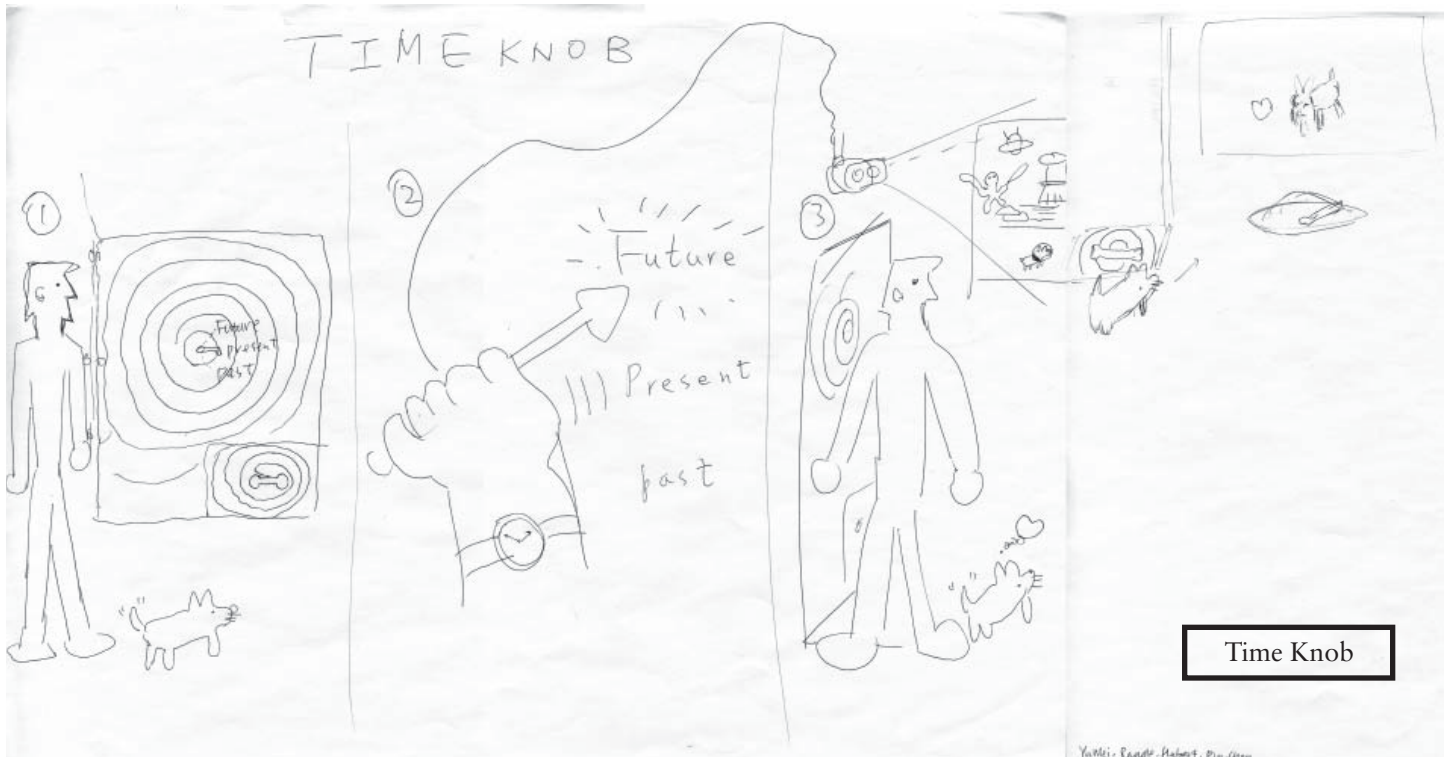
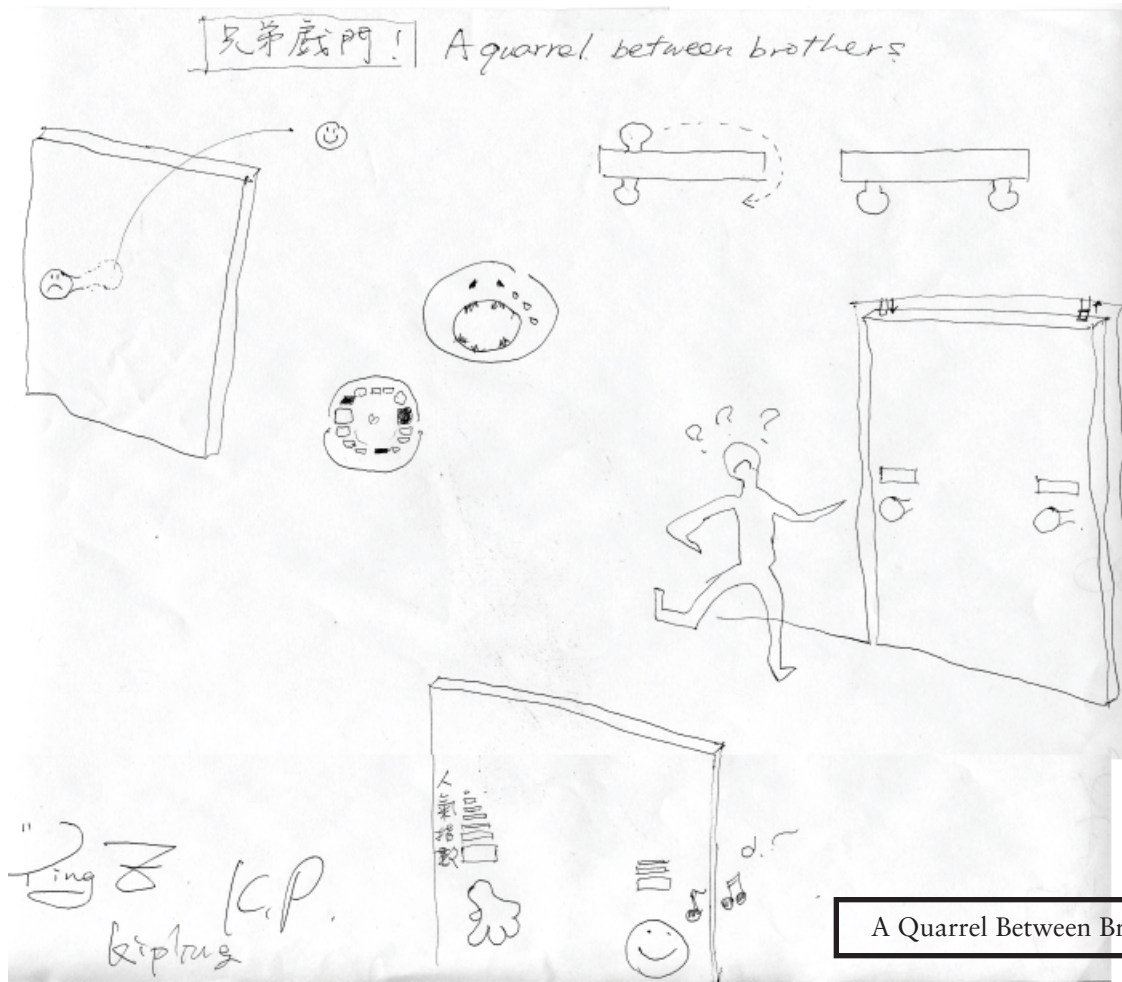
As for the design scenario of two doorknobs, students were able to shift their design thinking by integrating and satisfying form, function and time+narrative in their concepts. Students were aware of the spatial context and were able to ask why a doorknob should exist beyond its utilitarian form and be integrated into the flow of the ways in which we live in our space across time.

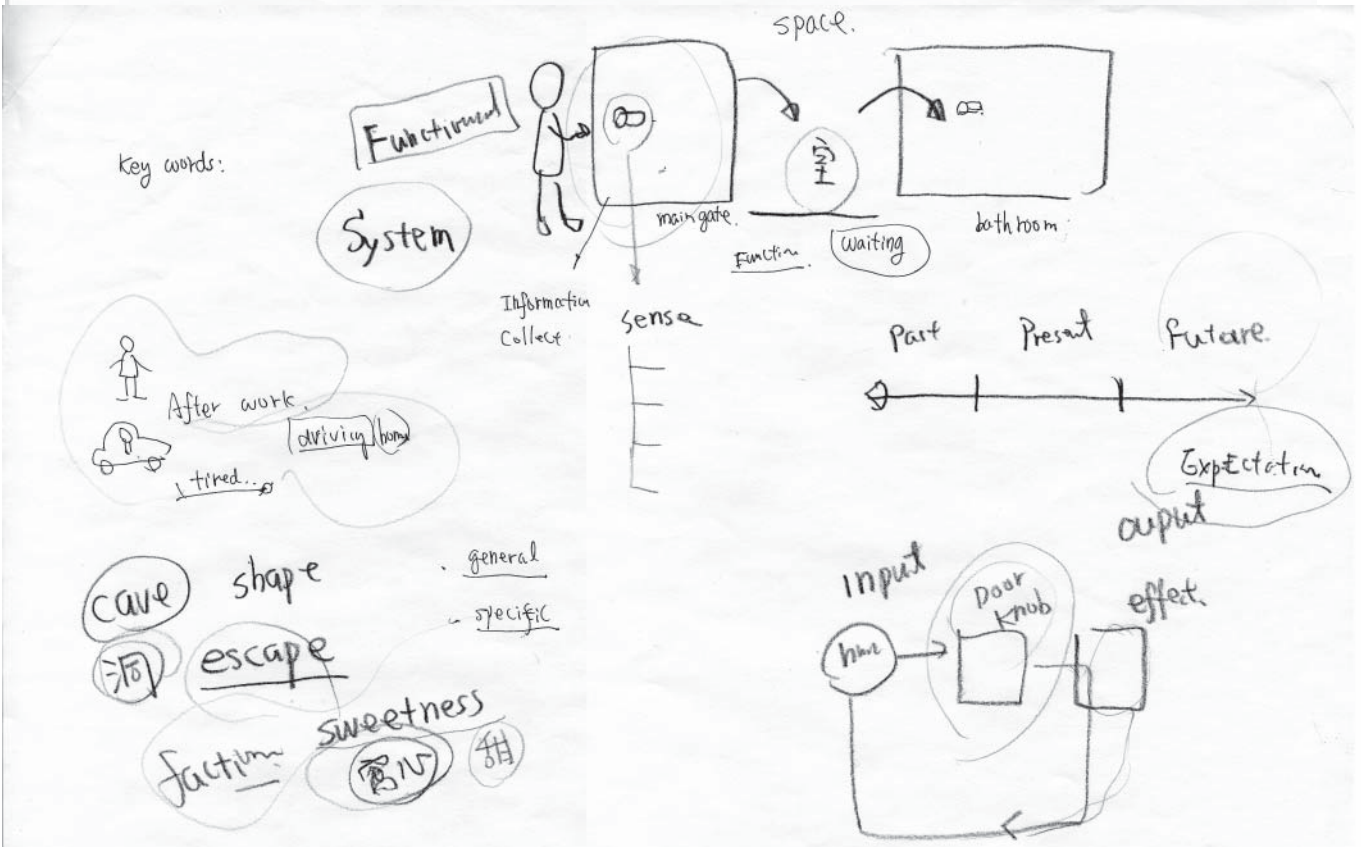
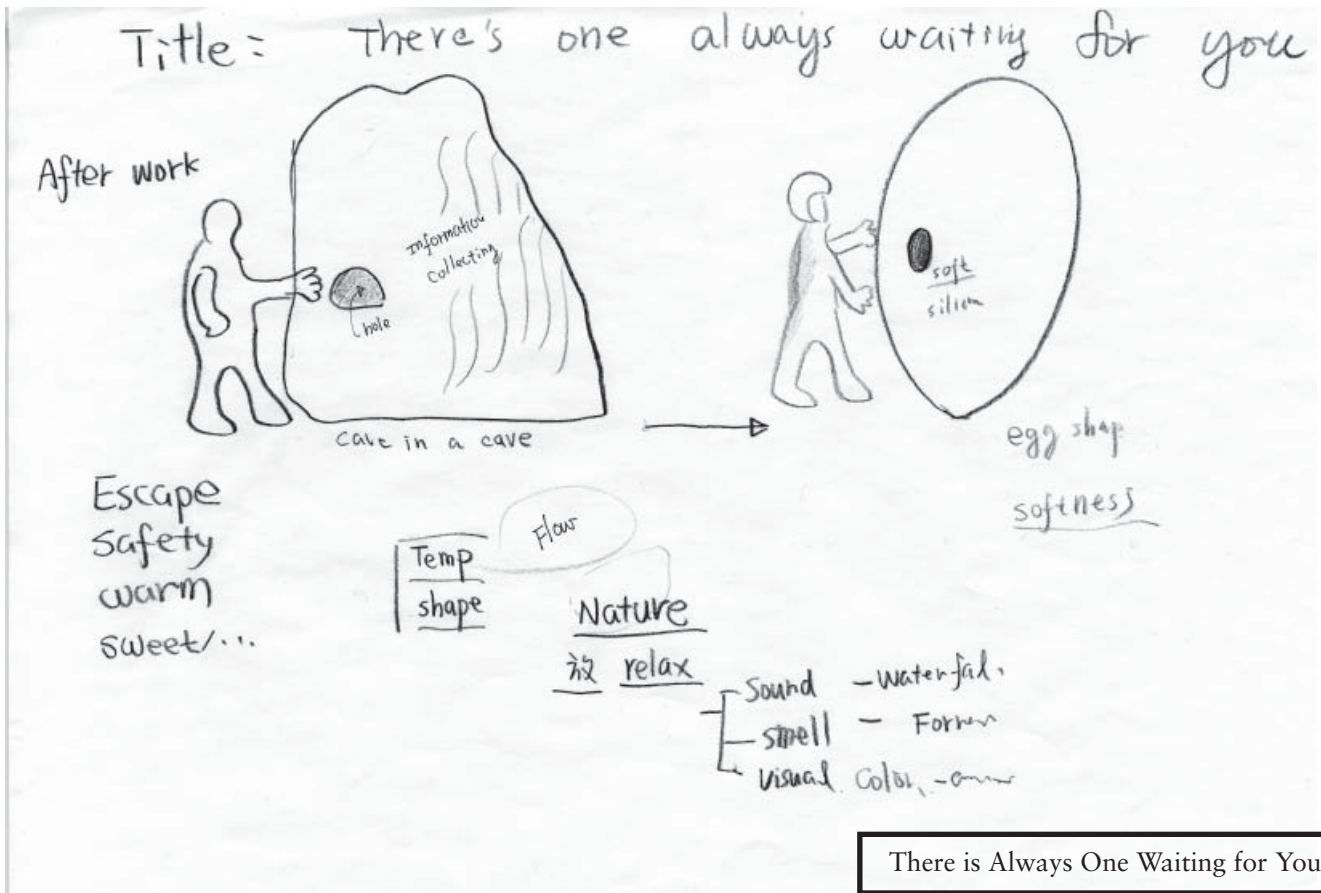


Through the workshop, students participated in critiques but the students were engaged in asking questions to clarify rather than to give constructive feedback that may also generate a discussion.

In order to better understand the art of a constructive critique, I divided the class into three teams. I assigned a specific role to each team during the critique: one team was to present; the second team was to give a constructive critique of the presentation; the third team was to give a critique of the second team that gave the critique of the presentation.







### *Correspondence from Students in the Workshop*

*Student 1:*

*It feels really great when you get to meet someone who can actually understand the situation you are facing and share her/his own experiences with you.*

*Student 2:*

*It was a wonderful experience for me to attend the design class. It really impacted on my daily routine. Usually, I kind of work alone, and not really co-work with other people. In my lab, each individual has his own charge, and we tend to pass task to next person when yours is done. Communicating and cooperation are not happening everyday in our lab. We have limited time and person to operate too many small scale projects. Well, I like the way we focus on communicating and cooperating. That helps. Too bad we have too less time to learn more. But I appreciated that I have this opportunity to attend this class and meet you. Thank you so much. I look forward hearing from you soon, and enjoy your stay in Asia.*

*Student 3:*

*Maybe you have experienced that someone to tell you that your workshop bring her/his very much idea or touch them very much. But I still want to tell you, to an programmer of ITRI, your workshop really opened a new world to me. Of course, I still have to thank all the classmates.*



*fin*