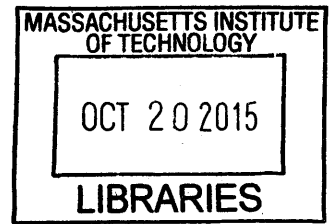


ARCHIVES



TRANSFORMATIONAL DESIGN

A Mindful Practice for Experience-driven Design

By Daniel Rosenberg

SM, Massachusetts Institute of Technology (2009)
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Submitted to the Department of Architecture in Partial Fulfillment of the Requirements for the degree of

DOCTOR OF PHILOSOPHY IN ARCHITECTURE: DESIGN AND COMPUTATION

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A Mindful Practice for Experience-driven Design

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Submitted to the Department of Architecture on August 7, 2015 in partial fulfillment of the requirements for the degree of Doctor of Philosophy in Architecture: Design and Computation

Abstract

After our initial hype over the digital revolution, we are realizing that interactive technologies, such as personal computers, smartphones, and tablets, are changing our daily experiences exponentially, without necessarily improving the way we live. Although contemporary design practitioners are increasingly interested in a more human-centered design, they objectify the experiences of the people they are designing for by not considering their own experiences during the design process. As a result, these designers do not have the means to observe, talk and reflect about the implications that their design practices and products have on their own experience and that of others.

I propose a radical alternative to contemporary practices conceiving and developing new interactive technologies. I call this Transformational Design—a mindful, hands-on, and collaborative practice that allows designers to bring forth their own experiences within their creative process (designer's experience) and then talk and think about the experiences of others (user's experience) in terms of what they have directly experienced. This practice combines Mindfulness practice (Vipassana) with exploratory design (Shape Grammars) using interactive materials, including sensors, microcontrollers, and effectors.

In this dissertation, I present the foundations of Transformational Design, including the conceptual guidelines—a vocabulary and models—along with the exercises to apply them in practice. In these exercises, participants express their experiences and design by putting together interactive and recycled materials. They also play as users and designers, exchanging their expressions and products, and then observing one another.

I built this practice by simultaneously conceiving the foundations and exploring them in workshops with many others. In total, I conducted 14 workshops with 188 participants in Chile, India, and the US. I have found that with Transformational Design, participants can become mindful, and then express their experiences as a construction; can bring forth new experiences by engaging with their designs in ways they have not done before; and can begin reflecting on how these experiences change the lives of others in ways they could not have predicted.

It is my hope that this practice will pave a meaningful alternative path, one that designers can use to begin reflecting as they are putting together new technologies, for themselves and others.

Thesis Supervisor: George Stiny

Title: Professor of Design and Computation

Acknowledgments

The verb *support* (in Spanish "soportar") is an ambiguous term because it has two connotations: to encourage or aid, but also to endure or tolerate. I have to thank many people, friends, colleagues, and family, for *supporting* me and my work throughout the last five years.

I begin with my friends, who are the special ones supporting me by their own will:

Andrea and Martin, you bring joy to my world. Thanks for Greenpoint and our US trips, and for saving my dissertation when I wanted to throw everything into the trash.

Daniel and Jos, your sleeping bag Marcelo was always there in NY when I needed to escape. We came together to this country and are still surviving as Latin Jews.

Edwina, you are crazy but I love you. I am not sure how you exactly helped me, but I am sure you did, and I still want to have you in here.

Christine, thanks for doing a workshop with me and wearing the Transformational Design t-shirt better than I do. As a way to honor you, I explain transformation using you and your red hair as an example on page 190 (Claire is there too).

Dina, Rachel, Theodora, Moa, you had to support me all these years in the Design & Computation Group. We are all going through a similar process and getting a bit crazy, that is true. But at least we are going through this together, hoping there is light by the end of the infinite corridor (maybe it is La Verde's?)

Onur and Diego, "puck, puck, puuuuuuuck!!"

Asli, we can do this. A good dissertation is a submitted one.

Yaniv, Rodanthi, and Katia you adopted me, and fed me in all those eclectic dinners and Jewish celebrations. Don't forget me, I can only say, "I am a big boy... I will be back soooooooooooooooooooooon."

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Carolina and Gabriel, your School for the Blind is one of the most progressive institutions and with the biggest heart I have ever seen. I admire what you are doing there. Thanks for opening the doors of your school and participating in the workshop.

Saeed and Saba, NuVu is like home. I have so much fun with you in Cambridge and India (I can't believe you left the care of these kids to me, however).

Chicho, you trusted blindly in my crazy workshops. It has been really nice working with you and the Catholic University of Chile. Many more projects to come.

Jose, you designed the Spaghetti with me and you were an amazing assistant in the workshops. I know you do not like this "experience" thing so much. You are an engineer. But I saw how you were having fun during the workshops, both as a student and an assistant (photo of you on page 157).

Victor, you gave power to Spaghetti by solving the mystery of the voltage regulator.

Ana, for future workshops together. Let's take over Latin America (but Venezuela).

Now, I have to get serious and thank my advisors who supported my work by listening and guiding me:

Terry, you are tough (did I say serious?). In the text, when I write "you may argue this or that" I am responding to your comments. So I dedicate those sections to you (there are a lot of them). I am also beginning the introduction with a story about you and your mom.

George, you shaped my understanding of design. I hope you like this dissertation. I am not sure, but I can only quote the best and say, "what you see is what you get" (Stiny 2006, 31)

Edith, you are the best listener that I know. It was really nice having this dissertation has an excuse to meet you for coffee and have those transformational conversations at Flour (I write about them on page 194).

Patricio, Ximena, Simon, Sebastian, and Humberto, you all opened your arms and hearts, and hugged me at Matriztica, your beautiful organization. I have stolen so many ideas from you. As you say, learning is transforming by living together. After spending so much time with you, I was transformed and altered the course of my work towards transformation. Cristobal thanks for bullying me at Matriztica (If I look like Millhouse you look like Nelson).

Paul, you are my cybernetic guru. I am grateful for your generosity on all aspects, work and life.

Marilyn, it has been seven years and you are finally getting rid of me. Are you going to miss me? You shaped the way I write by giving me a voice. I feel you wrote this dissertation so if the reader doesn't like it, it would be your fault. Also, are you sure I can write like this in the Acknowledgements? It is a bit too informal. Last-minute addition: while reading these acknowledgments you just said, "you're finally 'getting' prepositions."

Patricia, this final edition *appeared* thanks to you.

CRON, you are super heroes but you have to fix the m7-301 printer.

Cynthia, thanks for the chocolates. And Renee, thanks for your amazing disposition, calm, and for keeping everything moving smooth in the Design & Computation Group (if you approve the format of this dissertation I will buy you coffee as promised; am I bribing?)

Finally, I am infinitely indebted to my family, who supported me for the longest time, by having me in their lives since I was born:

Papo y Mami, you are the best parents in the world. Do you know why? because you "brought me into the world" (And yes, I am quoting you mom). Thinking about how to thank you makes me cry. Thanks for your infinite love, for feeding me, nourishing me, educating me, and making me who I am. And dad, thanks for being my technical assistant in the workshop with the blind. I included a photo of you on page 164.

Tali, Roni, Dafni, and Sibani, we are so diverse and yet so united, we are like a kvutza. Let's do a "Forongooooo!" And Tali, thanks for being my teaching assistant in the workshop at the Catholic University of Chile. Most of the photographs in Chapter 7 were taken by you.

Tata y Aidita, I dedicate this dissertation to you. I look up to you and still talk to you in my dreams. You are my grandparents and you are alive in me.

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INTRODUCTION

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1. Founding a Practice

As I am writing this introduction, I am thinking about the best way to begin. The first thing that comes to mind is what Terry Knight, a professor in the Department of Architecture and one of my advisors at MIT, asked me after reading my first draft: “So, Daniel, if I had to explain your work to my mother, what would I tell her?” At that moment, I did not know what to say. Although I had completed all the research and most of the writing, I was still unable to answer her question. I had a title for my work, Transformational Design, but I did not yet know how to explain it.

After several months and rewrites, I can now offer an answer to Terry’s question. As you read on, you are going to see that Transformational Design is a *practice*, a new design discipline that becomes real through the actual exercise of its foundations. And this practice is a mindful, hands-on, and collaborative activity for a creative process motivated and directed by human experience. I offer this practice to design practitioners and educators interested in experience, as well as for everyone open to exploring new ways of learning, teaching, and exercising design.

Others before me have touched on the concept of transformation in relation to design, describing design as an activity through which we change the environment, our physical world¹. Transformational Design, on the other hand, is the only practice that describes design as an activity through which we change our experiences and ourselves. Moreover, it is the only practice

¹ For example, Herbert Simon, an economist, computer scientist, and design theorist, describes design as an activity aimed at changing “existing situations into preferred ones” (Simon 1996, 5). In a similar way, Donald Schön, a design theorist, describes design as changing “indeterminate situations to determinate ones” (Schön 1990, 42). Although both, Simon and Schön, do not explain what they mean by “situation,” in the text they write about the design of artifacts or things in the physical world. While Simon writes about the creation of the *man-made artifacts* (Simon 1996, 111), Schön writes about the making of *physical objects* that occupy space (Schön 1990, 41).

that addresses these transformations from a mindful approach; from the first-person or point of view of the *designer's experience*. While designing for others, designers are bringing forth their own experience, and can observe, talk, and think about another person's experience (the so-called *user experience*) in reference to what they have experienced themselves. In this design practice, you will read about how you can become mindful of your experience while you are designing; you will read about how you can design to bring forth experiences you have never felt before; and you will read about how you can design for others without prescribing their experiences.

Everything you are about to read is a result of an iterative and open-ended process of exploration. Please take some time now to skim through the pages. You are going to encounter many words, some diagrams, but also many images of people doing things: drawing in front of rivers, connecting cables, gluing cardboard, and observing one another sensing and moving with materials (Fig. 1.1). These images are the result of the work I have developed over the past three years. I built this practice by simultaneously writing the conceptual guidelines and exploring them in practice with many others. In total, I conducted 14 workshops with 188 participants in Chile, India, and the US. On the following pages, I present a selection of six workshops, describing in detail the work of 24 participants.

In the text following this introduction, I describe this practice from the bottom up, through what I am calling its Three Foundations. However, here, I would like to introduce my practice backwards, offering you the whole picture, from the top down. Everything comes together through the Third Foundation, where you encounter an exercise: a game where participants express their experience to one another, respond by rearranging materials, and then deliver them and observe one another. This game is the enactment of a model, a set of conceptual guidelines describing the design moves that I, the designer, and the person I am designing for, can practice to transform ourselves together in design, as we are observing one another bringing forth our own individual experiences (Fig. 1.2).

The game and the model are supported by the previous two Foundations, both including an exercise and a set of conceptual guidelines (Fig. 1.3 and 1.4). Through the exercises I explore the activities that I then incorporate



| Figure 1.1 |
Transformational Design in practice



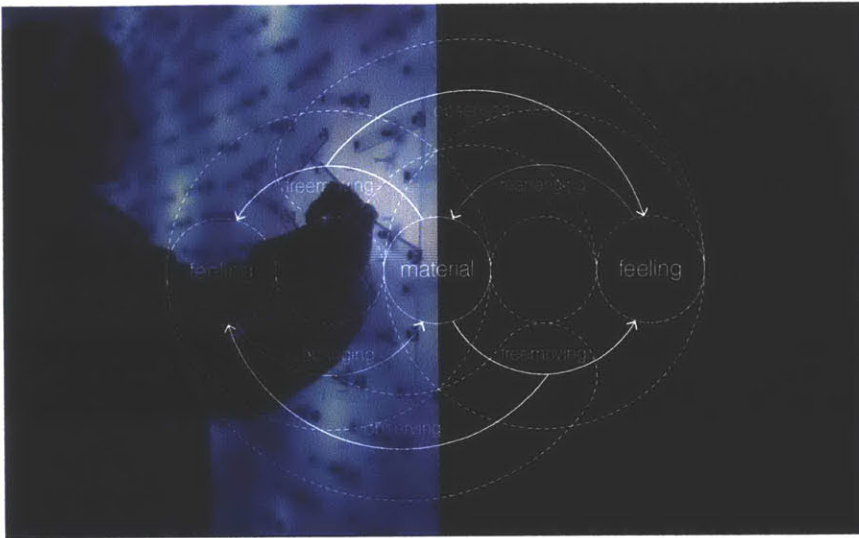
in the game, namely how to express an experience and how to rearrange interactive materials. Through the conceptual guidelines, which include an initial model and a vocabulary, I begin building the concepts and diagrams that I then incorporate into the final model of my Third Foundation.

In sum, Transformational Design is a practice supported by three foundations. This description answers Terry's question about the *what*. But I also want to extend her question as to the *why*. Coming down from the top, and after skimming through the Third, Second, and First Foundations, we arrive at this introduction. I decided to describe the *why* as part of this chapter to declare my motivations and state-of-the-art before I begin. On the last pages of this introduction you will encounter a section called An Alternative Path. In that section, you will find a more detailed summary of the Foundations of my practice, one by one, from the bottom up this time. Next, you will encounter a section called Three Hindrances. In that section, you will read about why I propose an alternative to contemporary practices, conceiving and developing new interactive technologies. In recent years, I have seen how designers interested in technological innovation are increasingly trying to address human experience within their practices, and yet I have also seen how their actual practices are keeping them from doing so.

Finally, as we skim through this chapter backwards, we arrive at the section that follows on the next pages, a section called Unreflective Transformations. In that section, you will read about the motivation behind everything you are about to read. I describe a problem that I have felt directly, as I have observed how new shining, blinking, and buzzing things are proliferating around me, changing my own life and the life of others in my world –and I have seen how these changes are taking place without our being able to direct them in ways we might want them to unfold.

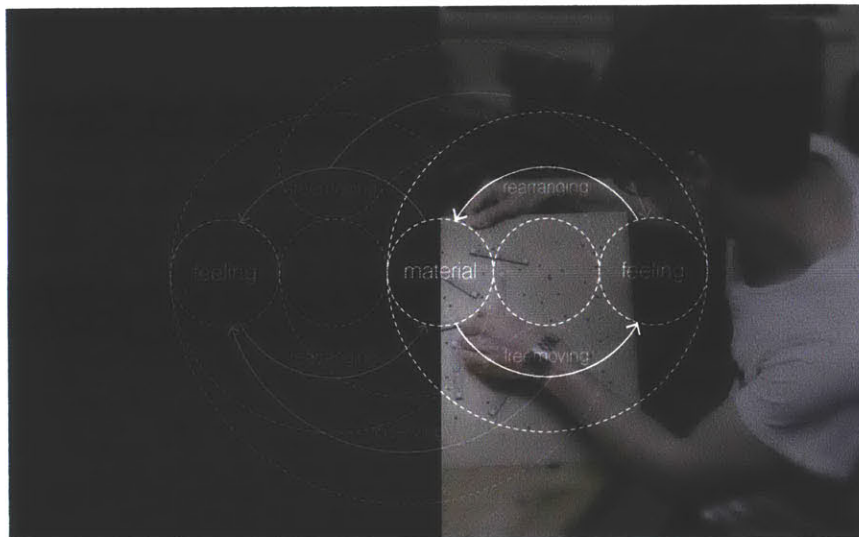
How to Read

I started top down, from the last pages, going backwards through the Foundations and arriving at this introduction. Now it is time for you to make your own path. I am delivering these materials to you, the words, diagrams, and images printed with ink in these 150 pieces of paper, and you



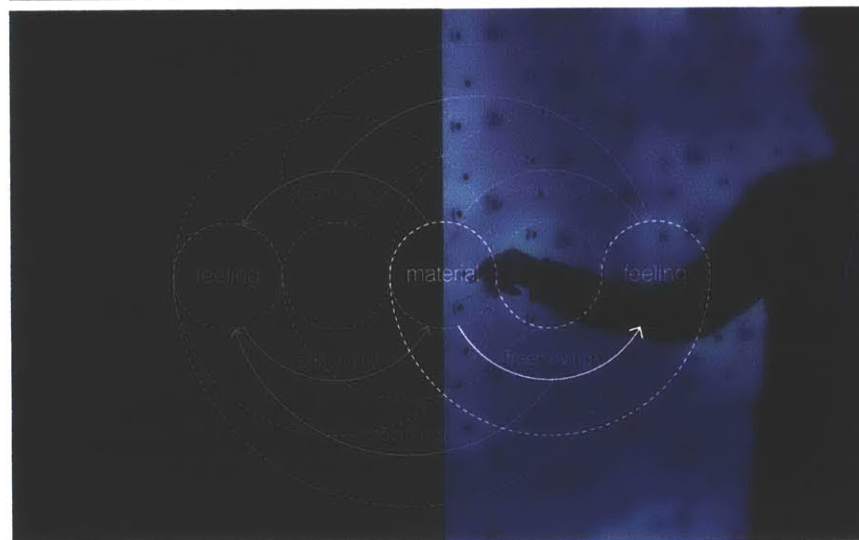
| Figure 1.2 |

THIRD FOUNDATION : Transformational Model



| Figure 1.3 |

SECOND FOUNDATION : Experiential Model



| Figure 1.4 |

FIRST FOUNDATION : Mindful Vocabulary

can explore these materials freely by moving your eyes, turning the pages, and reading it any way you want.

However, a *warning* before you begin: if you attempt to go through the whole text reading linearly in one sitting this may be rather painful. For my defense, Edith Ackerman, one of my advisors at MIT, said that the reading was like “climbing the Himalayas” and that, although the view from the top was “clear and wonderful,” climbing from the bottom up felt like an “ordeal.” I agree with Edith, and that is why I include this warning here at the base camp, before you begin your journey.

Fortunately, when we read we do not have to follow the laws of gravity; we can read linearly but we can also fly, jump, and dig inside the Himalayas. This is my invitation: read freely in any way you want, make leaps, skim, read backwards, and go back and forth. As an example, I offer three ways to explore the mountain.

One way you can read the text is by flying to the top right away and exploring the Third Foundation. You can appreciate the view from there, and then if you have questions or want to probe at closer range, you can fly down anywhere to any other terrain on the mountain and consult the other Two Foundations. A second way you can read the text is by jumping between parallel trails that inform one another. Some of these trails, chapters and sections, have similar slopes, views, rocks, and colors. For example, by jumping between chapters 3, 5, and 7, you will be able to peruse my findings to discover what the *Constructs*, the *Unrecognizables*, and the *Mismatches* are. And a third way you can read the text is by looking at the map, the Table of Contents (on pages 10 and 12), and then choosing a specific destination or path that you like or find intriguing. You can dig inside the Mountain, excavating, and then surface anywhere you want to begin reading the different terrains, rocks, clouds, and distant horizons.

These are only three suggestions. I am sure you will find many more. The point is that this text is not written as a linear *tome*. It is written as a *companion guide* you can keep on your desk, read now and then, or consult anytime you want to re-enter the realm of Transformational Design.

1.1. Unreflective Transformations

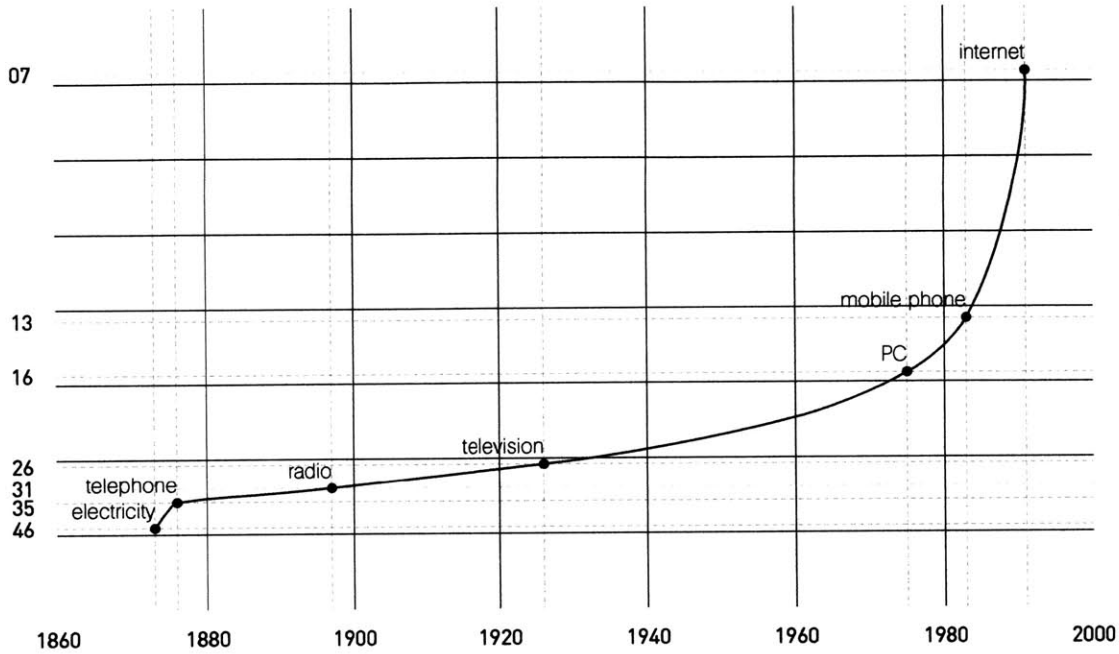
Over the last few years, I have seen how new *interactive technologies* such as personal computers, smartphones, tablets, wearable technologies, and the internet of things (IOT) are proliferating all around me and the people I know. These are labels, or words for *things* I see responding to me when I do something with them. With a smartphone, for example, I hold it, walk with it, and observe and click its screen to write to my friends, read their responses, take pictures, and listen to music.

I have also seen how these new technologies are affecting me and those around me. For example, I have witnessed how I have become anxious if I cannot find my smartphone, and how my sister is texting her friends while we are having dinner. As we are changing our experience—what we feel and do—we are also changing ourselves. I talk about *transformations* here to evoke not only one but the multiple changes we are all undergoing with and through these technologies: changes in what we do and feel when we work with these technologies, write and talk to one another, walk around our parks, have dinner with our loved ones, play, learn, and cry.

For me, these transformations are becoming a problem because I have seen how we are changing more than ever without directing the course of these changes in ways we might want them to unfold. These transformations are just *happening* to us; they are increasingly taking place without our reflection and response. I call this problem *Unreflective Transformations*. My strategy is to begin addressing this problem within the creative process itself, as designers are putting new technologies together.

More and More

These new technologies are proliferating over shorter and shorter periods of time. As a result, every day, I see, touch, or hear about a new type of phone, a new software application (app), a new object or space with a screen. I describe this proliferation to explain why I believe the problem of Unreflective Transformations has become more critical than ever.



| Figure 1.5 |

Adoption of Technologies
Redrawn from (Kurzweil 2006)

(Years until adoption by 1/4 U.S. population)
Electricity 46, telephone 35, radio 31, television 26, PC, 16,
mobile phone 13, internet 7

The writings of some futurist scholars support what I have observed directly. They have demonstrated the exponential growth of technological development using data about cost, power, size, and use of major human inventions. They talk about an *exponential curve* by expressing this growth graphically (Fig. 1.5). For them, the pace of technological development has always been exponential. For me, what is different today is that the changes are taking place within my lifetime. While before changes occurred over generations, or few and scattered within a person’s lifetime, today a person is undergoing numerous and simultaneous changes within decades or even years.

Alvin Toffler, a futurist scholar, describes how it took millions of years for humanity to move at 100 mph (trains in the 1880s), and only 80 years to move at 4,000 mph (rockets in the 1960s). He says, “Plotted on a graph, the line representing progress in the past generation would leap vertically off the page” (Toffler 1984, 26). In this case, however, people living in the 1900s may have taken a lifetime to change from moving in trains at 100 mph to moving in rockets at 4,000 mph. Today, new technologies are developed and adopted within decades, years, or even months and, consequently, in a

lifetime people are undergoing more changes than before. For example, Ray Kurzweil, another futurist scholar, shows how the adoption of the telephone by 1/4 of the U.S population took over 46 years, while the adoption of the internet only 7 years (Kurzweil 2006, 10)(Fig. 1.5). And Eric Schmidt and Jared Cohen, also futurist scholars, describe how between 2000 and 2010 the number of people connected to the internet increased from 350 million to more than 2 billion, and the number of mobile-phone subscribers increased from 750 million to over 5 billion (Schmidt and Cohen 2014, 4).

However, while most futurist scholars have focused on the inventions themselves, I focus on the experience we undergo with these inventions, because for me using and living with all these inventions has also affected our experience and who we are. For example, talking on the phone and talking on the mobile phone are different experiences: with the phone I talk from the same space and I am not always reachable, and with the smartphone I talk from any place, even as I walk, and I am always *on call*. I remember how, with the phone, I knew all my friends' mothers because when my friends were not home, their mothers would pick up the phone and I would talk to them. Today, however, with smartphones my friends are always accessible, and I do not get to meet or talk to their mothers anymore.

Thus, the exponential proliferation of new interactive technologies is changing our daily experiences faster and faster, every year, every month, every day. More and more interactive things are appearing around me and the people I know, and more and more are yet to come. This exponential proliferation explains why I believe we need to begin addressing this problem today. While you may argue that we have always transformed with the products that we have put together for one another, I argue that today these changes are occurring at unprecedented speed, so we have no time to reflect and decide how—and whether—we actually want to transform.

So What?

We are not only changing with and through our technologies, but we are also not able to direct the course of these changes in ways we might want them to unfold. As a result, I have witnessed directly how some changes

have affected my own sense of well-being and the sense of well-being of the people I know, making us feel distracted, insecure, and lonely. I describe these negative effects to make clear *why* the problem of Unreflective Transformations *matters*.

The writings of some scholars in science and technology support what I have observed directly. They have studied the implications of living with computers and smartphones today, and have found some negative effects such as distraction, insecurity, and loneliness. As they describe these effects, they also touch on other negative ones such as burden, unhappiness, discontent, anxiety, aversion, and fear. For them, these negative effects *are* the problem, which they are trying to solve or mitigate. For me, these negative effects are not the problem, but consequences of a problem. They demonstrate why the problem of Unreflective Transformations is important.

Alex Soojung-Kim Pang, a scholar of science and technology, describes interactive technologies as shining, blinking, and buzzing things that are increasingly diverting people's attention, dulling their capacity to concentrate and focus on a specific activity (Pang 2013, 65). For him, as people are becoming more and more accustomed to splitting their attention among different devices and applications, the constant buzz of these technologies is increasingly becoming a burden, making people feel overwhelmed, unhappy, and discontent (Pang 2013, 7). These shining, blinking, and buzzing things have screens with buttons and functions, which Howard Gardner and Katie Davis, both education scholars, call applications or *apps*. For them, these apps have contributed to people's anxiety and aversion to risk-taking, affecting their sense of self, autonomy, and identity (Gardner and Davis 2014, 81). Today's youth does not allow itself the time and space to figure out who and what they want to be, because they are too busy documenting and sharing their lives for external confirmation: texting, tweeting, emailing, and taking selfies (Gardner and Davis 2014, 75). And these activities have become means for connection. Sherry Turkle, an ethnographer and scholar of science and technology, shows how people are affected as interactive technologies replace face-to-face communication (Turkle 2012, 11). For her, we are increasingly feeling "lonely but fearful of intimacy" (Turkle 2012, 1), increasingly *alone* and yet increasingly *together* through superficial

connection instead of actual communication.

All of these scholars respond to these consequences chiefly as critics, after the fact—after these technologies have already been developed and adopted. For example, Soojung-Kim Pang offers an approach that does not modify the technologies but shows how to construct a more balanced and healthier relationship with them (Pang 2013, 216). Gardner and Davis offer guidance by discussing with people about existing laws, regulations, penalties, and best practices regarding the use of these technologies (Gardner and Davis 2014, 173). And Turkle offers her writings as a way to open up what she calls “necessary conversations” by asking about our values and human purpose (Turkle 2012, 19). She concludes, “Technology reshapes the landscape of our emotional lives, but is it offering us the lives we want to lead?” (Turkle 2012, 17).

These scholars are reacting to these interactive technologies by reflecting on the final products, without considering the process of transformation. That is, they do not see that there are more and increasingly more changes to come. They take the computers, the smartphones, and the apps as *the* technology, without seeing that these devices were not always there: they were conceived and developed by people. Their reaction is like reflecting about the consequences of a cake that has already been cooked and eaten, instead of showing how to reflect about a new cake as it is *being cooked*.

Reflecting while Designing

The proliferation of new interactive technologies has not just come out of nowhere. In recent years, the thrill of technological growth has led to the rise of new design practices; more and more business people are calling themselves designers, more and more designers are calling themselves entrepreneurs—and all these new designers are eagerly trying to develop the next *Big Thing*, the new technology that is going to change our worlds once more.

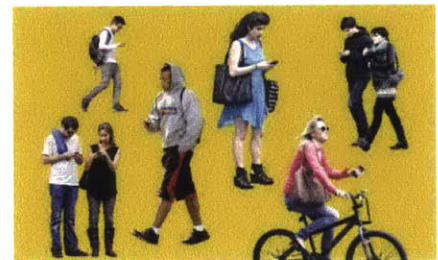
For me, these are the people with their hands on the ingredients, cooking, tasting, and delivering the new cake to people’s tables.



| Figure 1.6 |
Splitting attention among different devices
(Pang 2013)



| Figure 1.7 |
Texting, tweeting, emailing, and taking selfies
(Gardner and Davis 2014)



| Figure 1.8 |
Replacing face-to-face communication
(Turkle 2012)

This is why I begin addressing the problem of Unreflective Transformations within the actual design practice, where these new interactive technologies are being *cooked*. We can all reflect about the way we are transforming with and through technology. For example, I can take a moment, right here right now, and pay attention to what I am doing and feeling with my smartphone, and decide whether I like these doings and feelings or not. However, I can also begin earlier by tasting while cooking, that is by *reflecting as I am putting these technologies together*.

I propose three steps to begin reflecting as I am designing. The first step is becoming mindful of my experience in the moment, so that then I can talk and think about it. For me, reflection is about *feeling* the experience directly and then asking ourselves questions about how it feels.

The second step is bringing forth a new experience, an experience I have never felt before. In design, I am not reflecting about an experience that I know, but rather about an experience that I am feeling for the first time, as I am putting materials together and trying things out.

Steps towards Reflection

1. Becoming mindful of my experience in the moment, so that then I can talk and think about it
2. Bringing forth a new experience, an experience I have never felt before
3. Thinking about and observing the experience of the person I am designing for (in terms of my own experience)

And the third step is thinking about and observing the experience of the person I am designing for, in terms of my own experience. In collective design, I am not only reflecting about my own experience but also about the experience of the person I am designing for. And I can do so by observing and thinking about this person's experience and making sense of what I see and think in the light of what I experience myself.

In sum, I am neither reacting to the existing technologies, nor to the transformations we have undergone with them. For me, that is looking at the problem backwards. Instead, my strategy is to look forward and begin reflecting on products yet to come. Still, I need to know the state-of-the-art, or how contemporary designers are trying to develop these new interactive technologies today.

1.2. Three Hindrances

These new designers, who are eagerly trying to develop the next technology, come from different backgrounds. They come from Computer Science, Electrical Engineering, and Business². I know a computer scientist who used to talk about his practice as “software development” and now describes himself as an “experience designer.” At MIT, I have taken classes with electrical engineers who are not talking about efficiency and problem solving anymore, but rather about making musical instruments, interactive toys, and trees that speak. As a designer I have been invited by professors in business schools to collaborate with them and teach their students about innovation.

I have observed how these new designers have gathered together, made up new labels to describe what they are and what they do, and created new schools, laboratories, and companies using these labels. That is, they have created new design practices. In particular, I have seen how three new design practices have positioned themselves as the predominant ones that conceive and implement new interactive technologies today and bring them into people’s lives. These design practices are Experience Design, the Maker Movement, and Design Thinking.

However, through studying these practices, I have realized that their actual writings, initiatives, and processes are in fact obstructing their practitioners from reflecting about the transformations they are bringing forth. I call these obstructions *Hindrances*, and I have found three of them: *Delusion*, *Oversight*, and *Objectification*.

Although these new design practices are all affected by the Hindrances to different degrees, each one of them is obstructed by a particular Hindrance in a predominant way: Experience Design is obstructed by Delusion, the

² Even though these practices emerged out of Computer Science, Engineering, and Business, they borrowed some of their tools and methods from well-established design disciplines: Experience Design from interaction, graphic design, and design research (human-factors); Personal Fabrication from architectural education, including studio-based and hands-on learning; and Design Thinking from product and participatory design.

Maker Movement by Oversight, and Design Thinking by Objectification. I have chosen these three practices, along with their corresponding Hindrances, in order to contextualize my practice as an alternative.

Delusion

I call this first Hindrance Delusion because designers believe they are working with experience as their design subject when actually they are not doing so. This Hindrance is the most common among practitioners interested in a more human-centered design. Delusion is difficult to demonstrate because these designers are convinced that they are designing with experience as their design subject. However, this hindrance can be seen in how scholars describe the practice of those who claim that they are designing with experience as their subject.

In the context of interactive technologies, practitioners working in Experience Design³ are the contemporary designers who are primarily obstructed by Delusion. These practitioners, who call themselves *experience designers*, primarily develop graphic interfaces for personal computers, smartphones, and tablets (webpages, online platforms, apps). Beginning in the late 1990s, Experience Design emerged as computer scientists began realizing that their functional and technologically-driven account of Human-Computer Interaction (HCI) was too narrow (McCarthy 2004, 3). Practitioners and scholars in HCI began talking about experience as a way to express their interest in human activities as well as human-related concepts, such as social context, satisfaction, motivations, and emotions.

However, although their interest is experience, experience designers do not propose a means they can use to actually design with experience as their design subject. The delusion is that they believe they are designing with experience when they are not. I demonstrate this delusion by illustrating three ways in which scholars reflect the practice of experience designers when

³ This emerging design field has also been described as User-Experience Design or UXD. I use Experience Design because I want to focus on experience and design first, before talking about the experience of others (the so-called *user*). I incorporate the *user* within the third hindrance of *objectification*, which expands *delusion* to the collective domain.

they describe Experience Design. I have distinguished between product-oriented, technical, and theoretical approaches.

One way scholars reflect the practice of experience designers is by using a product-oriented approach. Delusion manifests itself here through the scholars' misunderstanding that they are writing about Experience Design, when in fact they are describing design products.

Take the work of Mike Kuniavsky, one of the earliest promoters of Ubiquitous Computing in Experience Design. In his book *Smart Things*, Kuniavsky defines experience as people's perceptions about the effectiveness, efficiency, and emotional satisfaction of a product (Kuniavsky 2010, 18), and Experience Design as a series of practices⁴ that create the experience of a product.

After briefly presenting these definitions in the introduction of his book, Kuniavsky gives examples of finished products in detail, including MP3 players (iPod), smart tables, refrigerators, smart toys, and displays (Kuniavsky 2010, 117). However, instead of describing these examples in the light of his own definitions of experience and experience design, Kuniavsky tells technical, historical, and commercial stories about them.

A second way scholars reflect the practice of experience designers is by using a technical approach. Delusion manifests itself here through the scholars' misunderstanding that they are writing about Experience Design, when in fact they are describing techniques borrowed from other disciplines.

Take the work of Russ Unger and Carolyn Chandler, both practitioners and scholars of Experience Design. In their book *A Project Guide to UX Design*, they define experience as a series of elements, including touching, hearing, and smelling physical things, as well as interacting with digital interfaces and people (Unger and Chandler 2012, 3), and Experience Design as the creation and synchronization of these elements to affect people's experience (Unger and Chandler 2012, 3).

⁴ According to Kuniavsky the practices that conform Experience Design are identity design, interface design, industrial design, interaction design, information design, service design, and information architecture (Kuniavsky 2010, 18).

Transformational Design

Kuniavsky's descriptions

Experience

People's perceptions about effectiveness, efficiency, and emotional satisfaction of a product

Experience Design

A series of practices that create the experience of a product

Unger and Chandler's descriptions

Experience

Touching, hearing, smelling physical things, and interacting with digital interfaces and people

Experience Design

The creation and synchronization of these elements to affect people's experience

McCarthy and Wright's descriptions

Experience

Felt activity including sensual, emotional, compositional and spatio-temporal threads

Experience Design

A design practice that pays attention to experience

After briefly giving these definitions in the introduction of their book, Unger and Chandler present, in detail, a catalogue of techniques borrowed from other disciplines, such as usability, marketing, and graphic and web design (Unger and Chandler 2012, 32). These techniques include user research, personas, storyboards, site maps, tasks flows, wireframes, and design testing⁵. However, Unger and Chandler do not integrate their own propositions into these existing techniques.

Finally, a third way scholars reflect the practice of experience designers is by using a theoretical approach. Delusion manifests itself here through the scholars' misunderstanding that they are writing about Experience Design, when they are only providing a critical account of how technologies are experienced according to them.

Take the work of John McCarthy and Peter Wright, both scholars in Human-Computer Interaction (HCI). In their book *Technology as Experience*, they define experience as a felt activity constituted by four threads: sensual, emotional, compositional and spatio-temporal (McCarthy 2004, 79), and Experience Design as a motivation to pay attention to experience within design (McCarthy 2004, 10).

After describing these threads of experience in detail, in the introduction and three chapters of their book, McCarthy and Wright present three personal stories illustrating how particular technologies are experienced. These stories include online shopping, piloting, and ambulance control (McCarthy 2004, 131). However, they do not explain how their threads of experience can be incorporated within an actual design process or how these technologies were actually conceived and developed by their designers.

In sum, these three approaches to reflecting the practice of experience

⁵ *User research* corresponds to personal interviews or general surveys, observation of potential users, cards sorting, Focus Groups, and Usability Testing. (Unger and Chandler 2012, 108). *Personas* are documents that describe an exemplary user or audience according to a particular product or design problem (Unger and Chandler 2012, 130). *Storyboards* are visual examples or scenarios describing users' tasks (Unger and Chandler 2012, 165). *Site Maps* are diagrams showing the relation between pages of a website (Unger and Chandler 2012, 231). *Task flows* are diagrams showing the path the user will take as they progress through a website (Unger and Chandler 2012, 231). *Wireframes* are low-fidelity website sketches of digital prototypes (Unger and Chandler 2012, 238). Design Testing correspond to quantitative or qualitative techniques used to validate design decisions with participants (Unger and Chandler 2012, 279).

designers provide examples of the hindrance of Delusion, which refers to my observation that while these scholars claim to be writing about experience and design, in fact they are writing about finished products, borrowed techniques, and the experience of technologies already designed.

Oversight

I call this second hindrance Oversight because, by overlooking experience and only focusing on the making of things, designers do not know how to make a thing that is different from other things they have experienced before. This hindrance is the most common among designers, because design has traditionally been described as the making of physical things, either directly or through a plan that informs that making⁶. However, the implication of this hindrance can be seen in how designers fail to fulfill their own promises.

In the context of interactive technologies, practitioners working as part of the Maker Movement⁷ are the contemporary designers who are primarily obstructed by Oversight. These practitioners call themselves *makers*, because they make physical things, including interactive tangible products that use electronics (wearables, e-textiles, internet of things). I consider this movement a practice because makers engage in hands-on activities such as drawing, soldering, programming, fabricating, and assembling. Over the last ten years, the Maker Movement has gained particular traction due to the Internet and the growing availability of powerful tools for software design and digital fabrication (Dougherty 2013, 7). By harnessing the Internet, the tools, and the entrepreneurial mind-set resulting from earlier software and web innovations, the makers have *promised* to democratize design,

⁶ Donald Schön, a design theorist, describes designing as making physical objects: “Architects, landscape architects, interior or industrial or engineering designers, make physical objects that occupy space and a plastic and visual form” (Schön 1990, 41). And John Habraken, a design theorist, describes designing as a planning that informs the making of physical objects: “in this culture of people and things, the designer has appeared as someone who produces a plan for what is to be made. Designing is one of several activities in which we engage to supply ourselves with the artifacts we want around us” (Habraken 2014, 9).

⁷ This movement encompasses other similar initiatives such as Personal Fabrication (Gershenfeld 2007) and the Do-It-Yourself (DIY) movement (Hatch 2013).

creativity, and innovation, stating, “we are all designers now” (Anderson 2012, 53) and “now, almost anyone can innovate”⁸ (Hatch 2013, 10).

However, although their interest is promoting design, creativity, and innovation, makers are only showing how to make things they already know of; that is, things they have experienced before. The oversight of experience is evident because makers neither talk nor write about human experience. I demonstrate the implications of this oversight by illustrating the initiatives that makers use to implement their promises. I have distinguished three main initiatives: Maker space, Maker media, and Maker faire.

One makers’ initiative is the Maker space. The implication of Oversight, in this initiative, corresponds to the incapacity of makers to teach and learn how to make something different from what others have already made. In other words, they are not really able to explain how to become creators of their own products.

The Maker space is described by its promoters as an instructional shop with the space and tools⁹ for people to use freely and make “whatever is in their imagination” (Pepler and Bender 2013, 23). Basically, the promise of this space is that it allows people to become makers of their own creations rather than consumers. As President Obama stated in his Educate To Innovate Campaign, makers “see the promise of being the makers of things, and not just the consumers of things” (“Remarks by the President on the ‘Education To Innovate’ Campaign” 2015).

However, in Maker spaces people are only taught how to consume the tools and how to re-produce things already designed by others. Take the TechShop, one of the earliest and most successful Maker spaces in the



| Figure 1.9 |

Maker Space
(MIT Architecture Fabrication Shop)

⁸ However, makers differentiate themselves from software and web products by promoting innovation as *making*: constructing *new physical things* in the real-world (Anderson 2012, 17)(Dougherty 2013, 7) (Hatch 2013, 11).

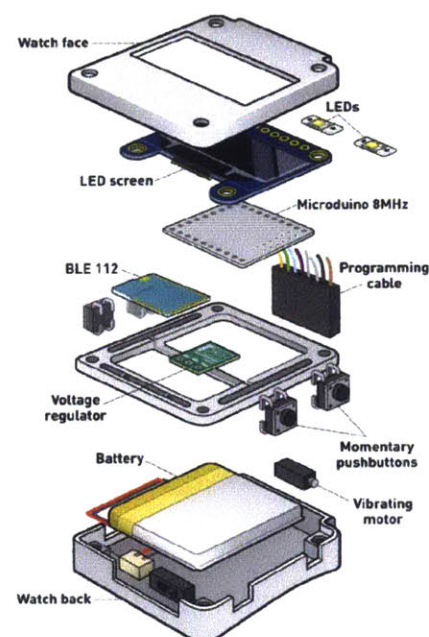
⁹ While some tools, such as 3D printers, laser cutters, and milling machines, have been widely used in the making of traditional non-interactive products, other tools have been used in the making of interactive products, such as robots, art installations, e-textiles, and wearables. These tools include hardware (small computers, such as Arduino or Raspberry Pi) and software (graphic interfaces to program these small computers) used to control the reactions and relations of electronics, sensors, and effectors of different kinds (Pepler and Bender 2013, 24).

world. This space offers skill-based classes and project-based workshops. While in the classes monitors teach the tools along with traditional making techniques (digital modelling, laser-cutting, 3D printing, programming, welding, and sewing)¹⁰, in the workshops they teach how to re-make physical objects have already been designed by others (ceramic bowls, wooden skateboards, metal flowers, leather belts, heart-shaped chocolates, and Arduino microcontrollers).

A second makers' initiative is the Maker media. The implication of Oversight, in this initiative, corresponds to the incapacity of makers to describe their creative processes to one another. In other words, they are not really able to explain how they came up with their designs.

The Maker media is comprised of printed magazines and online portals through which, according to their promoters, people “share their processes and products with others” (Halverson and Sheridan 2014, 496). While magazines showcase finished products along with step-by-step instructions, online platforms extend this content to include real-time troubleshooting through blogs and digital forums (Peppler and Bender 2013, 26). Basically, the promise of this media is allowing people to share and, consequently, learn from one another. As Dale Dougherty, creator of *Make Magazine*, said “people take a little bit from here and a little bit from there, and the resulting mash up leads to some pretty exciting creations” (Dougherty 2012, 12).

However, in Maker media people share how to build the finished products; they do not share how the products were actually conceived. Take *Make Magazine* and *Instructables.com*, two of the most popular media promoted by the Maker Movement. The last edition of *Maker Magazine* showcases 34 finished projects, including a \$250 robotic arm, an open-source Smartwatch (Fig. 1.10), two remote-controlled airplanes, and a climbing-wall for your backyard (“*Make: Magazine*, V43 - Electronics & Wearables” 2015). Similarly, the current homepage of *Instructables.com* features 60 finished projects, including a ring with an LED display, a sword from the legend of *Zelda* (videogame), a four-wheel robot, and a heart with LED lights.



| Figure 1.10 |

How to make a Smartwatch
 (“*Make: Magazine*, V43” 2015)

¹⁰ These are the classes and workshops listed on the TechShop webpage, accessed February 10, 2015, http://www.techshop.ws/take_classes.html.

Basically, in this initiative people are not learning from each other's creative processes, but rather from step-by-step instructions on how to replicate a finished product. Even though in online portals people write and respond to one another, they communicate primarily to help each other solve technical problems.

Finally, a third makers' initiative is the Maker faire. The implication of Oversight, in this initiative, combines the previous implications, that is, the incapacity of makers to become creators of their own products and to learn from one another's creative processes.

The Maker faire is a massive and open event where, according to its promoters, people get together to be "amazed and to make" (Pepler and Bender 2013, 26). Basically, the promise of this fair is that it allows makers to meet in person and learn directly from one another. As Chris Anderson, former editor-in-chief of *Wired* magazine, said, people come to the Maker faire "to share their work and learn from other makers" (Anderson 2012, 18).

However, the Maker faire only promotes the curiosity and amazement of visitors, showing them neither how to become a maker nor how to learn from other makers. Take the last World Maker faire, hosted in New York City in 2014. Even though this faire included stands with making activities (3D scanning, soldering, e-textiles, laser cutting), the event was basically an amusement park, where visitors could fly drones, play in life-size mouse traps, race cars, and could also attend talks by scientist and managers from the movement's major sponsors (NASA, Pixar, Intel, LG electronics, Arduino, and Raspberry Pi)¹¹.

Thus, instead of providing a venue for instructing participants how to become makers and how to learn from other makers, the Maker faire promotes the movement's ideology, tools, and sponsors.

In sum, these three initiatives to implementing the Maker Movement demonstrate the implications of the hindrance of Oversight, for while makers claim to be promoting design, creativity, and innovation, in fact they are

¹¹ The program and schedule of the Maker faire hosted in NYC in 2014 can be found on the Maker faire website, accessed February 10, 2015, <http://makerfaire.com/new-york-2014/schedule/>

only instructing people how to use the tools and how to re-make a thing already designed by others. This is like instructing people how to use a typewriter to type a poem by Neruda, and then claim that by so doing, they will become poets.

Objectification

I call the third hindrance Objectification because designers treat the experience of the people they are designing for as an external object, without including themselves. Like Delusion, this hindrance is also common among practitioners interested in a more human-centered design. Objectification is difficult to demonstrate because these designers are convinced that they are designing the experience of others. However, this hindrance can be seen in how designers relate to the experience of the people they are designing for within their actual practice.

In the context of interactive technologies, practitioners working in Design Thinking are the contemporary designers who are primarily obstructed by Objectification. I call these practitioners *design thinkers*, and they ideate, develop, and implement a wide range of interactive solutions, including graphic interfaces, tangible products, architectural spaces, and services. Over the last ten years, Design Thinking emerged as businesses realized the importance of a human-centered design for effective innovation (Glen, Suci, and Baughn 2014, 653). Although Design Thinking is not a new term¹², it has become widely known and adopted since the promotion of consultant office IDEO¹³ and their D-school educational program at Stanford University (Denning 2013, 31). The benchmark of IDEO's approach to Design Thinking is practicing human-centered design, which basically means proposing innovations that meet the needs and desires of people.

¹² Previously, Design Thinking was proposed in fields of product design, architecture, and urban planning by (Rowe 1987)(Buchanan 1992) (Cross 2011). Herbert Simon, the economist and political scientist, was the first scholar integrating design and business, in the mid-sixties (Simon 1996).

¹³ IDEO is basically a professional design and entrepreneurial firm for creativity and innovation, which promotes their own way of working through models, tools, and stories about their more profitable products.

However, although their interest is a more human-centered design, design thinkers objectify the experience of the people they are designing for, by detaching themselves from the process and trying to capture people's experiences, match them with solutions, and deliver experiences as commodities. Through objectification, design thinkers believe they can *operate* on the experience of people, without realizing they are actually operating on their own. I demonstrate this objectification by showing how design thinkers address experience within their process of "creativity and innovation" (Kelley and Kelley 2013, 22). This process includes three phases: Discovery, Ideation, and Implementation.

The first phase within Design Thinking's creative process is Discovery (Kelley and Kelley 2013, 22). The hindrance of Objectification manifests itself in this phase through the design-thinkers' intention to capture people's experience and find patterns or abstract truths they can use in their design.

This phase is about unveiling people's experiences, so that design thinkers can define a problem to be solved by design. As Tom Kelley, business consultant and general manager of IDEO, said, "Observing people's behavior in the natural context can help us better understand the factors at play and trigger insights to fuel our innovation efforts" (Kelley and Kelley 2013, 21).

In this phase, design thinkers use a series of research techniques to gain insight into the experiences of the people they are designing for. These techniques include interviews, immerse-in-context, analogous-settings, and people's self-documentation¹⁴. Throughout these techniques, design thinkers talk about people's experiences as a way to include human-related concepts such as people's senses, emotions, surprises, frustrations, motivations, decision factors, activities, behaviors, and thoughts. For example, in interviews, design thinkers instruct other designers to "capture what you see,

¹⁴ Interviews involves visiting people, asking them open questions, such as "tell me about an experience," and observing their workarounds ("Design Thinking for Educators" 2015, 31). Immerse-in-context is analyzing a relevant experience by observing people's experience or having the experience directly. Analogous-settings, is learning by observing an experience that is related or similar to the experience of the design challenge. And people's self-documentation is asking participants to "record their own experience" using photographs, diaries, day schedules, as well as voice and video recordings ("Design Thinking for Educators" 2015, 36).

hear, feel, smell, and taste” (“Design Thinking for Educators” 2015, 32). In immersing-in-context, they instruct other designers to ask themselves “what emotions do you experience (surprises, frustrations, motivations, decision making factors), and why?” (“Design Thinking for Educators” 2015, 33). In analogous settings, they instruct other designers to list “all activities, emotions, and behaviors that make up the experience of your challenge” (“Design Thinking for Educators” 2015, 34). And in people’s self-documentation, they instruct other designers to ask participants to “record their own experiences” and “capture and share their thoughts, decisions, and emotions” (“Design Thinking for Educators” 2015, 36)

For design thinkers, Discovery is the phase through which they can frame the problem and provide the context for the next phases of their creative process. Consequently, after completing their research, design thinkers get together and try to “recognize patterns” and define insights about “abstract truths” and “actionable principles” that span across a group of people (Kelley and Kelley 2013, 23). They then try to translate these truths and principles into “problem statements” that they can use to generate solutions in the next phase of Ideation. A problem statement is basically a phrase that focuses on improving people’s experience; for example, “helping bike commuters to drink coffee without spilling it or burning their tongues” (Kelley, Littman, and Petters 2001, 57).

For me, the design thinkers’ intention to capture the experiences of people and find patterns or abstract truths, demonstrates that they consider this experience as a something they can *grasp*. This initial objectification, establishes the design thinkers’ beliefs and way of thinking about experience in the next two phases of their creative process.

The second phase within Design Thinking’s creative process is Ideation (Kelley and Kelley 2013, 22). The hindrance of Objectification manifests itself in this phase through the design thinkers’ intention of matching people’s experiences with designed solutions.

This phase is about coming up with answers to the problems unveiled in the previous phase. As Tim Brown, CEO and president of IDEO, declared, “The mission of design thinking is to translate observations into insights

and insights into products and services that will improve lives” (Brown 2009, 49).

In this phase, design thinkers use a technique called brainstorming, which is basically a collective activity where they think about a product or service that would solve the problem, write down a description of this product or service on a piece of paper (Post-It) and then, hang this piece of paper on the wall and describe this idea to one another (Kelley and Kelley 2013, 23). In this context, an *idea* is basically a written or oral description of a product or a service. This idea refers to an experience indirectly by responding to the problem statement revealed in the previous phase. For example, with the idea “bicycle cup holders,” design thinkers are trying to improve the experience of bike commuters (Kelley, Littman, and Petters 2001, 57).

For design thinkers, Ideation is the phase through which they translate the problem, from the previous phase, into an actual solution that they can then refine and implement in the next phase (Brown 2009, 49). Consequently, before moving to the next phase, design thinkers select their preferred ideas, and then use prototypes to evaluate and communicate them (Buchenau and Suri 2000, 424).

For design thinkers, these prototypes are not only visual or physical mock-ups of the actual products, but also representations of people’s future experiences. (Buchenau and Suri 2000, 424). They talk about these representations as *experience prototypes*¹⁵, describing them as sketches, storyboards, videos, role play, or any kind of medium that designers can use for “communicating the elements that make up an experience” (Buchenau and Suri 2000, 424). For example, design thinkers describe storyboards as a series of images that represent the complete user experience over time, and role plays as tools with which to act out the user experience (“Design Thinking for Educators” 2015, 58). And some of these prototypes create “approximate and partial simulations of the real experiences others will have” (Buchenau and Suri 2000, 432).

¹⁵ In their paper Experience Prototyping, Jane Fulton Suri and Marion Buchenau, both anthropologists and design thinkers, describe experience as a dynamic, complex and subjective *phenomenon* that depends on the perception and contextual interpretation of sensory qualities of an product or service (Buchenau and Suri 2000, 1)

For me, the design thinkers' explicit intention to improve people's experiences, suggests their belief that they can objectify and prescribe the experience of these people. Their intention to evaluate, communicate, or simulate other people's experiences through *experience prototypes* accentuates this belief. This objectification continues to grow in the next and final phase of their creative process.

Finally, the third step within Design Thinking's creative process is Implementation (Kelley and Kelley 2013, 22). The hindrance of Objectification manifests itself in this step through the design thinker's conviction that they are packaging and delivering experiences to people.

This phase is about refining and commercializing the products and services developed in the previous phase, using experience as a means to deliver them to the market. As David M. Kelly, designer and founder of IDEO, stated, "we are now focused more and more on a kind of human-centered design, and that really involves designing behaviors and personalities into products"¹⁶.

In this phase, design thinkers develop roadmaps for a successful execution and inclusion of their solutions into the market. That is, they develop strategies for selling the products or services, capturing customers, and retaining them (Brown 2009, 112). Implementation includes marketing their solutions, tracking their evolution, and responding with new strategies, or even with new products. Their design practice encompasses marketing campaigns, complementary products and services (webpages, apps), architectural spaces, and trained service providers.

For design thinkers, Implementation is the phase through which they *package* the experience ideated in the previous phase (Kelley and Littman 2005, 150). They distinguish a shift in today's economy, moving from delivering products to providing services, to selling experiences (Kelley and Littman 2005, 185). Consequently, they recommend that businesses invest in the delivery of experiences (Brown 2009, 111). For them, experiences are

¹⁶ I transcribed this phrase from the TED talk that David M. Kelly gave on February, 2002. The talk can be seen and listened on the TED website, accessed February 10, 2015, http://www.ted.com/talks/david_kelley_on_human_centered_design

on the rise, with people increasingly buying and giving experiences “from wine-tasting classes to tennis lessons or a weekend at the spa” (Kelley and Littman 2005, 207). They instruct designers to take advantage of this moment, and design experiences for “fun and profit” (Kelley et al. 2001, 194), experiences “finely crafted and precision-engineered as any other product” (Brown 2009, 110).

For me, this phase crystalizes the objectification of experience that these designers began building up in the previous phases of their creative process. Here, the experience of people is literally described as an *object*, as a commodity that can be packaged, delivered, and sold to people.

In sum, these three phases to practicing Design Thinking provide examples of the hindrance of Objectification, for while design thinkers are interested in human experience, they detach themselves and treat people’s experience as something they can grasp, prescribe, and sell.

1.3. Another Path

The Hindrances are not simply obstacles that designers *encounter* in their practice, but obstacles that designers *create* for themselves, as a result of their actual design practice. That is, their own ways of thinking, teaching, and exercising their practices, including their writings, initiatives, and processes, *hinder* them from reflecting about their own and other’s transformations. I have seen how the hindrances are ingrained within the actual practice of contemporary designers conceiving and implementing interactive technologies. Consequently, an alternative path is needed.

I propose an alternative practice, a path that is not paved with Hindrances. I call this practice *Transformational Design*. Instead of trying to eliminate the Hindrances, my strategy is to propose a new design practice, where there is no fertile ground in which the hindrances can grow, leading naturally towards reflective transformations in design: a new mindful practice for experience-driven design.

I argue that by following this path, by reading, learning, and exercising this practice, designers will be able to observe how their design processes

and products are transforming themselves and others.

I use the word *practice* to describe my proposition as both, a noun and a verb. I describe Transformational Design as a noun, as a new discipline or field of study for a creative process motivated and directed by human experience. I also describe Transformational Design as a verb, as the actual exercise of this discipline. In sum, Transformation Design is a practice that is meant to be practiced.

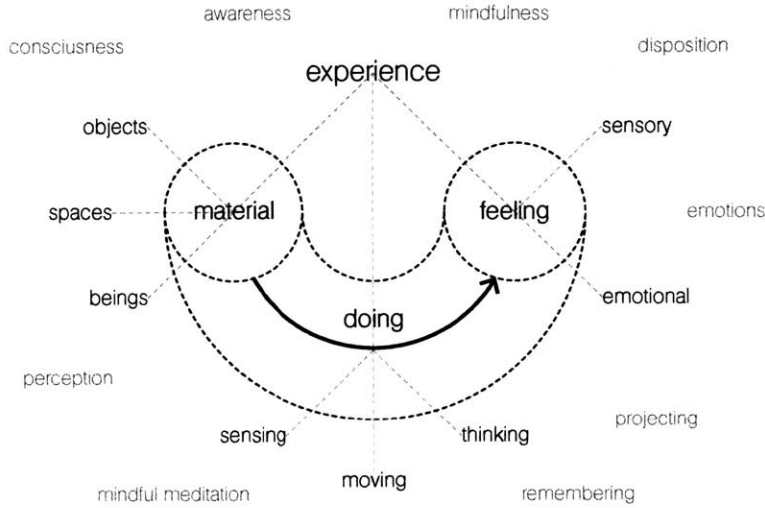
Transformational Design is supported by Three Foundations, each constituted by a set of conceptual guidelines and an exercise that explores those guidelines in practice. Together, these Three Foundations pave the way for a mindful, hands-on, transformational design practice.

A Mindful Practice: Vocabulary and Exercise

My practice's First Foundation grew out of my interest in understanding how our design products are felt, touched, smelled, heard, tasted, and seen. As I describe in the Hindrance of Delusion, in recent years I have observed an increase in people's desire to design with human experience as their subject. I shared a similar interest, and began studying their discourses and propositions. However, I could not find what I was looking for, because I realized that these people were not able to talk about and address human experience within their practice. I finally understood that I had to build an alternative path for myself, the first foundation for a new design practice.

The First Foundation includes a vocabulary and an exercise, which together constitute a first step towards addressing the problem of Unreflective Transformations in design. Instead of merely declaring an interest in human experience, I offer a vocabulary and an exercise to designers as a means to become mindful, to express, and to think about experience in design.

In the vocabulary, I describe the categories and associated concepts intended to provide this means. I call this the Mindful Vocabulary (Fig. 1.11). In the exercise, I describe how the vocabulary can be used in practice, and I study whether people can express their experiences in terms of this vocabulary. I call this the Expressing Exercise.



| Figure 1.11 |
The Mindful Vocabulary

Together, the vocabulary and the exercise constitute the basis through which my practice becomes unique. Transformational Design is the only design practice that is based on Mindfulness from the Buddhist approach¹⁷. My vocabulary is drawn from my own reading and practice of Vipassana Meditation, the oldest Buddhist mindful meditation tradition, with more than 2,500 years studying human experience in a systematic and pragmatic way. My ultimate vision is to bridge design practice and mindful meditation practice, in order to open a new path for experience-based design practitioners and educators.

The Mindful Vocabulary is basically a set of words and a diagram, which I can use as evocations to direct my awareness, intentionally, toward the direct contemplation of my experience, and as evocations to talk about experience with myself and with others. In my vocabulary, experience is *feeling*, feeling what I am doing with materials. I describe *feeling* as a complex

¹⁷ My approach to *Mindfulness* differs from other Western approaches where the focus has been understanding *Mindfulness* as a type of thinking characterized by novel distinctions or the creation of new categories (Langer 1990, 78)(Langer 2014, 12). My approach is not about Mindfulness as a type of thinking, but rather as the directed and intentional contemplation/awareness of experience (meditation), which includes contemplating my own thinking (any type of thinking, novel and habitual) as it arises and fades away from moment to moment.

of bodily sensations, *doing* as an action of body and mind, and *materials* as the world recognized using learned labels.

My strategy is not to prove my Mindful- Vocabulary to be true or false, but rather to show its use as a means for designers to become mindful, express, and think about experience in design. I develop the first exercise of my practice, the Expressing Exercise, with the intention of trying things out with people and exploring whether the vocabulary is actually providing this means to them.

The Expressing Exercise is basically an activity through which participants put the Mindful Vocabulary into practice. In this exercise, participants live an experience, express this experience using a template that I have developed for them, and then talk about their experiences with one another (Fig. 1.12).

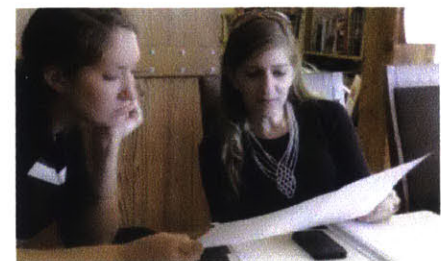
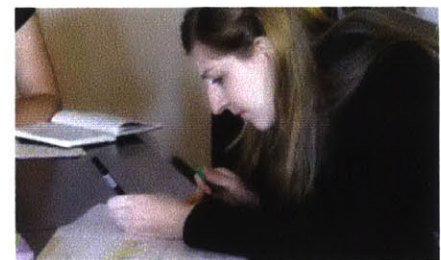
After trying things out with people and reflecting on the evidence, I found that with my vocabulary, participants are actually able to become mindful, and then express their experiences and think about them. I also found that they do not express the actual experience but rather a construction: a retrospective and coherent narrative about what they have experienced.

A Hands-on Practice

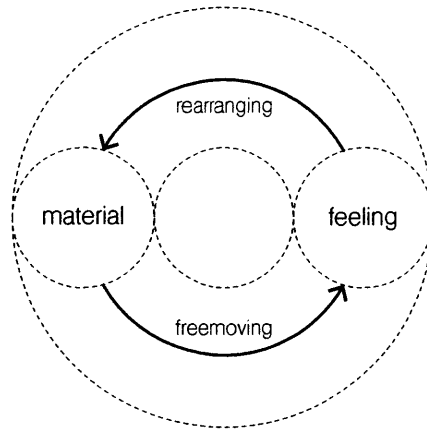
My practice's second foundation grew out of my desire to understand how we design by a direct engagement with the materials. As I describe in the Hindrance of Oversight, in recent years I have observed an increase in people's interest in making new things for themselves, using the new tools and through hands-on activities. I shared this interest in the tools and the promotion of design as a hands-on activity. However, I also felt that learning the tools and the technical know-how was not enough. There was something missing. By using my vocabulary to describe design as a hands-on activity, I began to realize that designers were not *making* things, but rather putting materials together to experience something new, different from what they had felt before. In parallel to my vocabulary, I began extending my path towards building the second foundation for a new design practice.

First hypothesis

With my Mindful Vocabulary, designers are able to become mindful, express, and think about experience in design



| Figure 1.12 |
The Expressing Exercise



| Figure 1.13 |
The Experiential Model

This Second Foundation includes a model and an exercise, which together constitute a second step towards addressing the problem of Unreflective Transformations in design. Instead of ignoring experience when making things, I offer a model and an exercise to designers as a means to bring forth new experiences and, consequently, make things that they have never seen, touched, or heard about before.

In the model, I describe the design moves, or operations, intended to provide this means. I call this the Experiential Model (Fig. 1.13). In the exercise, I describe how the model can be practiced, and I study whether people can bring forth new experiences by practicing the model. I call this the Rearranging Exercise.

Together, the model and the exercise build on the previous foundation, specifically on the Mindful Vocabulary. And by extending this vocabulary to design, I differentiate my path from other design practices even more. Not only is my practice the only one based on Mindfulness, but also the only one that uses Mindfulness within a hands-on and exploratory design activity. My model is drawn from my own reading of Shape Grammars, a design theory proposed by my advisor and MIT professor George Stiny and others (Stiny and Gips, 1972). My vision is to extend his propositions to

encompass human experience, in an activity where designers explore freely by rearranging materials and trying things out with their bodies.

The Experiential Model is basically a set of words and a diagram, which I can use as guidelines to experience something new with the materials that I am putting together in design and, consequently, make things that I have never seen, touched, or heard about before. For me, designing is also an experience, where I feel myself *rearranging* materials and *freemoving* with them. I describe rearranging as *picking up, modifying, and putting materials together*, and freemoving as *trying things out by sensing and moving with these materials freely*. While rearranging is the *making* dimension of design, or technical know-how, freemoving is the creative dimension through which the new experience emerges as a mindful insight.

My strategy is not to prove my Experiential Model to be true or false, but rather to show its use as a means for designers to bring forth new experiences in design, experiences they have never felt before. I develop the second exercise of my practice, the Rearranging Exercise, with the intention of trying things out with people and exploring whether the model is actually providing this means to them.

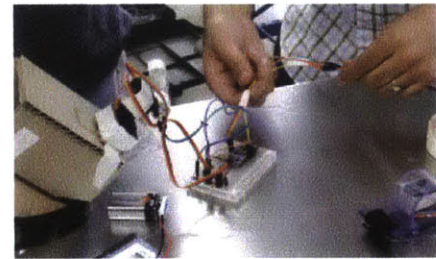
The Rearranging Exercise is basically a hands-on activity through which participants put the Experiential Model into practice. In this exercise participants rearrange materials using a toolkit I developed for them, try things out by freemoving with the rearranged materials, and then show them (Fig. 1.14).

Participants rearrange materials without trying to make a thing they know, which means they do not design using learned labels, such as *bicycle, house, chair, or bag*. Instead, they explore what they can do and feel with the materials freely.

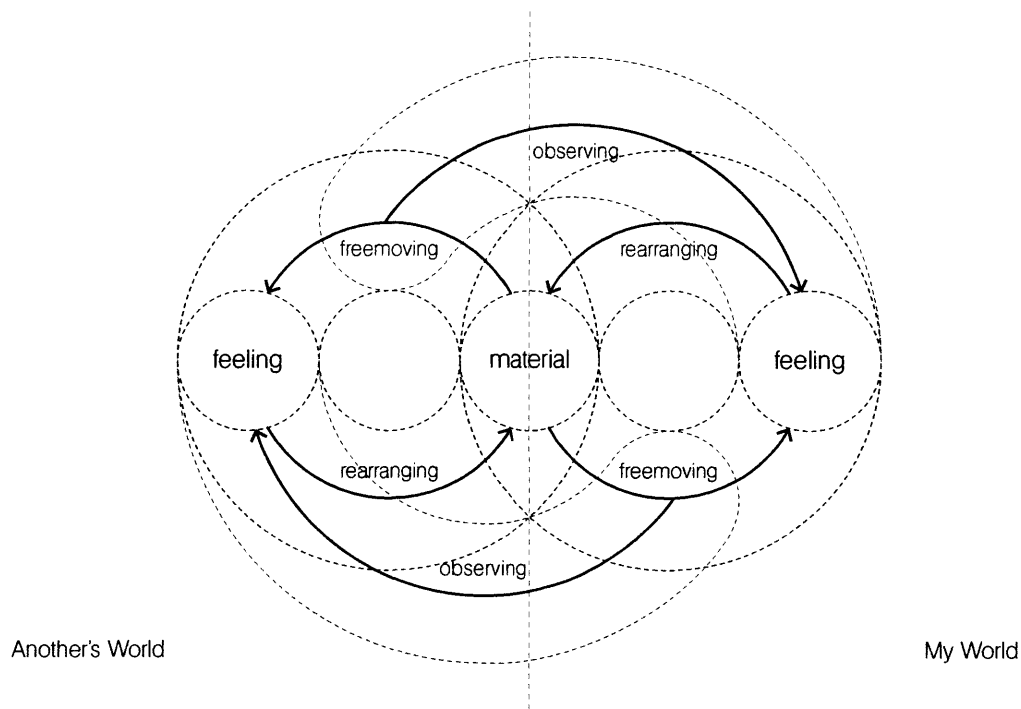
After trying things out with people and reflecting on the evidence, I found that with my model, participants are actually able to bring forth new experiences. When participants rearrange materials with which they bring forth a new experience, these materials are not recognized by people who did not rearrange them—they are new.

Second hypothesis

With my Experiential Model, designers are able to bring forth new experiences in design, experiences they have never felt before



| Figure 1.14 |
The Rearranging Exercise



| Figure 1.15 |
The Transformational Model

A Transformational Practice

My practice's third foundation grew out of my interest in understanding how we design for other people. As I describe in the Hindrance of Objectification, in recent years I had observed an increase in people's desire to design *other people's experiences*. In my case, however, I had the intuition that designing *for* others was not the same as designing the experience of others. And by extending my vocabulary and previous model to the collective domain, I started realizing that instead of designing the experience of others, designers were actually learning from themselves and from others, transforming together reciprocally. This is how I began completing this alternative path, by building a third foundation for a new design practice.

This Third Foundation includes a model and an exercise, which together constitute a third step towards addressing the problem of Unreflective Transformations in design. Instead of trying to capture, match, and deliver people's experiences without including themselves, I offer a collaborative model to designers as a means to observe and think about the experience of the person they are designing for, filtered through their own experience.

In the model, I describe the principles and design moves intended to provide this means. I call this the Transformational Model (Fig. 1.15). In the exercise, I describe how the model can be practiced, and study whether people can think about and observe one another's experience by practicing the model. I call this the Transformational Game.

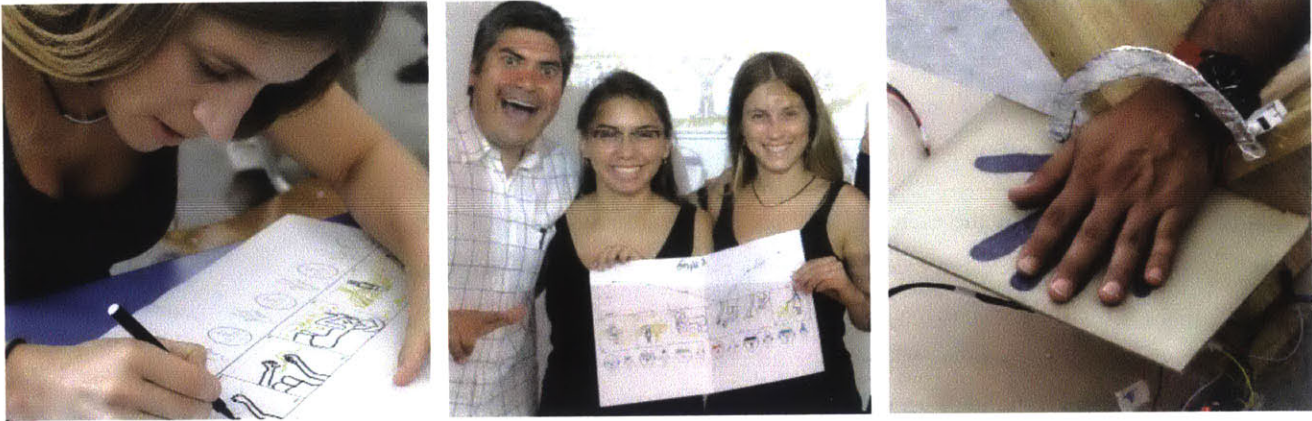
Together, the model and the exercise build on the previous two foundations, completing a new design practice, called Transformational Design. This practice is the only one that uses mindfulness within an exploratory and hands-on activity, wherein designers include themselves, their experiences, and transform together with the person they are designing for. This model is drawn from my own reading of the Biology of Cognition, a theory about living systems proposed by Humberto Maturana, a biologist and neuroscientist (Maturana, 1970). My vision is to extend his propositions as to encompass the creative aspects of our coexistence, how we bring forth new ways of living and new worlds through designing for one another.

The Transformational Model is basically a set of words and a diagram, which I can use as guidelines to transform together with the person I am designing for, by bringing forth our own individual experiences and by observing one another. For me, designing is a reciprocal activity in which I feel myself rearranging materials, delivering them to another person, and observing how that person moves with them. I describe delivering as placing the materials in front of another person, and observing as *seeing* (sensing) the other person's movements with all my senses. While delivering is silent, giving space for the other person to try things out freely, observing is generous and nonjudgmental, giving space for me, the designer, to see the other person's response without expectations.

My strategy is not to prove my Transformational Model to be true or false, but rather to show its use as a means for designers to observe and think about the experience of the person they are designing for, filtered through their own experience. That is, through my model designers make sense of another person's experience according to their own experience. I develop the third exercise of my practice, the Transformational Game, with the intention of trying things out with people and exploring whether the model is actually providing this means to them.

Third hypothesis

With my Transformational Model, designers are able to observe how design transforms their own and others' experiences.



The Transformational Game is basically a hands-on and collaborative activity through which participants put the Transformational Model into practice. This exercise extends the previous two exercises to the collective domain, through a game where a minimum of two participants play as users and designers for one another, in a spatial configuration that I have developed for them. First, they play as users by expressing an experience they would like to live. Next, they play as designers, by rearranging materials as a response. Then, they play as users and designers in turns; as users, they move with the materials while their designers observe, and as designers, they move with the materials while their users observe (Fig. 1.16).

After trying things out with people and reflecting on the evidence, I found that with my model, participants are actually able to observe their own and others' transformations. In my game, for both users and designers there is a difference between what they want or intend to experience and what they end up experiencing. Participants can observe these differences, and then think and talk about what they have observed.




| Figure 1.16 |

The Transformational Game

FIRST FOUNDATION : *Experience*

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The blue light extended outside the windows of the room and towards the infinite corridor, inviting visitors to come inside. It was the opening night of the Festival of Art, Science, and Technology (FAST), an event to celebrate the 150th anniversary of MIT. For the festival, my friend Kaustuv and I designed what we called Maxwell's Dream, a canvas with magnetic levers visitors could touch and rotate to create patterns of intense blue light. And as people were approaching, we were excited and nervous to observe how they would respond to our design.

We opened the doors, and around a hundred people jumped inside, all at once, running, pushing one another, and trying to touch the levers. They seemed surprised, delighted, and engaged, like babies observing, touching, and discovering the world for the first time. As they touched the levers and observed others doing so, they smiled, laughed, photographed, and called their friends. The situation got out of control, and we had to make a line and ask people to take turns.

That night, everything changed for me. As I was observing how people were responding to what we had put together for them, I told Kaustuv, "this is what it is all about... design is not about the levers, the magnets, or the lights; design is all about human experience." Kaustuv looked at me with confusion, and after a couple of moments replied, "Could be, but what do you mean by 'experience'?" I did not have an answer, but I came closer to the levers and as I was rotating them, I said, "Maybe experience is just this."

The First Foundation of my practice is about Experience, or about how we bring forth our worlds. The story illustrates everything you need to know about this Foundation. For me, experience is not about the *materials* but about *feeling* what I am *doing* with them. For us and for the visitors, only through feeling ourselves observing, moving, and touching the materials, could Maxwell's Dream emerge.

This Foundation is the first step towards addressing the problem of what I call Unreflective Transformations. I argue that in order to reflect on our experience, we need to become aware of it, the way I did when I intuitively rotated the levers and realized, "experience is just this." So the only answer I had for Kaustuv's question about experience was that he had to try things out for himself.

In this Foundation, you will read about how to become aware of your experience, so that you can talk and think about it. In the first chapter of this Foundation, you will encounter a vocabulary that describes experience as felt activity. I call this The Mindful Vocabulary. In the second chapter, you will encounter an exercise that shows how this vocabulary can be used in practice. I call this The Expressing Exercise.

Together, this vocabulary and exercise constitute the grounds supporting the next two Foundations, all working toward an alternative path, a new mindful practice for experience-driven design practitioners and educators.

2. Mindful Vocabulary

In this chapter, I introduce a set of words and a diagram you can use as evocations to become mindful, express and think about experience in design. I call this the Mindful Vocabulary. This vocabulary is part of the First Foundation of Transformational Design, wherein I establish the grounds for the next two Foundations.

This Vocabulary is mainly drawn from Vipassana Mindful Meditation, 2,500 year old tradition of studying human experience from within in a systematic way (Gunaratana 2011). I reflect and elaborate on this tradition by contemplating my own experience from within, having learned and practiced Mindful Meditation at the Cambridge Insight Meditation Center, over the past six years.

You will learn about this vocabulary through reading words but also through observing a diagram that illustrates the relationships between the words. Together, these words and diagram will show you how to talk and think about human experience after becoming mindful of your own –from within and in the moment– so that as you are bringing forth an experience within and throughout your design process, you can begin reflecting about it.

In this chapter, you will first encounter what I mean by *experience*, the overarching description of my vocabulary, encompassing all the other descriptions. You will also learn about my strategies for writing about experience: my descriptions are only words that mindful practice can demonstrate directly. Next, you will encounter the Primary Categories that make up experience, namely *feeling*, *doing*, and *materials*. You also learn about the Secondary Categories that make up each of these Primary Categories, namely *sensing*, *moving*, and *thinking* (for doing), *sensory sensations* and *emotional*

sensations (for feeling), and *objects, spaces, and beings* (for materials). Finally, you will encounter the Stream of Experience, which shows you how experience unfolds from moment to moment.

This vocabulary is my response to the growing interest in experience among contemporary designers who are putting interactive technologies together. I offer this vocabulary to them, to these design practitioners interested in designing with experience as their subject. However, I also warn them that this vocabulary is based on mindfulness, by which our experience is felt directly and the experience of others begins to be seen in the light of our own.

2.1. Mindful of Experience

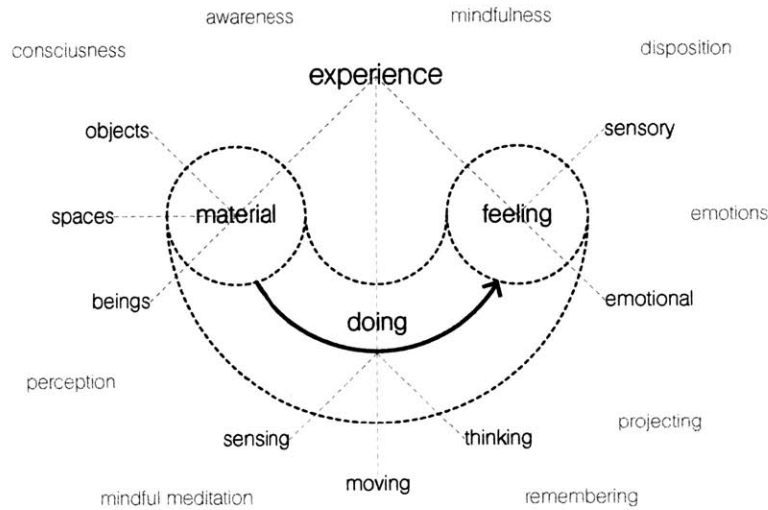
The first and overarching description of my vocabulary is *experience*. I describe experience as feeling what I am doing with materials in the flow of the present, right here, right now. Experience therefore is *feeling*, but in order to feel I need to do something with my body, and in order to do something with my body I need to come into contact with materials in my world or in my imagination, such as objects, spaces, or beings: I touch a chair, smell a flower, hear a song, taste a chocolate, see a painting, remember an ex-lover¹.

All the words that you read in this chapter build up this description of experience. Everything comes together through the diagram, where you can observe the vocabulary as an image, with lines and shapes between the words expressing the relationship between them (Fig. 2.1). This is a vocabulary based on mindfulness and, consequently, the words and the diagram are only evocations you can use to contemplate and understand experience for yourself.

¹ This description of experience as “felt” differs from most descriptions found in Western Philosophy. For example, the Pragmatist Philosopher John Dewey, describes experience as the interaction between nature and man: “Experience is the result, the sign, and the reward of that interaction of organism and environment.”(Dewey 2005, 22) However, this description does not contradict my proposition. In a way, I am just showing how the environment or nature arises through feeling what I am doing.

Experience

Feeling what I am doing with materials



In the diagram, you can observe the word *experience* at the top, and eleven words branching out from there and towards the bottom. I call these words **Categories of Experience**, because they are the complementary facets that I can pay attention to, while exploring my experience from within. These eleven categories include: doing, feeling, materials, sensing, moving, thinking, sensory sensations, emotional sensations, objects, spaces, and beings.

The grey words in the background are also part of my vocabulary. These words do not describe experience directly but are supporting concepts that I use to explain the categories with more detail and to show how mindful practice can demonstrate experience directly. These nine supporting concepts are as follows: mindfulness, awareness, mindful meditation, perception, disposition, consciousness, remembering, projecting, and emotions.

I like to think about moving a torch inside a dark cave, where I hold this light source to illuminate the wall of the cave, where I can see different stone textures, or categories, as I am becoming aware of my experience. They are all there, together, as part of a unique experiential moment. But by moving the torch and illuminating the categories, one by one, I can direct my awareness with intention. The lines in the diagram correspond to the

| Figure 2.1 |
The Mindful Vocabulary

possible trajectories of my torch, showing me how the categories relate to one another. The horseshoe shape surrounding the categories expresses the subtle light that is always present, illuminating a common ground from which I can see the other categories through an interplay of varying light intensities. The arrow is the movement of this dim light, changing intensities, slightly and slowly from left to right, showing my experience as an active and yet passing moment.

This Mindful Vocabulary is based on some Buddhist teachings and practices as described in the *Four Foundations of Mindfulness*, a series of talks given by the Buddha about Vipassana Meditation, the oldest Buddhist mindful meditation practice (Gunaratana 2011, 25). The Four Foundations of Mindfulness are Mindfulness of Body, Mindfulness of Feelings, Mindfulness of Mind, and Mindfulness of Dhammas (Gunaratana 2012, 8). While the first three foundations mostly illustrate the actual practice of meditation, the Dhammas explains the phenomena or categories of experience that illuminate that practice. There are five Dhammas: Hindrances, Aggregates, Sense-Spheres, Awakening Factors, and Four Noble Truths (Analyo 2004).

I propose three strategies to describe human experience, using the Four Foundations of Mindfulness as the main background. The first strategy is concentrating on some of the teachings, particularly on two Dhammas: the Sense-Spheres and the Aggregates. The Dhammas as a whole pave “the path to realization,” the liberation, awakening, and ultimately the end of suffering (Analyo 2004, 184). However, my objective is not to end suffering but to provide a vocabulary designers can first use to become mindful of their experiences, and then use to think and talk about them with one another. I only use the Sense-Spheres and the Aggregates because they describe the central aspects of personal experience which allow me to build up this vocabulary. The Sense-Spheres are the six sense-objects (touchables, smells, sounds, tastes, visibles, and thoughts) along with their respective sense-organs (body, nose, ear, tongue, eye, and mind). The Aggregates of experience are the Forms, Sensations, Perceptions, Dispositions, and Consciousness.

The second strategy is to use mindful meditation to demonstrate the

vocabulary through direct contemplation². Mindful meditation is the actual practice of being mindful, where mindfulness means *directed and intentional present-moment awareness* (Goldstein 2013, 13), becoming aware of experience by paying attention to what is happening in the moment, directly and without preconceptions, as if it were occurring for the first time (Gunaratana 2011, 133). The Mindful Vocabulary is not theoretical and does not explain experience as an external object, but rather as an unfolding phenomena that everyone can contemplate for him or herself. Therefore, in my vocabulary any description includes “mindful of” tacitly as a prefix. Through Mindfulness, designers can become aware of their experiences and then express, think, and reflect about them as they change throughout their design processes.

The final strategy I use to describe experience is to borrow the Buddhist non-ontological epistemology as an overarching way of understanding and talking about experience. Buddhist epistemology does not seek to describe *universals* through words written down as concepts and theories in books. It is not about knowing how things *are* independently of us, but rather how things *appear to us* directly. Therefore, words are only words, and they do not replace experience. Words do not describe how things are, but rather help us find out ourselves through direct contemplation: “Words are only fingers pointing at the moon. They are not the moon itself. The actual experience lies beyond the words and above the symbols” (Gunaratana 2011, 131). I align myself with this way of thinking, and the Mindful Vocabulary along with everything I write are only words that bring about personal evocations.

These three strategies are related: the written teachings are only words that mindful practice can demonstrate directly. Consequently, in order to demonstrate the Categories of Experience I also ask you to experience things

Mindfulness

Directed and intentional awareness of experience (Mindful Awareness)

Awareness

Bare knowing of experience in the present

Mindful Meditation

The actual practice of being mindful

(Mindful of) Experience

(Mindful of) Feeling what I am doing with materials

² My approach to *Mindfulness* differs from other Western approaches where the focus has been understanding mindfulness as a *type of thinking* characterized by novel distinctions or the creation of new categories (Langer 1990, 78)(Langer 2014, 12). My approach is not about mindfulness as a type of thinking, but rather as the directed and intentional contemplation/awareness of experience (meditation), which includes contemplating my own thinking (any type of thinking, novel and habitual) as it arises and fades away from moment to moment.

directly by following a simple mindfulness exercise. Let us come back to the first description of my vocabulary: *experience is feeling what I am doing with materials*. Please, after reading the following lines, take a moment to do and feel what you have read and then come back to the text. You are probably feeling you are sitting on a chair right now, so we will start from that experience:

Move your arms towards the materials below you (the chair) and touch them by moving your hands and fingers back and forth. While you do so, pay attention to the different sensations on your fingers. As you feel what you do, you may recognize different textures and components of the chair. You may also begin thinking about other things you have to do, such as an important meeting you have to prepare for tomorrow.

In this exercise (and in every experience you have had and will have) you were feeling what you were doing with the materials in your world. You were moving your hand (doing), feeling your fingers (feeling), and recognizing the chair and its different textures and components (materials).

2.2. Categories of Experience

I describe human experience through what I call the three Primary Categories and eight Secondary Categories. The primary categories—*feelings*, *doings*, and *materials*—allow me to describe experience as *feeling what I am doing with materials*. I expand this definition of experience by describing each of the Primary Categories through their corresponding Secondary Categories: *sensory and emotional sensations* (for feeling), *sensing, thinking, and moving* (for doing), and *objects, spaces, and beings* (for materials).

Experience is felt activity, and I feel what I am doing with my body through sensory and emotional sensations. I feel my movements along with the different senses including my thinking: I move, touch, smell, hear, taste, see, and think. I move and sense to bring forth the materials in my world, including objects, spaces, and beings.

Primary Categories

Feelings, doings, and materials are the main words that I use to describe experience and, consequently, I call them the Primary Categories. I describe the feelings as a complex of bodily sensations, including two secondary categories, sensory and emotional sensations. I describe the doings as actions of body and mind, including three secondary categories, sensing (touching, smelling, hearing, tasting, and seeing), moving, and thinking. I describe the materials as the *world* we recognize in our experience by doing and feeling something. The material category includes three secondary categories: objects, spaces, and beings. This subcategories appear when we do something and feel something with them, and when the doing is *thinking* these same secondary categories appear as thoughts (thoughts about objects, spaces, or beings).

These three categories of experience are based on two Dhammas, the Aggregates and the Sense-Spheres, as described in the Four Foundations of Mindfulness. Even though in the Dhammas they are explained separately, according to my readings the Sense-Spheres are actually included in the Aggregates, as the first aggregate of experience. The story tells us how the Buddha first explained to his disciples the arising of experience from within by using five piles of grain. He called these piles of grain the *Aggregates* (Boisvert 1995, 4)(Varela, Rosch, and Thompson 1992, 63). The Buddha began with the first pile of grain to explain the first aggregate, and kept adding grain for each of the following aggregates, one by one. The aggregates of experience are: Form, Sensation, Perception, Disposition, and Consciousness (Fig. 2.2).

The first aggregate, *Form*, corresponds to the sensory aspect of experience. This aggregate is actually described as the *Sense-Spheres*, which refers to the contact between six sense-organs and their associated sense-objects: body and touchables, nose and smells, ear and sounds, tongue and tastes, eye and visibles, and mind and thoughts (Goldstein 2013, 205).

The next aggregate after *Form* is *Sensation*, which corresponds to the affective aspect of experience. The contact between the sense-organ and its

Feeling

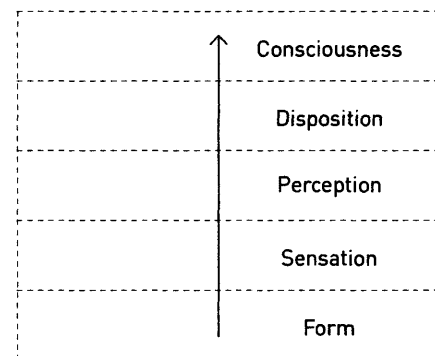
Complex of bodily sensations including sensory and emotional sensations

Doing

Actions of body and mind, including sensing, moving, and thinking

Materials

World that I recognize by feeling my doing. This *world* includes objects, spaces, and beings



| Figure 2.2 |
The Aggregates

Form Aggregate (Sense-Spheres)	
Sense-organ	Sense-objects
Body	Touchables
Nose	Smells
Ear	Sounds
Tongue	Tastes
Eye	Visibles
Mind	Thoughts

object *feels* in a certain way, which provides the *how* of experience: how does it feel? (Analayo 2004, 204). The third aggregate *Perception* corresponds to the cognitive aspect of experience. After feeling the sensations, one recognizes or identifies the object using learned labels, which provides the *what* of experience: what is it? (Analayo 2004, 204).

After *Perception* comes *Disposition*, which corresponds to the conative and conditioned aspect of experience, which drives action (Analayo 2004, 204). Following feeling and perceiving, volitional reactions or impulses arise in the mind. Dispositions are the energetic forces behind every action and movement, and therefore they drive experience as it changes from moment to moment (Goldstein 2013, 187). The last of the aggregates is *Consciousness*, which is the faculty of knowing one's own experience (Goldstein 2013, 188). This is the first aggregate with the capacity of being self-conscious (Boisvert 1995, 118). Because the aggregates accumulate one on top of the other, I can become self-conscious of my Form, Sensation, Perception, and Disposition through the function of consciousness. The faculty of knowing is consciousness, the actual knowing is awareness, and the directed and intentional awareness is mindfulness.

In my description of experience, I use the first three aggregates, including the Sense-Spheres. I describe the first two aggregates as active verbs: the sensory aspect of experience becomes the *doing*, and the affective aspects of experience the *feeling*. I also consider the third aggregate, the cognitive aspect of experience, as the *material* or actual label of what I am recognizing. Regarding the other two aggregates, I include the conative aspects of experience as part of the feeling, and its subcategory of emotional sensations. I include Consciousness tacitly as the faculty of being mindful, which I considered to be always omnipresent in any description and contemplation of experience.

In sum, I have adapted the Sense-Spheres and Aggregates into my Primary Categories in order to build up a unique description of experience: experience is feeling what I am doing with materials, where *feeling* corresponds to a complex of bodily sensations; *doing* to actions of body and mind, and *materials* to the world recognized using learned labels. However,

these descriptions are only words and are not the *feeling*, *doing*, and *material* themselves. This is a mindful vocabulary, and these words are only evocations you can use to direct your awareness to the different categories of experience, and explore things for yourself.

Secondary Categories

I write about each of the Primary Categories through their corresponding Secondary Categories, or subcategories: *feeling* includes sensory and emotional sensations; *doing* includes sensing, thinking, and moving; *material* includes objects, spaces, and beings. The order of the primary categories (first *feeling*, second *doing*, and third *material*) allow me to describe experience as *feeling what we are doing with materials*. However, I begin describing the subcategories of *doing*, following the order of the Aggregates, because I describe the other two categories, feeling and materials, in reference to the doing.

Doing

The subcategories of doing are *sensing*, *moving*, and *thinking*. According to the Sense-Spheres everything is included within *sensing*, or the contact between sense-organ and its sense-object. Sensing includes *moving* because moving is touching the body (sense-object) by using the body (sense-organ). Sensing includes *thinking* because thinking corresponds to the sixth sense, with the *mind* as sense-organ and the *thoughts* as sense-objects. However, I consider moving and thinking as independent categories of experience. I consider moving as an independent category because it corresponds to the operational and sequential character of experience, which allows all other senses to take place as part of a flow of changes supported by the body. I describe thinking as a separate category because it corresponds to a parallel and internal sensory process (sensing with the mind) that complements and sometimes colors the external one (sensing with the body).

In my vocabulary, *sensing* corresponds to the five senses, which I describe as active verbs: touching, smelling, hearing, tasting, and seeing. Moving corresponds to a type of touching. When touching I am actually moving, and

Perception

Re-cognition of the sense-object in terms of learned labels

Disposition

Conditioned reaction of the mind to our perceptions of the world

Consciousness

The faculty of knowing one's own experience

Transformational Design

Sensing

Sensing the sense-objects with the sense-organs

Moving

Changing bodily postures and sensing them while they change from moment to moment

Thinking

Sensing through the mind's sense-organs and sense-objects (thoughts)

when moving I am actually touching my own body. Moving corresponds to sensing the bodily postures, including translation, repose, and also gestures, expressions, and breathing, which together allow speech. *Thinking* refers to a type of sensing that manifests through the mind's sense-organs: touching (through the mind's body), smelling (through the mind's nose), hearing (through the mind's ears), tasting (through the mind's tongue), and seeing (through the mind's eyes). When the mind is using its sense-organs, the sense-objects are thoughts.

My first subcategory of doing is *sensing*. I describe these senses in detail through the Sense-spheres, the sensory aspects of experience. However, in the context of my vocabulary, sensing is a type of doing, an active verb. Sensing is a doing because it is an action of body and mind: sensing is active and not receptive, is something that I *do*: I move my hands and fingers to touch; I breathe in to smell; I move my head and cup my hands around my ears to hear; I open my mouth, chew, move my tongue, and swallow to taste; I move my head and eyes, and blink to see (Table 2.1).

My second subcategory of doing is *moving*, which corresponds to the act of sensing the bodily postures as they change from moment to moment in order to operate in our worlds: we walk, jump, throw, drive, bike, speak, and dance. In my vocabulary, I consider moving as an extension of touching because in order to touch we need to move our body, our hand and fingers and get into contact with the touchables. Walking, for example, can be described as touching with the feet (sense-organ) in order to change our relation to the floor or space (sense-object)³. Also, the body is both sense-object and sense-organ and, thus, the body is touched with the body⁴. In other words, I can touch myself. Consequently, I can also sense my body's different configurations as they change from moment to moment. Even though within the *Aggregates* movement is not mentioned, the first Foundation of

³ In the book *Being Alive*, the anthropologist Tim Ingold, describes walking as touching. He says, "our primary tactile contact with the environment is through the feet rather than the hands" (Ingold 2011, 16).

⁴ For example, in *Phenomenology of Perception*, the philosopher Maurice Merleau-Ponty describes, "When I press my two hands together, it is not a matter of two sensations felt together as one perceives two objects placed side by side, but of an ambiguous set-up in which both hands can alternate the roles of touching and being touched" (Merleau-Ponty 2002, 106)

Doing	Sense-object	Sense-organ	Sensing as Doing
Touching	Chair	Body	I am touching the chair with my hands
Smelling	Flower	Nose	I am smelling the flower with my nose
Hearing	Song	Ears	I am listening to the song with my ears
Tasting	Chocolate	Tongue	I am tasting the chocolate with my tongue
Seeing	Painting	Eyes	I am seeing the painting with my eyes

| Table 2.1 |

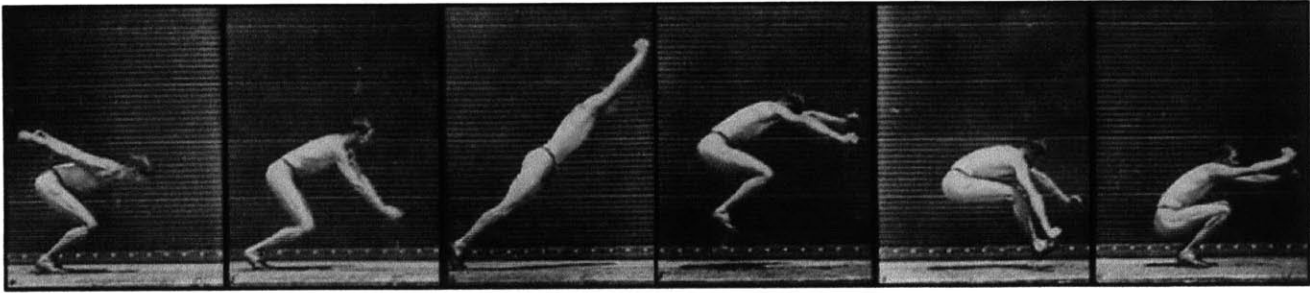
Examples of Sensing as Doing

Mindfulness is the Body, and it includes mindfulness of breathing, postures, and activities (Goldstein 2013, 45).

We use words to talk about our movements, such as verbs, but these words actually refer to different bodily configurations as they change from moment to moment in order to operate in the world⁵. For example, what are I am doing when I say I am jumping? When jumping I am pushing my whole body away from the floor by leaping up with my legs. These movements are continuous because I feel them in the flow of the present. However, I can describe the distinctive felt moments within that flow, for example kneeling, the actual leap, being in the air, and then falling: a series of bodily postures, which from a third-person's perspective would seem similar to the images shown by the photographer Eadweard Muybridge (Muybridge 1984, 54) in his studies of human locomotion (Fig. 2.3).

The basic movements and postures of our body include translation and repose. In translation, I use my body-parts to push my body forward or backwards in order to change my overall position. These movements include crawling, walking, hiking, climbing, running, jumping, and swimming. In repose, my body is usually static and the configuration of bodily-parts allow my muscles to rest. These postures include standing, sitting, kneeling, or lying down. These basic movements, locomotion and repose, respond to

⁵ This awareness of the body while moving can be related to the concepts of kinesthetic-sense or proprioception. The psychologist James J. Gibson describes proprioception "as sensitivity to the self," and explains how several channels of sensations or perceptual systems provide the information needed for self-perception (Gibson 2014, 108). He says, "the movements usually produce sights and sounds and impressions on the skin along with the stimulation of the muscles, the joints, and the inner ear" (Gibson 2014, 108). By describing the subcategory of moving, however, I am not trying to explain the mechanisms or systems needed for self-perception, but I am simply trying to show how we can direct our awareness towards feeling our body as we move.



| Figure 2.3 |

Photographs of a person jumping by Muybridge
(Muybridge 1984, 54)

our particular operational coherences as human beings. In other words, I do what I can do within the limits of my body, anatomy, and physiology. I cannot fly, walk on water, or move faster than thirty miles per hour. However, throughout our cultural evolution we have extended our capabilities by rearranging the materials we find in our worlds and moving with them in new ways. For example, we have rearranged metallic materials, plastic, and glass to create devices that allow us to fly. Similarly, there are other doings that extend our basic bodily operations: sailing, driving, biking, and skateboarding, as well as hammering and brushing. In all these doings we can distinguish a sense-object: a boat, car, bicycle, skateboard, hammer, and brush.

Thinking is the third subcategory of doing. Thinking is often described as a logical reasoning, intellectual capacity, or rational thought⁶. In my vocabulary, however, I describe thinking as a type of sensing that arises from the contact between mind (sense-organ) and thoughts (sense-object). In the Sense-Spheres, the *mind* is treated as any other sense-organ and *thoughts* as any other sense-object. When mindful of experience, thoughts come to mind the same way smells come to nose, and sounds come to ears. My vocabulary is not about the ontological nature of *thinking*, but rather about being able to contemplate how thoughts arise or fade away from moment to moment.

By directing my awareness towards how I am thinking, I can see how I am actually sensing with my mind's senses. For example, one type of thinking

⁶ By reasoning I refer to the Cartesian formulation, in which thinking is reduced to arguments structured in a mathematical logic that are used to deduce certainties about what we think, feel, perceive, and imagine (Descartes 1984-1991).

Doing	Sense-object	Sense-organ	Thinking as Doing
Touching	Chair	Mind's Body	I am touching the chair with my mind's hands
Smelling	Flower	Mind's Nose	I am smelling the flower with mind's my nose
Hearing	Song	Mind's Ears	I am listening to the song with mind's my ears
Tasting	Chocolate	Mind's Tongue	I am tasting the chocolate with my mind's tongue
Seeing	Painting	Mind's Eyes	I am seeing the painting with my mind's eyes
Moving	Body	Mind's Body	I am moving my body with my mind's body

| Table 2.2 |

Examples of Thinking as Doing

corresponds to listening using my mind's ears, where the sense-object (thoughts) is my own internal voice. When I think in this way, I listen to myself and have an internal conversation. We are actually talking to ourselves all the time. We are listening to a voice telling us about the errands we should finish today, about our mistakes on yesterday's job interview, about the words we should say to the person we like, about the meeting we have to prepare for tomorrow. For example, people say we think in a particular language, and in my experience this is actually true. I speak Spanish (native) and English, and I found myself most of the time thinking in Spanglish. Also, thinking using the mind's ear refers not only to listening to an internal voice. I can also listen to other sounds using my mind, such as songs or other people's voices⁷. However, I can also think using the mind's other senses. People like to talk about visual-thinking for example (Arnheim 2004). This is a good expression to describe what is actually happening: I not only listen using my mind's ear, I also see images using my mind' eye. In the same way, I can also think using all my senses. I can touch with my mind's body; I can smell with my mind's nose; I can hear with my mind's ear, I can taste with my mind's tongue (Table 2.2).

Within my vocabulary, thinking cannot take place anywhere but in the present. The past and the future are constructions that arise when I think about something I believe I have experienced *before*, or think about something I believe I am going to experience *next*. However, thinking about before (past) and thinking about next (future) always happen *now*. Thinking

⁷ Psychologist Daniel Gilbert demonstrate how we imagine a song by asking the reader to follow these instructions: "If I were to ask on which syllable the high note in 'Happy Birthday' is sung, you would probably play the melody in your imagination and then 'listen' to it to determine where pitch rises and falls." (Gilbert 2007, 130)

Transformational Design

Remembering

Thinking (now) about sense-objects I have sensed before

Projecting

Thinking (now) about sense-objects I have not sensed before and believe I am going to sense next

is a type of doing, a category of experience that unfolds in the present and, therefore, when I think about the past and about the future, I think about the past and the future right here right now. Thinking about the past is usually described as *remembering*, and thinking about the future as *projecting*. But what I am actually remembering or projecting? I am remembering (thinking about) sense-objects I have sensed before, and I am projecting (thinking about) sense-objects I believe I am going to sense next.

Projecting is not always about the *future*, I can also use my mind to project freely, by thinking about sense-objects that I have not sensed before and do not expect to sense next. Thinking is sensing with our all our mind's senses, and therefore, I can remember and project touching (moving), smelling, hearing, tasting, seeing.

Feeling

The subcategories of feeling are *sensory* and *emotional sensations*. According to the Four Foundations of Mindfulness, these sensations could be either pleasant, unpleasant, or neutral (Goldstein 2013, 82). Experience is feeling, and I feel what I do: sensing, moving, and thinking. Actually, sensing, moving, and thinking do not appear until I feel them. How could it be otherwise? How could I know I am doing anything without feeling it? We experience our worlds through feeling and this feeling brings about the affective aspect, the mood or feeling tone through which everything that happens to us acquires its color.

In my vocabulary, sensory sensations refer directly to feeling the contact between sense-objects and sense-organs: I feel touching (and moving), smelling, hearing, tasting, seeing, and thinking. And emotional sensations correspond to feeling the bodily changes triggered by conditioned reactions to this sensory sensations. According to a story told by the Buddha, these feelings come together like darts, where the sensory sensations are the first dart and the emotional sensations the second dart (Bodhi 2000, 1264). The first dart could be an unpleasant sensory sensation, such as the one that arises when touching fire. The perception of this feeling as *painful* may trigger a second dart, the emotional sensation, which after been felt through some bodily changes, could be perceived as sorrow or fear.

Sensory Sensations

Direct feeling of the senses, including thinking and moving

Emotional Sensations

Feeling bodily changes triggered by reactions to sensory sensations

Doing	Pleasant	Unpleasant	Neutral
Touching	(1) Touching feels pleasant	(2) Touching feels unpleasant	(3) Touching feels neutral
Smelling	(4) Smelling feels pleasant	(5) Smelling feels unpleasant	(6) Smelling feels neutral
Hearing	(7) Hearing feels pleasant	(8) Hearing feels unpleasant	(9) Hearing feels neutral
Tasting	(10) Tasting feels pleasant	(11) Tasting feels unpleasant	(12) Tasting feels neutral
Seeing	(13) Seeing feels pleasant	(14) Seeing feels unpleasant	(15) Seeing feels neutral
Moving	(16) Moving feels pleasant	(17) Moving feels unpleasant	(18) Moving feels neutral
Thinking	(19) Thinking feels pleasant	(20) Thinking feels unpleasant	(21) Thinking feels neutral

| Table 2.3 |

Twenty-one Sensory Sensations

The first subcategory of feeling is *sensory sensations*, which refer to the direct feeling of the senses. There are three types of feeling for each doing: *pleasant*, *unpleasant*, or *neutral*, all arising from touching, smelling, hearing, tasting, seeing, as well as moving and thinking. Therefore, there are twenty-one Sensory Sensations that are distributed throughout the body, constituting a complex of bodily sensations (Table 2.3). Sensory Sensations correspond to the second Aggregate of experience. At this point of the aggregates, I can attend to my body, examine the sense-organ and the sense-object and see how their contact feels. I can focus on my hand and fingers, for example, touching something and feeling pleasant. I can ask: where in my body is the sensation and how does it feel (pleasant, unpleasant, or neutral)? In this precognitive stage, however, I cannot yet talk about the *name* of the sensation. The *properties of things*, whether they are hot, cold, heavy, or smooth, are also labels we have learned from others. When you first touched fire, you may have felt an unpleasant sensation, as your mother told you: “Never touch this again, this is *hot*, this is *hot*.”

The second subcategory of feeling is *emotional sensations*, which refer to sensory sensations where the *sense-object* is the *body* as it undergoes changes and the *sense-organ* is the same *body* that senses these changes: I may feel the rising of my heartbeat, fluctuations on my breathing, trembling and sweating hands, dilatation of the arteries on my arms and legs, constriction of muscles in my abdomen, as well as changes in the glands of my mouth, throat, skin, and liver. That is, I feel the body *with* the body: I feel a complex of bodily sensations as they change from moment to moment. I could also ask: where in my body is the sensation and how does it feel (pleasant, unpleasant, or neutral)? These emotional sensations, however, are triggered by

previous sensory sensations. As I am feeling an unpleasant sensation when touching fire, I may feel a second sensation as my body reacts, and then I may say, “I am scared.”

The emotions are the labels we give to the actual feeling of bodily changes. Therefore, in my vocabulary, I distinguish between *emotional sensations* and *emotions*. While emotional sensations are felt, emotions are perceived: I feel an emotional sensation and then recognize an *emotion* (a label for that sensation) through perception. When I use a word to express what I feel, such as *scared*, I am recognizing a sensation I have felt before (using that label). However, the words are obscuring what we are actually feeling. When we say we are scared we are actually feeling a complex of bodily changes, and that *actual feeling* is the emotional sensation.

Emotion

Recognition of the felt emotional sensations using learned labels

Because the emotional sensations are triggered, they are conditioned by previous experiential moments. The fourth Aggregate, Dispositions, corresponds to the volitional reactions conditioned by sensory sensations. Pleasant sensations trigger desire, craving, and grasping. Unpleasant sensations trigger aversion, anger, irritation, and fear (Goldstein 2013, 174). These reactions become emotional sensations when they manifest through bodily sensations. Some of these volitional reactions affect our movements, such as changing our sitting posture when we are feeling uncomfortable (an unpleasant feeling in our backs), and others trigger a complex of bodily changes, or emotional sensations.

My description of emotion, relates my Buddhist background to some studies and propositions from western philosophy and science. For example, Antonio Damasio, a neuroscientist who specializes in human emotions, describes them as the bodily responses or reflexes triggered by the sensory devices and by thoughts processes (Damasio 2000, 56). And William James, a pragmatist psychologist and philosopher, describes emotions as the feeling of the changes in the “bodily sounding board” triggered directly by the perception of the exciting fact (James 2007, 14). For Damasio, all emotions use the “body as their theater” including visceral, vestibular, and musculo-skeletal systems (Damasio 2000, 51). Damasio distinguishes three types of emotion: primary, secondary, and background emotions. Primary emotions are anger, fear, disgust, happiness, sadness, surprise (Damasio 2000, 50).



| Figure 2.4 |

Bodily Maps of Emotions
(Nummenmaa et al. 2014)(Emotions from left to right)
Anger, fear, disgust, happiness, sadness, surprise, neutral

Secondary or social emotions are embarrassment, jealousy, guilt, or pride. And background emotions are well-being or dissatisfaction, calm or tension (Damasio 2000, 51). What is interesting is that all these emotions manifest as bodily changes. In an experiment, researchers created bodily maps of emotions (Nummenmaa et al. 2014) by asking participants to color the bodily regions whose activity they felt increasing or decreasing while receiving certain stimuli (Fig. 2.4). These stimuli are words, stories, movies, and facial expressions that researchers associated with specific emotions.

However, Damasio distinguishes emotions from feelings. For him, emotions are the bodily changes that are *then* felt and, thus, he considers emotions as external and public and the feeling of those emotions as internal and private (Damasio 2000, 36). On the other hand, for William James, the emotion IS the feeling, and thus emotions dissociated from bodily feeling are inconceivable (James 2007, 21). For him, emotion is the direct feeling of the bodily changes: “we feel sorry because we cry, angry because we strike, afraid because we tremble, and not that we cry, strike, or tremble, because we are sorry, angry, or fearful” (James 2007, 14). My distinction between *emotional sensations* and *emotions* avoids this conflict about whether emotions are external or felt. For my vocabulary, emotional sensations are felt, and emotions recognized. I can recognize emotions in others as well. These *observed emotions*, however, are not external and public because they become *what they are* by evoking my own emotional sensations.

Material

The subcategories of materials are the objects, spaces, and beings, which together constitute my world: all sense-objects that I touch, smell, hear, taste, see, and then feel and recognize in perception. We recognize *objects* in our world, including trees, rocks, balls, pencils, bottles, chairs, computers; we recognize *spaces* in our world, including caves, tents, houses, parks, airports, cars, airplanes; and we recognize *beings* in our world, including plants, animals, and other people. I describe materials as everything we encounter and act upon in our worlds, and, in that sense, plants, animals, and other people are also materials.

These objects, spaces, and beings correspond to what people call *reality*: a physical, external, and unique world that is *out there*. In my vocabulary, however, this world is not external and unique but rather is brought forth by everyone of us experientially: I sense, feel, and then perceive my world⁸. According to the Aggregates, this perception is not about *gathering* the features of the world but rather about recognizing the materials (using learned labels). For me, these labels are learned and distinguished according to what I do with materials. What is a chair? When you were a baby, your mother may have shown you how to sit on a particular configuration of materials, and told you: “Sit here, this is a chair.” Similarly, we have learned to label most of the materials around us, and we perceive them accordingly: look around you, you may see, feel, and perceive your desk, your computer, the room, the window, the tree outside, your friend sitting next to you⁹.

I describe the type of materials we bring forth in our worlds by distinguishing between objects, spaces, and beings. The objects are the materials I recognize when I feel myself *holding* them with my arms or hands, or when I observe them and consider that I can *hold* them. Materials can also be

⁸ I am not arguing against the existence of an external *reality*, but rather describing how this *reality* appears experientially with what we feel and do.

⁹ My description of *materials* relates to the Theory of Affordances proposed by psychologist James J. Gibson (Gibson 2014). For him, affordances are what the environment *offers* the animal (Gibson 2014, 120). For example, he describes a chair as a *surface* that affords sitting on: a *sit-on-able* (Gibson 2014, 120). My only concern with this theory is placing the *affordance* as a property of the materials. Instead of saying that the materials afford our actions, I prefer saying that *we act upon them*.

perceived as objects when we think about them. I can feel myself holding materials using my mind's body or observing them using my mind's eyes. *Holding* means a sequence of bodily postures where I contain, embrace, or hug the materials with my body. Consequently, objects include a series of materials or rearrangements of materials; for example trees, rocks, balls, pencils, bottles, chairs, and computers.

The spaces are the materials I recognize when I feel myself *moving* inside them, or when I observe them and consider that I can *move* inside them. Materials can also be perceived as spaces when we think about them. I can feel myself standing or walking through materials using my mind's body, or observing them using my mind's eyes. *Moving inside them* means a sequence of bodily postures where I change my overall position on top or through these materials: I stand, sleep, sit, walk, run, jump inside spaces. Consequently, spaces include a series of materials or rearrangements of materials; for example, caves, tents, houses, parks, airports, cars, and airplanes.

The beings we encounter in our world are also *materials*, in the sense that we can touch, smell, hear, taste, see, and then feel and recognize them. Beings include all living creatures (animals and people) and plants. We recognize beings when we feel ourselves observing how they change, grow and have agency in our worlds. For example, I recognize other people when I feel myself observing, listening to, and learning from what they do: they talk to me, express their emotional sensations using their faces and bodily dispositions, and coordinate their movements with me, holding objects and moving inside spaces. We can also perceive beings when we think about them. I can feel myself touching my dog using my mind's body, or observing my dog using my mind's eyes.

Objects, spaces, and beings, are only subcategories I use to describe the different type of materials we bring forth in our worlds. These subcategories, however, are neither fixed nor absolute because they arise from what we do. For example, a table can become a space if I hide below it, and a house can become an object if I hug it. Also, some rearrangements of materials can be objects and spaces, such as clothes. I can feel myself inside the clothes but I can also feel myself holding them.

Objects

Materials I bring forth when feeling myself *holding* them (or thinking about holding them)

Spaces

Materials I bring forth when feeling myself *moving* inside them (or thinking about moving inside them)

Beings

Materials I bring forth when feeling myself observing how they change, grow, and have agency in my world

2.3. Stream of Experience

“Within the breadth of a mind moment, a citta [consciousness] arises, performs its momentary function, and then dissolves, conditioning the next citta in immediate succession. Thus, through the sequence of mind moments, the flow of consciousness continues, uninterrupted like waters in a stream” (Bodhi 2003, 156).

My description of experience, so far, has referred to a particular moment where I feel what I am doing with materials: I feel myself touching a flower. However, then I may keep walking on the grass, listening to the wind in the trees, or seeing my ex-lover with my mind’s eyes (thinking about her). What I feel when I touch the flower corresponds to one experiential moment which arises, stays for a while, and then fades away to give space for another experiential moment (Bodhi 2003, 156). My experience as a flow corresponds to a sequence of these experiential moments, each one arising, staying for a while, and fading away, one after another. I call this sequence of experiential moments the *Stream of Experience*. Even though I use this stream to express, talk about, and compare experiences, the stream does not replace the actual experience. The stream is only an abstraction that allows me to explain how experience changes from moment to moment.

In Figure 2.5 you can see a graph with a Stream of Experience (S1) as it unfolds through the three subcategories of doing: moving, sensing, and thinking. I structure the graph around the doings because they allow me to describe the operational aspects of an experience; that is, what is actually *happening*: I am sitting, touching, or thinking. However, the streams include the feelings and materials as well: the doings are felt and they take place with materials. For each of these subcategories, I include five possible doings that can happen. For moving, however, I can include other configurations of bodily postures, known and new ones, such as biking, flying, hammering, talking, and googling.

While the graph illustrates the possible streams, the actual experience follows a unique path. In other words, by mindfully traversing these experiential moments in the flow of the present my actual experience becomes real.

Experiential Moment

Feeling what I am doing with materials in a particular moment

Stream of Experience

Sequence of experiential moments as they arise, stay, and fade away

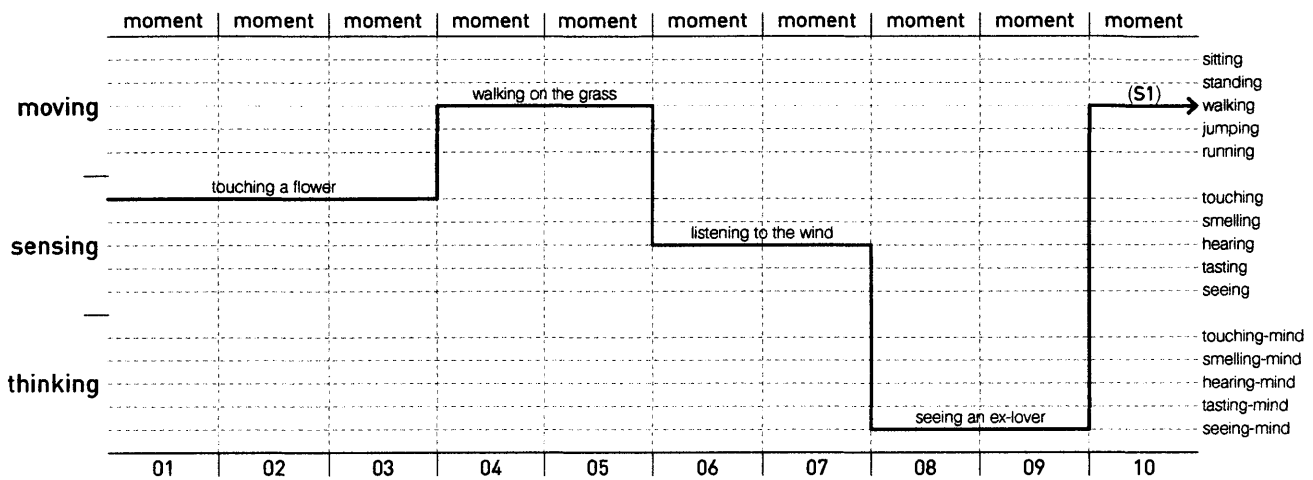
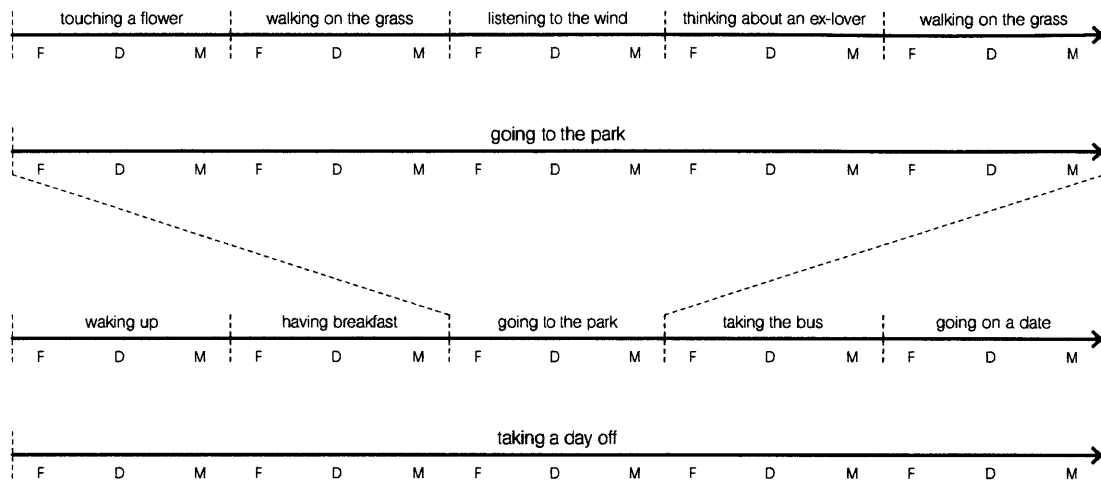


Figure 2.6 illustrates my actual experience by flattening the graph and showing a unique and horizontal stream flowing from left to right. This unique stream may describe an overall experience including different but contiguous experiential moments. For example, I can describe my experience of *going to the park* as a stream including touching a flower, walking on the grass, listening to the wind in the tress, thinking about my ex-lover, and walking on the grass.

This stream, however, only appears *now* when I construct a coherent sequence of moments according to what I have experienced *before* and what I may experience *next*. In the present moment, I can only be mindful of one experiential moment. I can still move through the flow and direct my awareness to different experiential moments, but I am experiencing these moments one after the other. *Mindfulness is an awareness that is directed and intentional*. I can feel myself thinking about my ex-lover and then I can shift my awareness towards the feeling of the flower. Moreover, experience unfolds in the present, and the present cannot be divided. Consequently, I am not specifying the duration of a moment by the conventional division of time in seconds, minutes, or hours. The *moments* are not units of time, but abstractions that allow me to make temporal distinctions between experiential moments: some experiences may *feel* a bit longer and may take more *moments* than others.

| Figure 2.5 |
Stream of Experience traversing the Doings

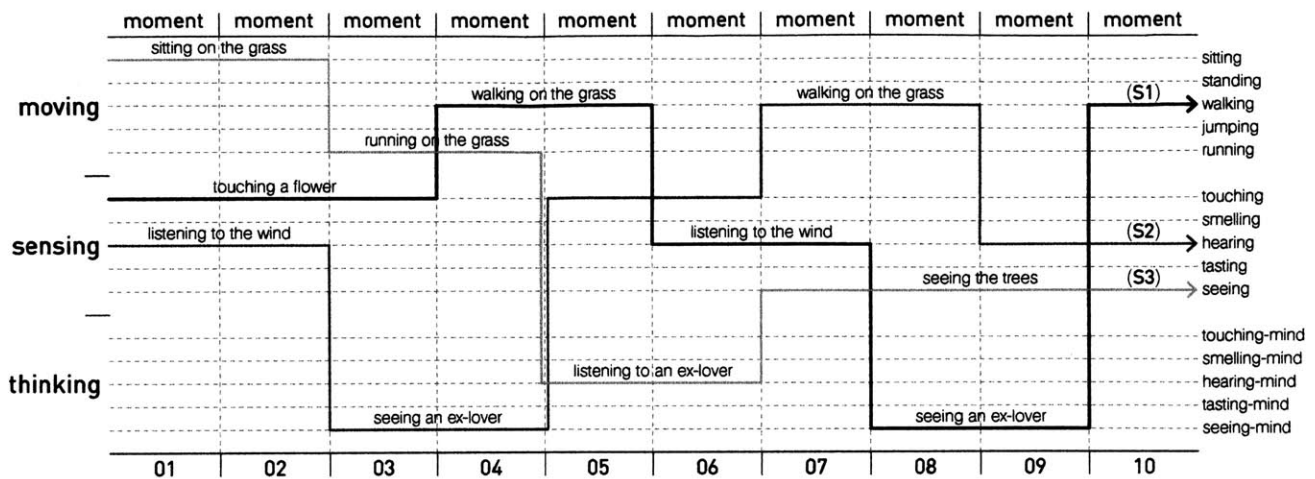
Transformational Design



| Figure 2.6 |

Stream of Experience (flattened)

You may argue that we are undergoing multiple experiences at the same time (same moment): I touch the flower, while I walk on the grass, while I think about my ex-lover, while I listen to the wind in the trees. And you may be right: we do a lot of *sensings*, *movings*, and *thinkings*. But can I mindfully feel all these doings together at the same time? We often do all these doings, but without awareness, in a kind of *autopilot* mode and without actually feeling them (Langer 1990, 13). My dad used to tell me: “take a moment to enjoy your food... you are swallowing without tasting!” For me, we distinguish these multiple *experiences* retrospectively, either because we felt them in a sequence as part of a stream (and think *now* that they happened at the same time) or because we distinguish now that we have done something before (even if we were not actually aware of what we were doing while doing it). I could have felt myself touching the flower, and then walking, and then listening to the wind in the trees. And I may realize *now* a coherence between these experiential moments and think about them as happening at the same time, when they in fact took place as a stream, one after another. Moreover, I may not have felt my body while I was walking but I realize now that I have walked because I have changed my position (I am now touching a different flower) and I know that in order to be here I must have walked. We go through our days on *autopilot* mode and most of the time (moments) we are not aware of our experiences.

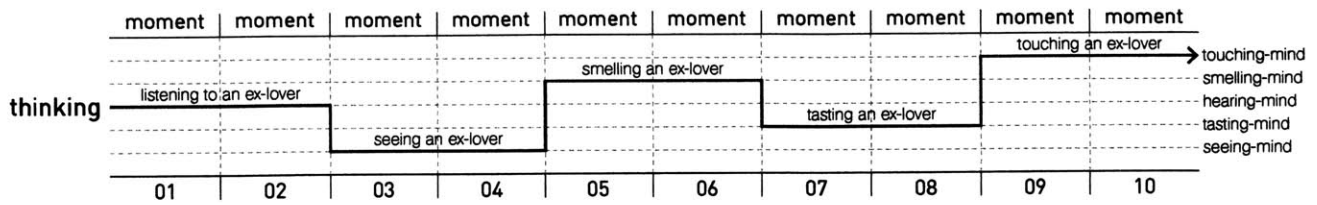


When I see a coherence between experiential moments, I construct a story: an experiential stream that is not necessarily the same as the one I actually felt (in the moment I felt it). After going to the park I construct a narrative with a coherent sequence of experiential moments: I listened to the wind in the trees, I thought about my ex-lover, I touched a flower, I walked on the grass.

| Figure 2.7 |
Retrospective Streams

Figure 2.7 illustrates how I can construct different streams retrospectively: I can describe the felt experiential moments (S1) but in a different sequence (S2) or include experiential moments I did not actually feel, such as sitting on the grass or seeing the trees (S3).

Furthermore, when I see a coherence between experiential moments I have undergone before, I may build up different narratives according to how I remember them *now*. I describe remembering as thinking in the present about sense-objects I have felt before. We remember the experience of our first kiss, our graduation, our holiday, our childhood, and describe these experiences using different streams. Now, as I am remembering my experience of going to the park, I could think about this experience as part of another stream, such as *taking a day off*, which may include waking up, having breakfast, going to the park, taking the bus, and going on a date (Fig. 2.6). And, still, I could describe *going to the park* as a stream including touching the flower, walking on the grass, listening to the wind on the trees, and thinking about an ex-lover.



| Figure 2.8 |

Stream of Experience (Thinking about Ex-lover)

These different ways to think about, talk and reflect about our experiences allows us to shift our awareness and explore the incommensurable layers, details, and nuances of what we feel and do with materials. For example, what do you think when you think about your ex-lover? Do you just listen to her or his voice or see her or his face? In my case, I can also feel her perfume as I smell her, her taste as I kiss her, and her hand as I touch her (using my mind's senses). When I say I am *thinking* about my ex-lover, I am actually referring to a Stream of Experience involving some or all these senses that come to my mind. It is a stream because the different doings refer to a unique material (my ex-lover) and, therefore, I can distinguish a coherence, a kind of unified property between them (Fig. 2.8).

3. Expressing Exercise

In this chapter, I introduce an exercise in which participants live an experience, express this experience by drawing, and then propose changes to their expressed experiences. I call this the Expressing Exercise. This exercise is part of the First Foundation of my practice, wherein I put my vocabulary into actual practice and establish the grounds for the exercises in the next two Foundations.

This exercise is partially inspired by First-person's Methods, explicit and empirical techniques that study human experience by bringing together neuroscience and mindful practices¹ (Varela and Shear 1999, 3). However, while First-person's Methods search for experiential invariants among subjects (Depraz, Varela, and Vermersch 2003, 90), my exercise explores how participants can express their different experiences using my vocabulary.

You will learn about this exercise through reading words but also through observing images of people doing things: walking through the mountains, drawing in front of rivers, and talking about their experiences with one another. First you will encounter the setup of the exercise, including its phases and rules, so that you can practice the exercise directly or conduct the exercise with people. The phases are *Learning*, *Expressing*, and *Proposing*. Next, you will encounter the evidence that resulted from two exercises: one where participants expressed using an Open Canvas and one where they expressed using a Guided Canvas, both of which I developed as templates for participants to graphically express their experience. Finally, you will encounter the findings of the exercise: when participants are expressing an experience, they are not extracting the experience but actually constructing it.

¹ These methods, proposed by Neuroscientist Francisco Varela (Varela 1995), are drawn from Neuroscience (Embodied Cognition), Phenomenology (Introspection), and Buddhism (Mindful Meditation).

The evidence consists of my own observations, after documenting the exercises by writing notes, taking photographs, and recording audio and video. The findings consist of my own reflection on the evidence in the light of having directly observed people participating in the exercise.

As I was developing Transformational Design, I was using this exercise to explore some of the propositions of my vocabulary. In particular, I wanted to see how certain concepts of my vocabulary are appropriated by people, and whether they are useful for them as a means of becoming mindful, expressing, and thinking about their experiences.

3.1. How to Express

In this section, I describe the general setup for the exercise, which I organize in three phases: *Learning*, *Expressing*, and *Proposing*. In the first phase, participants are introduced to my vocabulary and informed about the specific format of the exercise. In the second phase, participants live and express an experience. In the third phase, participants describe their experiences to one another and together propose changes to their expressed experiences.

In the Learning Phase, participants are introduced to the Mindful-Vocabulary, by writing down the Categories of Experience (feeling, doing, and materials) on a whiteboard, and then describing them in terms of the Secondary Categories (sensory and emotional sensations, sensing, moving and thinking, objects, spaces, and people). This exercise does not require participants to have had practice in mindful awareness; consequently, in this phase it is also necessary to explain how to become present and direct our attention to the senses, movements, and sensations. I recommend explaining mindfulness through actual practice, by asking participants to close their eyes and move their arms, touch the chairs they are sitting in, and pay attention to how this doing feels.

After being introduced to my vocabulary, participants are informed about the format of the exercise: the type of experience they are going to live and express, and the type of template they are going to use. For the exercise, I develop a template for graphically expressing the most significant moments

within a Stream of Experience: a coherent sequence of feelings, doings, and materials. I call this template the *Experience Canvas*, and I develop two versions of this template: the *Open Canvas* and the *Guided Canvas*. These versions emerged as a result of the actual exercises, through trying things out with participants.

The Open Canvas is essentially an open-ended strip with empty frames that participants fill out from left to right, by drawing their doings and materials and by coloring their feelings. In this canvas version, writing is not allowed (Fig. 3.1).

The Guided Canvas is basically an Open Canvas with three additions: an emotional graph (above the strip with empty frames), body mapping (below the strip), and category chart (at the bottom). I incorporate these additions to the template after observing how participants fill out the Open Canvas (Fig. 3.2). I include the emotional graph because participants need a simple structure to express their flow of emotional states; I include the body mapping because participants need the body as an outline to color their feelings; and I include the category chart because they need to write general comments and observations (in terms of my vocabulary).

In the Expressing Phase, participants live an experience and express by drawing and coloring their canvases with five markers: black, yellow, red, green, and blue. They express individually during the course of their actual experience, by taking any amount of time they need to draw and color their canvases.

For both the Open and the Guided Canvas, participants express by following the Rules for Expressing, which assign the order and color for expressing the feelings, doings, and materials within an experiential moment. Participants begin drawing their doings in black, as bodily postures. Then, they continue drawing the materials in yellow, as background or support for the doings. And then, they color the feelings on top of the bodily postures, using red for unpleasant, green for neutral, and blue for pleasant sensations.

Phases of the Exercise

1. *Learning*

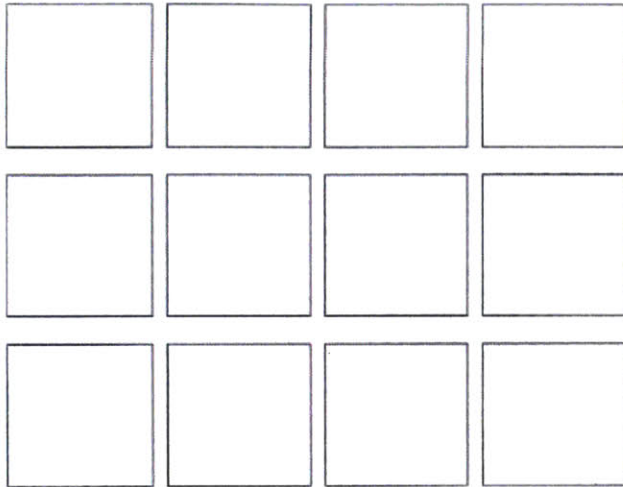
Understanding the Mindful Vocabulary and details of the exercise

2. *Expressing*

Living an experience and expressing that experience

3. *Proposing*

Using the expressions to propose changes



| Figure 3.1a |

Open Canvas (Empty)



| Figure 3.1b |

Filling out the Open Canvas



| Figure 3.1c |

Open Canvas (Filled Out)

Rules for Expressing

1. Live an Experience
2. Draw your own doings as bodily postures (use black)
3. Draw the materials that are part of that experience (use yellow)
4. Color the feelings (sensory and emotional) on top of the doings (use red for unpleasant, green for neutral, and blue for pleasant)
5. Note that your drawing should express the most significant moments

In the Proposing Phase, participants use their canvases to explore design possibilities. After experiencing and expressing they gather together to show their canvases and describe their experiences to one another. They reflect together and propose changes to their expressed experiences according to what they liked and did not liked about them. Then, after talking and reflecting about these changes, they can explore them in two ways: either they can explore their propositions by rearranging actual materials or they can draw and color the changes on top of their canvases, without rearranging actual materials.

3.2. Filling out the Canvases

In this section, I present the evidence that resulted from two exercises: one where participants express using an Open Canvas and one where they express using a Guided Canvas. In the first example, participants express a journey and then propose changes expressed experiences by rearranging materials. In the second example, participants express a working activity and then propose changes by drawing on top of their canvases.

The evidence corresponds to what *I observe* participants are doing from my own perspective, from a third-person position. I document their process by taking notes and photographs, as well as recording audio and video. For each exercise, I also include a chart with the background of participants, the location where the exercise is taking place, and the type of hosting institution.

As I was developing Transformational Design, I was invited to conduct two-day workshops, two with villagers in rural settlements and one with professionals in an experience-design consultancy. The timeframe and type of participants specified by these invitations seemed appropriate for trying out the vocabulary and the canvases that I was putting together. I thus decided to use these workshops to explore the first exercise of my practice.

Open Canvas

In the first exercise, villagers express a journey experience by filling out the Open Canvas, and then propose changes by rearranging materials. These villagers are adults in their mid-sixties living in Navidad and Coya², Chile, who volunteer after being contacted directly by staff members of local community center. For the journey, I ask villagers to choose a place within their natural surroundings. Navidad and Coya are both rural villages settled in unique geographical conditions. Navidad is settled on a bay area including the Pacific Ocean, a river, and a peninsula (Fig. 3.3 top). Coya is settled in the middle of the mountains, with two rivers, two valleys, and the Andes (Fig. 3.3 bottom). For the exercise, I ask them to explore this chosen place freely by doing whatever they want to do—walking, observing, sitting, smelling, running, listening.

The Expressing Phase is completed in approximately two hours, which includes living the experience and taking the necessary moments to fill out the Open Canvas. The Proposing Phase takes place at the community center's classroom, an open space with tables and chairs (3.4). This third phase is completed in four hours, which includes learning basic electronics, describing the experiences to one another, and proposing design intentions by rearranging electronic and recycled materials (cardboard, bottles, paper, cans).

For the Expressing Phase, I present evidence for two participants, one per village. While in Navidad, Angelica is an unemployed woman on her mid-sixties; in Coya, Maximo is a retired miner in his seventies. For the Proposing Phase, I present evidence for two groups, one per village as well. In Navidad, the design group includes Angelica, Monica, and Florencia. In Coya, the design team includes Maximo, Andres, and Juan Carlos. For both, Expressing and Proposing phases, I present the photographs and descriptions of what I observed.

² Navidad is a commune on the coast of Chile comprised of several fishing and agricultural settlements and villages. Coya is a small mining village in the mountains of Chile. I was invited to teach these design workshops by the ILab, a social innovation laboratory that bridges academia and practice as an applied extension of the Catholic University of Chile's Master of Innovation. It was founded by Cristobal Garcia, a Chilean sociologist with a Master of Science in Comparative Media Studies from MIT.

Exercise 1: Journey Experience

Canvas: Open Canvas

Participants: 16 Villagers (adults with no professional degree)

Hosting Institution: ILab (Social Innovation Laboratory at the Catholic University of Chile)

Location: Navidad and Coya, 6th Region, Chile (Rural settlements)

Date: August 14, 16, 19, and 20, 2013



| Figure 3.3 |

Navidad (top) and Coya (bottom)



| Figure 3.4 |

Community center

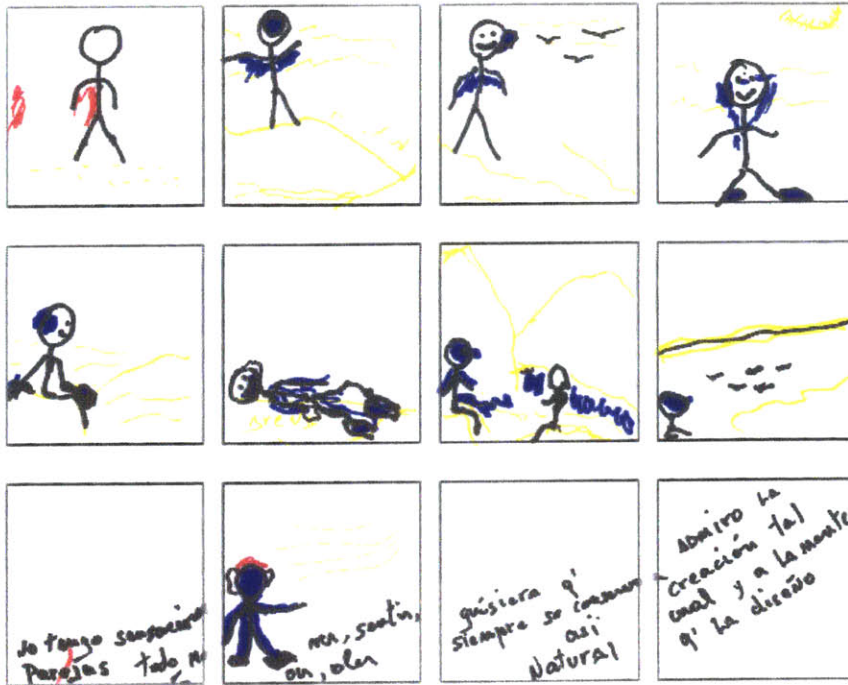


| Figure 3.5 |
Angelica living an experience

In Navidad, Angelica is participating in the Expressing Phase by exploring her immediate environment while filling out her canvas. As you can see in Figure 3.5, she is sitting in the cliff and appreciating the landscape, the river, the peninsula, and the ocean. In her canvas, she expresses different moments by drawing her body in different postures: standing and opening her arms at the top of the cliff, walking down the hill and observing the birds, sitting and contemplating the landscape, lying down on the grass, and sitting with another person on the slope (Fig. 3.7). During most moments she shows feeling pleasant sensations by coloring these postures in blue and drawing smiley faces. The first moment, however, is colored in red, which suggests her unpleasant feeling after the bus ride mixed with the heat of the sun on her back. By the end she also writes some positive comments, such as “no tengo sensaciones parejas, todo me gusta” (I don’t have neutral sensations, I like it all), and “quisiera q’ siempre se conservara asi natural” (I wish this will always be conserved the way it is, natural).

| Figure 3.6 |
Angelica expressing an experience





| Figure 3.7 |

Angelica's Experience Canvas



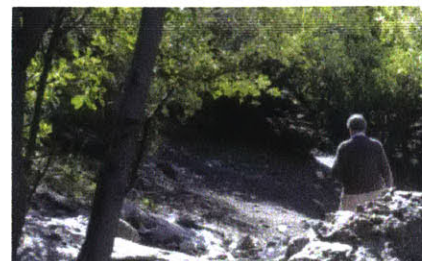
Transformational Design



| Figure 3.10 |
Maximo's Experience Canvas



In Coya, Maximo is also participating in the Expressing Phase by exploring his immediate environment while filling out his canvas. As you can see in Figure 3.8, Maximo is following a pathway, walking around the mountains and then taking a moment once in a while to sit or stand and appreciate the view, the trees, the river and the Andes. In his canvas, he expresses the translation of his body by drawing an arrow (Fig. 3.10). He colors his feet in blue to express that it is pleasant to feel the ground, which he also draws in blue and write “camino” (pathway). He draws his ears and colors them in blue to suggest that listening to the breeze and to the birds feels pleasant. He draws birds in yellow and writes “pajaros” (birds) and “brisa” (breeze) next to his ears. He expresses his emotion by drawing a blue smiley face. However, after walking around the “montañas” (mountains) he encounters trash, which he draws in red. He also colors his eyes red to express that seeing that trash feels unpleasant. This time, he expresses his emotion with a sad face. Finally he shows that he is happy again with a smiley face when he encounters his friends, whom he draws in yellow. He writes, “compañía” (companionship) as well as “cielo azul” (blue sky) and “cordillera” (mountains).



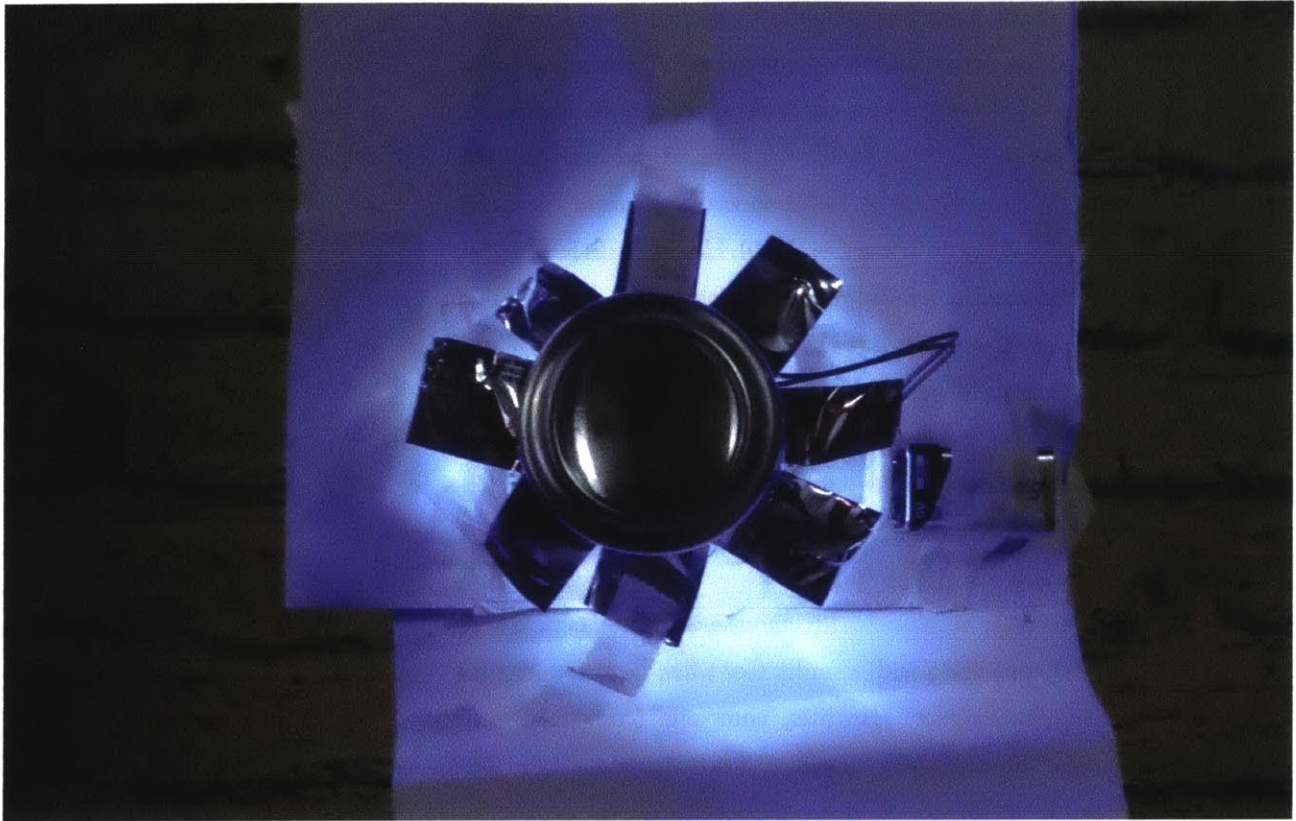
| Figure 3.8 |

Maximo living an experience

| Figure 3.9 |

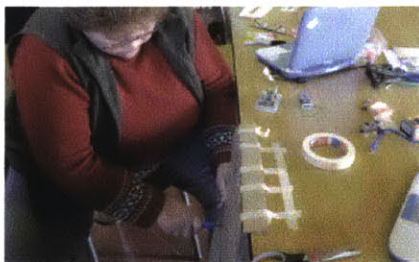
Maximo expressing an experience





| Figure 3.11 |

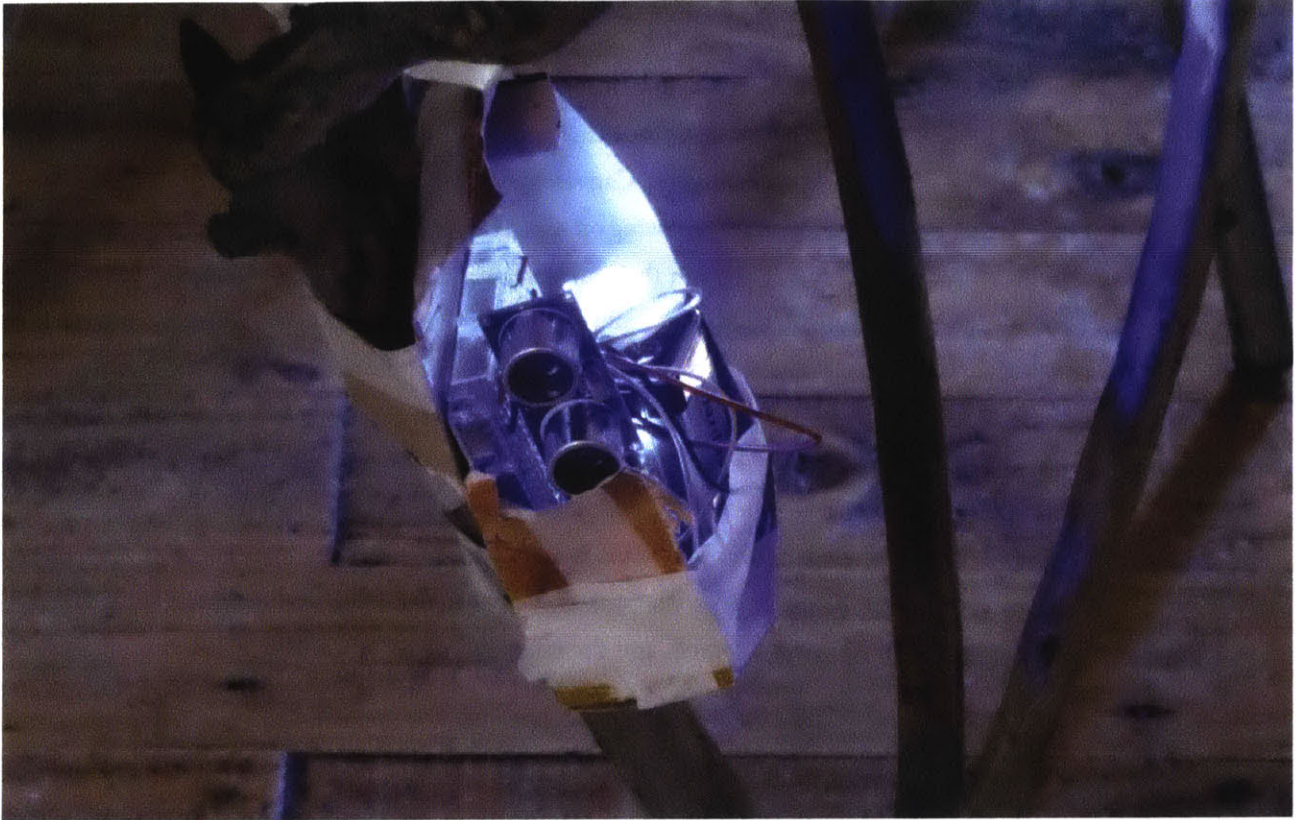
The Seeing-the-wind



| Figure 3.12 |

Angelica rearranging materials

In Navidad, after living the journey experience and filling out their canvases, participants get together in the community center for the Proposing Phase. Angelica works with Monica and Florencia and before rearranging materials they show and explain their canvases to one another. They realize together how disconnected they usually are from being present: from feeling what they do in their immediate environments. Particularly, they talk about the importance that the feeling of the wind has in their daily lives. They respond to this realization by proposing what they call a *seeing-the-wind*: a rearrangement of materials (sensors, LED lights, and paper) that translated the movement produced by the wind into intensity of blue light (Fig. 3.11). They talk about how to heighten their attention of their feeling of the wind by making it visual through light. Angelica also proposes building multiple *seeing-the-winds* and placing them in the landscape, in the highest points of the peninsula so that the wind could be seen from their towns at night.



| Figure 3.13 |
The Invisible-fence

In Coya, after living the journey experience and filling out their canvases, participants get together in the community center for the Proposing Phase. Maximo works with Andres and Juan Carlos, and before rearranging materials they show and explain their canvases to one another. They realize together that seeing artificial fences in the mountains feels unpleasant, and they talk about how to conserve the mountain as naturally as possible. These fences are necessary to separate the cattle and keep the cows and sheep in separate private clusters. Maximo, Andres, and Juan Carlos then respond to this realization by proposing what they call an *invisible-fence*: a rearrangement of materials (sensors, speakers, cardboard) that emitted a sound in a frequency only heard by the cattle to keep the animals from trespassing between private properties (Fig. 3.13). Juan Carlos proposes building multiple invisible-fences, attaching them to the trees in a network in order to replace actual physical fences, and clearing out the landscape from these fences they do not like.



| Figure 3.14 |
Juan Carlos rearranging materials

Guided Canvas

Exercise 2: Working Experience

Canvas: Guided Canvas

Participants: 4 Professional designers (UXD and Interaction Design)

Hosting Institution: The Meme (User-Experience Design Consultancy)

Location: Cambridge, Massachusetts

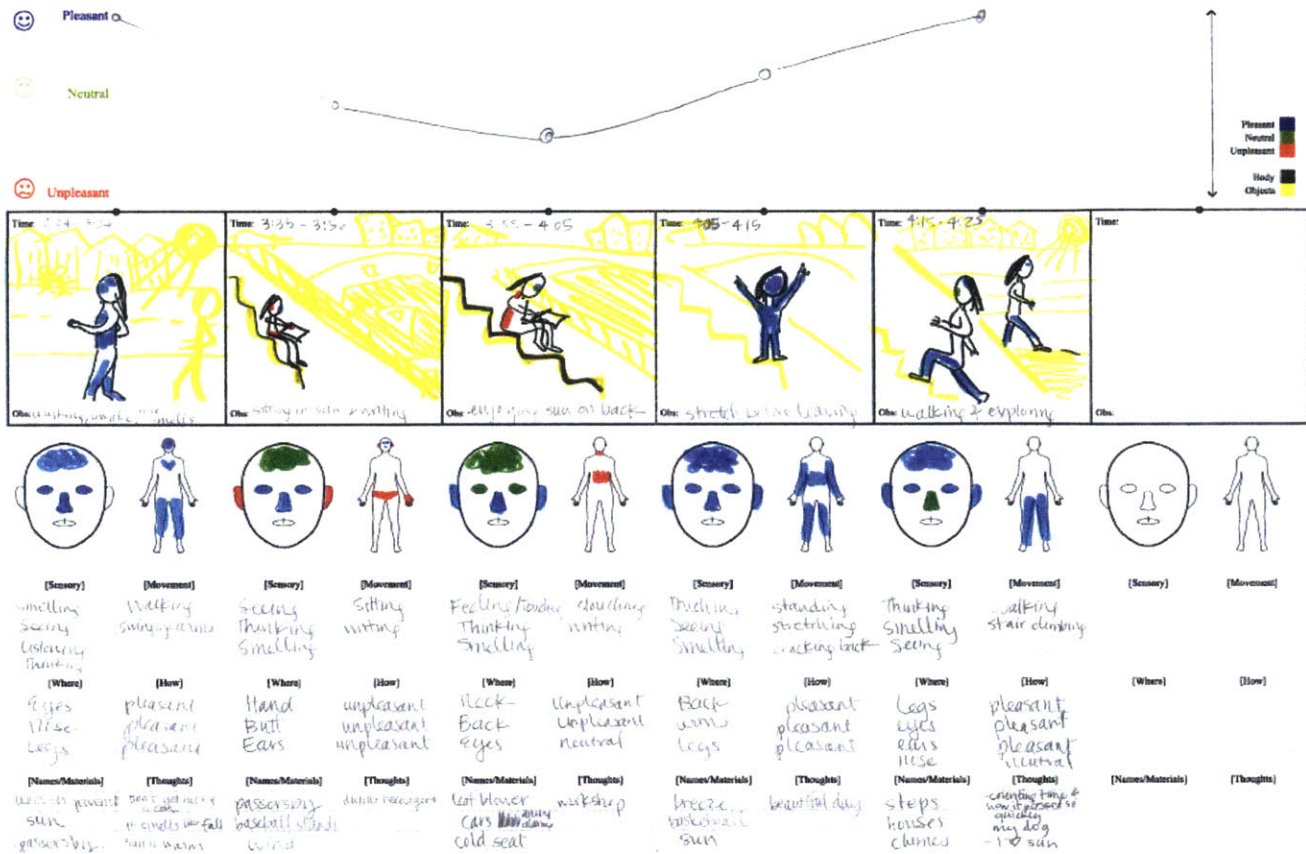
Date: September 17 and 18, 2013

In the second exercise, professionals express a working activity by filling out the Complete Canvas, and then propose changes to their expressed experiences by drawing on top of their canvases. These professionals are young practitioners in their mid-twenties and thirties, working at the Meme Design³, a design consultant office in Cambridge Massachusetts. For the actual working activity, I ask them to think and write about the last meeting they had with their clients. This is a generic task, a regular activity part of their daily practice. In the exercise, I ask participants to work outside the office, which includes walking to a location, working there (task), and then coming back to the office. I define four locations: a coffee house (1369 Coffee House in Inman Square), a public park (Donnelly Field), a library (Cambridge Library), and the street (free walking).

The Expressing Phase is completed in one hour, which includes living the experience and taking the necessary moments to fill out the Guided Canvas. The Proposing Phase takes place at the office's conference room, an open space with a whiteboard and chairs around a big table. This third phase is completed in two hours, which includes describing their experiences to one another, and proposing changes by drawing on top of their canvases.

For the Expressing Phase, I present evidence for two participants, Suzanne and Carlos. While Suzanne is an ethnographer with experience in design, Carlos is an architect with experience in User research and User studies. For the Proposing Phase, I present evidence for four participants, including Suzanne and Carlos, as well as Hyejin and Jenna. For both, Expressing and Proposing phases, I present the photographs and descriptions of what I observed.

³ The MeMe Design is a strategic design consultancy based in Cambridge, Massachusetts. It was founded in 2006 by Hyejin Lee, a designer with a Master of Design Studies in Digital Media from the Harvard Graduate School of Design (GSD). The office develops user-research, user-studies, and proposes design strategies for technological companies developing interfaces for smart-phones, tablets, and digital cameras. Their biggest client is Samsung. In its webpage, the MeMe Design promotes itself with the following phrases: "We envision the future, we decode human behavior, and we chart paths through complexity" (accessed February 10, 2015, <http://www.thememedesign.com/>)



| Figure 3.16 |

Suzanne's Experience Canvas

In Cambridge, Suzanne is participating in the Expressing Phase by working in a public park, Donnelly Field. As you can observe in Figure 3.15, Suzanne is walking toward the park and then sitting in the bleachers to work. In her canvas, she expresses most of these moments and includes others, namely standing up and stretching (Fig. 3.16). In most moments she expresses feeling pleasant sensations. However, while working she feels unpleasant sensory and emotional sensations. After working at the park, Suzanne walks back to the office and sits in the meeting table. She has not finished her canvas and spends some additional moments to complete her doings and color her feelings.



| Figure 3.15 |

Suzanne walking to the park

Transformational Design

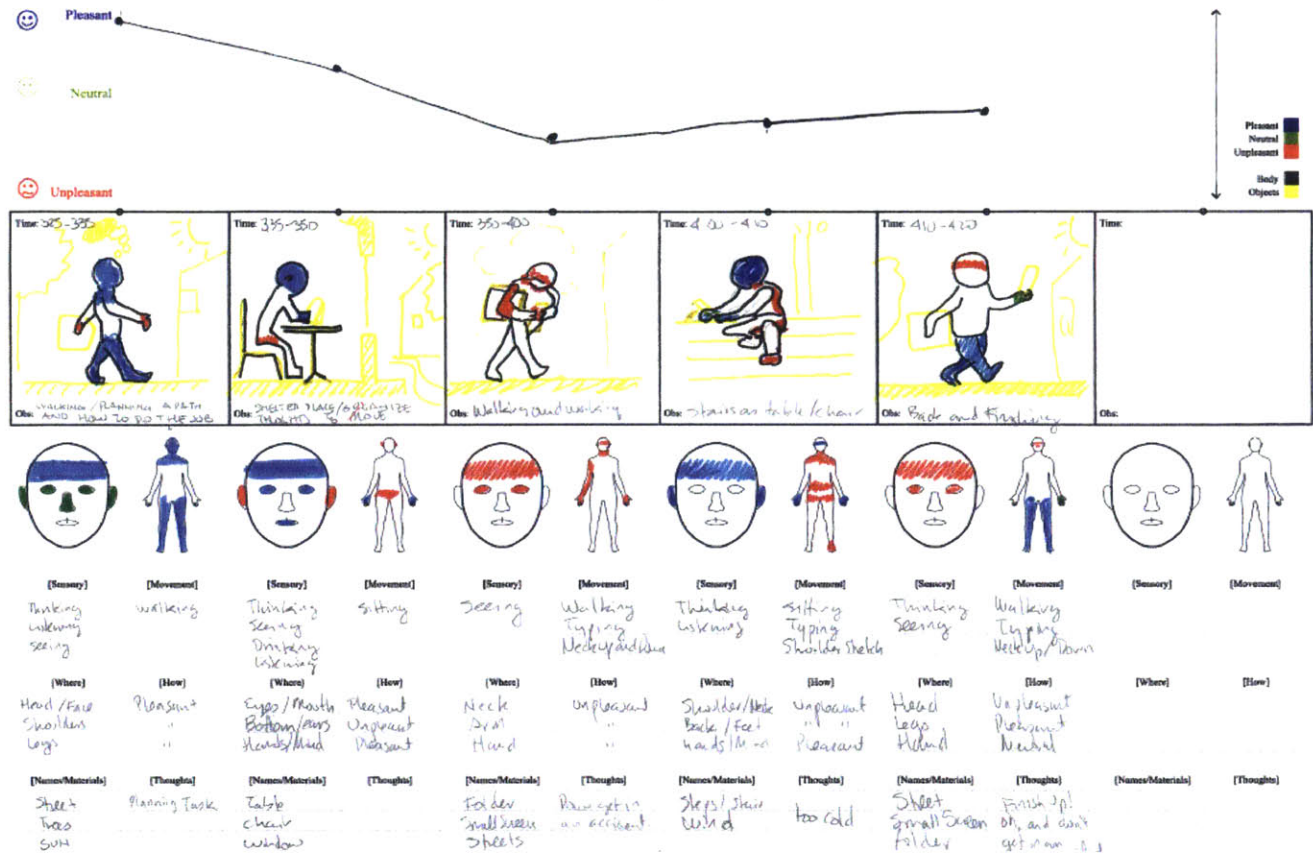


Figure 3.18 |

Carlos's Experience Canvas



Figure 3.17 |

Carlos crossing the street

Meanwhile, Carlos is also participating in the Expressing Phase by walking around Cambridge. However, instead of working in a specific place, his task is to work while walking freely in the neighborhood of the office. Carlos walks around the streets and stops once in a while to work and fill out his canvas (Fig. 3.17). In his canvas, he expresses different moments by drawing his bodily postures: walking, sitting on a chair, working while walking, sitting on stairs, and walking and thinking (Fig. 3.18). In the moments when he is working while walking, Carlos expresses unpleasant sensations by coloring his forehead and eyes in red. Afterwards, Carlos explains that was really hard for him to walk, work, be mindful, and draw his canvas at the same time. After working while walking, Carlos comes back to the office, sits next to Suzanne, and he also spends some additional moments to complete his doings and color his feelings (Fig. 3.19).

After completing the Expressing Phase, Suzanne and Carlos begin the Proposing Phase by gathering together around a table with Jenna and Hyejin (the other two participants). Together, they hang their canvases on the whiteboard and one by one describe their experiences (Fig. 3.20). Then, they reflect on each other's experiences and propose changes by drawing on top of their canvases.

For Carlos' canvas, they propose to alleviate the unpleasant experience of working while walking. They draw a device with which they could walk without having to pay attention to the street, allowing them to focus on the actual working experience. Carlos explains the device by referring to the blind person's experience of walking with a guide dog without seeing the street. They call this device the *Invisible Guide Dog* (Fig. 3.21 top).

In her canvas, Hyejin expresses unpleasant sensations when trying to work in a public library while observing people and listening to their conversations. Using her canvas, they propose to alleviate the distractions she has encountered in the library. Together, they talk about a device with which they could separate themselves from the lights and the sounds. They call this device a *Personal Cocoon* (Fig. 3.21 bottom).

Spontaneously, after describing their experiences and modifying their canvases, the participants reflect on the actual exercise of expressing the experience and discuss about how to integrate this exercise into their Experience Design practice.

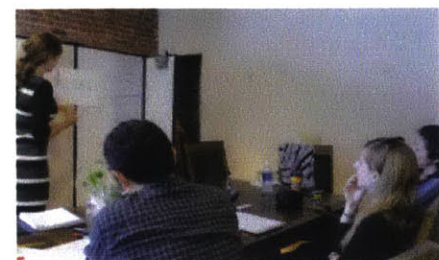
Suzanne explains her canvas, and then reflects on exercise. She says, "I felt like it took a while... a minute to think in this framework of feeling, doing... and materials."

While showing his canvas, Carlos agrees and replies, "Yes, and it was hard because in the immediacy of the moment you can capture a lot, but at some point you have to submerge into doing this [pointing at his canvas] and then come out again ... and I think this kind of interrupts the mindful experience."



| Figure 3.19 |

Carlos completing his canvas at the office



| Figure 3.20 |

Participants describing their experiences

3.3. The Constructs

In this section, I present my findings, which are the result of reflecting on the evidence in the light of having directly observed the participants living and expressing an experience. In the exercises, I find that when participants fill out my canvas, they do not express the experience they are actually living, but rather they construct a retrospective and coherent narrative about what they had experienced⁴. This narrative is not thought about and then expressed, but is actually constructed through the very process of expression, in this case though drawing the Canvas. I call these expressions the *Constructs*.

These Constructs allow me to reflect on my first hypothesis: *With my Mindful Vocabulary, designers are able to become mindful, express, and think about experience in design*. Even though expression is a construction, in the exercise the vocabulary helped participants to become more aware of their experiences unfolding in the moment. Also, using my vocabulary they were able to talk about their (constructed) experiences with one another, and were able to propose changes in terms of their experiences. Consequently, I conclude that my vocabulary is useful for designers as a means to become mindful, express, and think about experience.

First, I present the findings of the Expressing Phase, where I find that participants expressed after the fact. Participants cannot express the actual experience while they are having it because expressing an experience is also an experience: *feeling ourselves filling out the canvas*, which is a stream of experience that includes thinking (imagining and remembering) and drawing. Then, I present the findings of the Proposing Phase, where I find that participants were able to describe their experiences to one another and propose changes to their expressed experiences. And I use this finding to begin delineating how designers can use my vocabulary and exercise in design.

⁴ My findings are aligned with the work of anthropologists Victor W. Turner and Edward M. Bruner. They describe the people's expressions of experience as multi-layered and self-referential stories or narratives, including "not only action and feelings but also reflections about those actions and feelings" (Turner and Bruner 2001, 5).



| Figure 3.22 |

Angelica drawing her canvas and appreciating the view

Constructed and Reconstructed Experiences

In the Expressing Phase, I asked participants to draw their canvases *while* they were experiencing something (journey or work). I assumed that they could experience something and at the same time draw what they were experiencing. However, by observing the participants doing the exercises, I realized that an experience cannot be expressed *while* having it because that experience is actually interrupted by the very process of expression. In other words, expressing an experience is also an experience: a stream of experiential moments including thinking and drawing. Consequently, participants could not express an experience while experiencing that experience. Instead, participants either constructed an experience with moments that did not occur in the exercise, or reconstructed an experience after the fact.

For example, in the exercise using the Guided Canvas, Angelica constructed a story with experiential moments that she did not actually experience. I argue that she either projected these moments or remembered them from other experiences. By comparing her photographs with her canvas you can see that Angelica did not actually experience all the moments she expressed (Fig. 3.22 and 3.23). She may have stood up to open her arms at the top of the cliff, but she did not walk down the hill to observe the birds, or lay down on the grass.

I observed Angelica throughout the entire exercise and she did not change her position: she stayed on the cliff, sitting and drawing her canvas, and



| Figure 3.23 |

Angelica's Experience Canvas

once in a while taking some moments to contemplate the landscape, the river, the peninsula, and the ocean. As an observer, I cannot know what Angelica was thinking, but because she drew experiential moments that she did not experience directly, I can assume she was projecting these moments or remembering them from other experiences she had lived before.

In my vocabulary, I describe thinking as sensing *sense-objects* (thoughts) using the mind's *sense-organs*. As a type of thinking, I describe *remembering* as sensing *sense-objects* I have felt before; and *projecting* as sensing *sense-objects* that I have not felt. These *thinkings* unfold in the *present* using some or all our mind's senses: touching with our mind's body, smelling with our mind's nose, listening with our mind's ears, tasting with our mind's tongue, and seeing with our mind's eyes. Therefore, when I say that Angelica was thinking, I mean that she was literally using her mind to touch, smell, listen, taste, and see. Even though she did not actually lay down on the grass, I argue that she could have used her mind's eyes to see herself laying down, and even her mind's body to touch the grass, and her mind's nose to smell it.

However, how did she project or remember the experiential moments that she is expressing in her canvas? Angelica did not construct this story by projecting or remembering all these moments and then simply by drawing them out all at once. Instead, she engaged in an iterative process: a stream of experience including thinking, drawing, thinking, drawing, thinking drawing. These streams included other doings, such as sitting and observing the landscape and what other participants were doing. I argue that all these



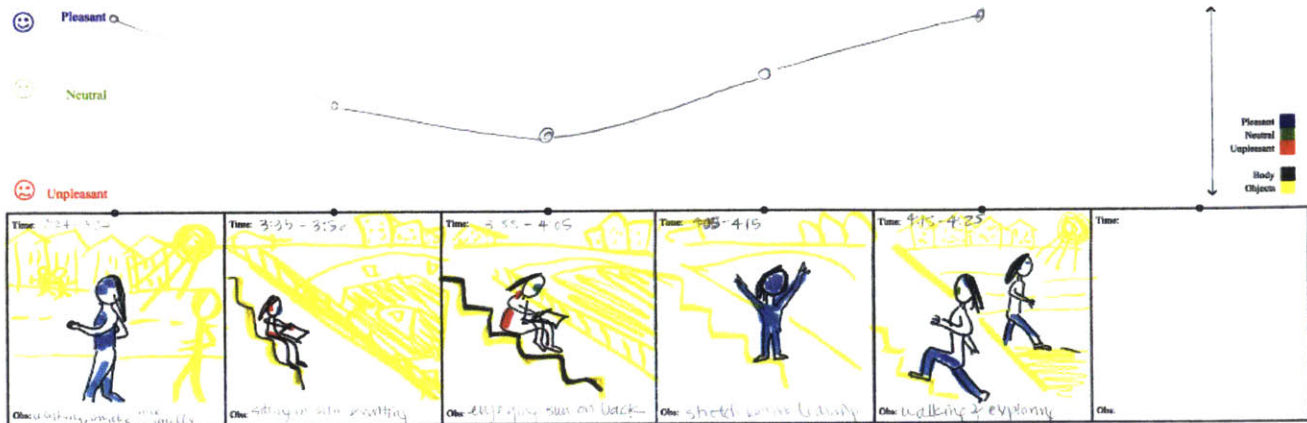
| Figure 3.24 |

Angelica drawing her canvas and appreciating the view

moments nurtured her process of construction. For example, I observed how Angelica stopped drawing a couple of times to observe her drawing, the view, and what other participants were doing. Again, as an observer, I cannot know what she was thinking but because she stopped and observed, I can assume that whatever she was remembering or projecting was nurtured by observing her drawing, the view, and what others were doing. For example, although she did not actually walk down the hill, she was at the top of the cliff observing how other participants were doing exactly that.

While Angelica constructed an experience that did not actually occur, Suzanne reconstructed her experience by remembering the significant moments she had just experienced. In the photographs, you can see how she was first walking and then sitting and drawing (Fig. 3.24). She had to stop walking in order to draw herself feeling that walking. In other words, drawing the canvas interrupted the very experience she wanted to contemplate and express. By interrupting it, she was able to take a moment and express what she had just experienced a moment before. What is interesting is that in her canvas she also included herself expressing: she drew herself expressing the experience of expressing (Fig. 3.25). As an observer, I cannot know what Suzanne was thinking, but because she expressed the experience after the fact, I can assume she was remembering the experiential moments she had just felt before.

However, I argue that Suzanne did not *relive* the actual experience by

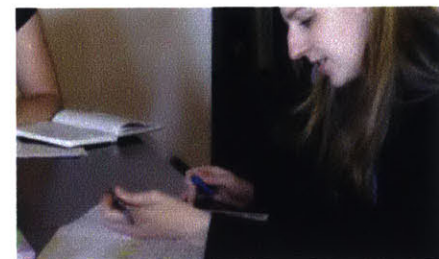
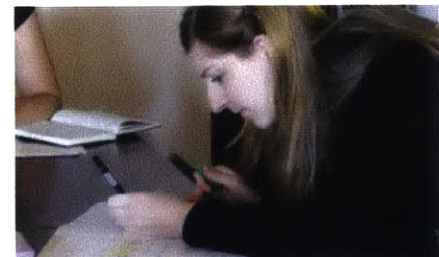


| Figure 3.25 |

Suzanne's Experience Canvas

remember that experience, because thinking about an experience is another experience all together. Even though *remembering* is sensing *sense-objects* I have felt *before*, I am sensing these sense-objects *now*, and sensing them as *thoughts* using our mind's senses. In other words, feeling myself sensing with my body's senses is different from feeling myself sensing with my mind's senses. For example, seeing images with my eyes is different from seeing images with my mind's eyes. Therefore, I conclude that Suzanne did not express the actual experience but a different one: what she *remembered* about that experience.

Similarly to what happened with Angelica, Suzanne did not reconstruct her story by remembering her experiential moments and then simply drawing them out. Instead, she engaged in an iterative process: a stream of experience including drawing and thinking, which were modulating one another. Back at her office, I observed Suzanne completing her canvas. She did not think and then draw, but rather started drawing right away by moving her arms and hands holding a pencil and making marks on a piece of paper, while observing what she was doing (Fig. 3.26). Once in a while she read the Rules for Expressing, reflected on what she had drawn, and then kept drawing. She also modified her drawing a couple of times, by using a black pencil and an eraser before tracing with the color markers. As an observer, I cannot know what Suzanne was thinking, but because she did not take a moment to think before drawing and because she changed her mind throughout the process, I can assume that what she was seeing with



| Figure 3.26 |

Suzanne drawing her canvas (top) and observing her canvas (bottom)

her mind's eyes was nourished by what she was seeing with her body's eyes while drawing.

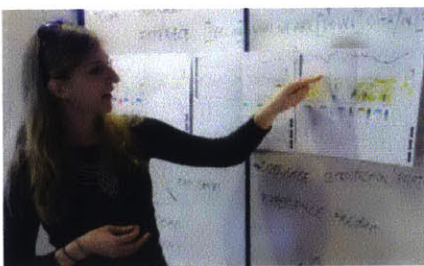
By observing Angelica and Suzanne doing the exercises and by reflecting on the evidence, I realize that thinking about an experience does not take place before drawing it. Essentially, participants constructed or reconstructed their experiences through drawing them: by thinking participants knew what to draw, and by drawing participants knew what to think next. In other words, thinking and drawing modulated one another.

Expressing in Design

In the Proposing Phase, I asked participants to describe their experiences to one another and propose changes to their expressed experiences. I was using this phase to begin exploring how designer can begin using my vocabulary and exercise within a design process. I found that my vocabulary does not help designers to *capture* an experience as it is *actually* lived. Instead, my vocabulary facilitates designers to become more aware of their experiences; allows them to see things in ways they would not otherwise see them; and helps them to reflect, talk about and propose changes in terms of their experiences.

First, the exercise facilitated participants to become more aware of their experiences, unfolding in the moment. Because they assumed they had to express in terms of my vocabulary, they directed their awareness with intention towards what they were feeling and doing in the moment (while experiencing and before they had to express). In the second exercise, after expressing Hyejin said,

“This was really new to me. Even looking at the building color and the roof... I don't usually pay attention to the colors and what's outside... what I am looking, watching... what I am hearing, what I am listening... that is usually just background, everything is background noise... it used to be. But today, I was looking and trying to catch with my eyes and with my nose and hears.”



| Figure 3.27 |
Suzanne explaining her canvas

Second, the exercise helped participants to learn my vocabulary, which consequently allowed them to think, draw, and talk about their (reconstructed) experiences. As an observer, I saw how most participants were able to fill out their canvases by following the Rules for Expression. I also observed how they were able to show their canvases to one another, make sense of each other's canvases, and talk to one another in terms of my vocabulary (Fig. 3.27).

Finally, the exercise helped participants to reflect and propose changes to their expressed experiences. In Navidad, the exercise allowed villagers to reflect: to think about what they have experienced and decide what to do next. For example, the villagers in Navidad proposed the *Seeing-the-wind* after realizing together that they had not been aware of the presence of the wind in their daily lives (Figure 3.28). They talked about this realization after showing their canvases to one another and describing their experiences in terms of my vocabulary. In Cambridge, the design practitioners talked about modifying what they had experienced by tracing on top of their original canvases and proposing the *Invisible Guide Dog* and the *Personal Cocoon*.

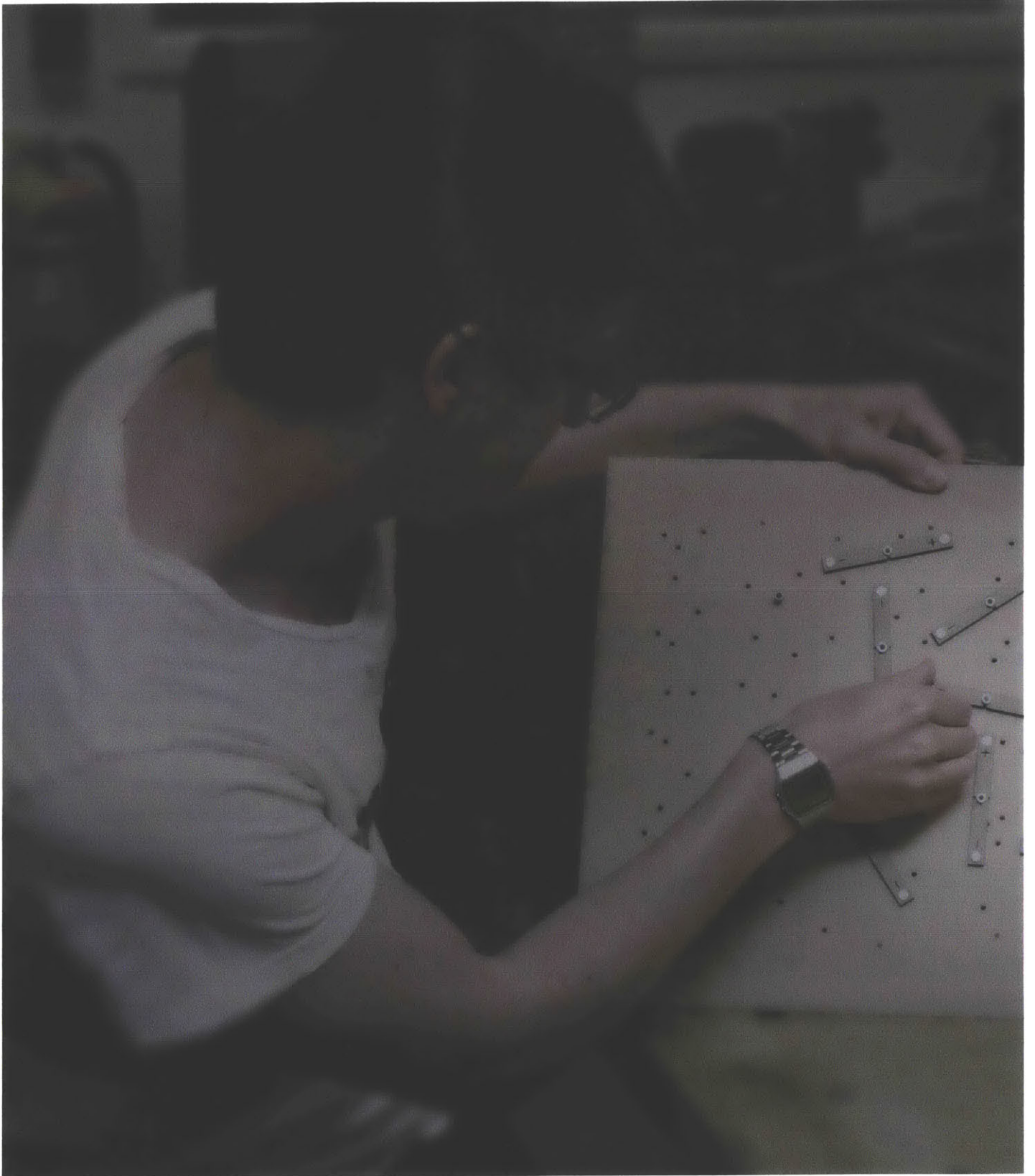


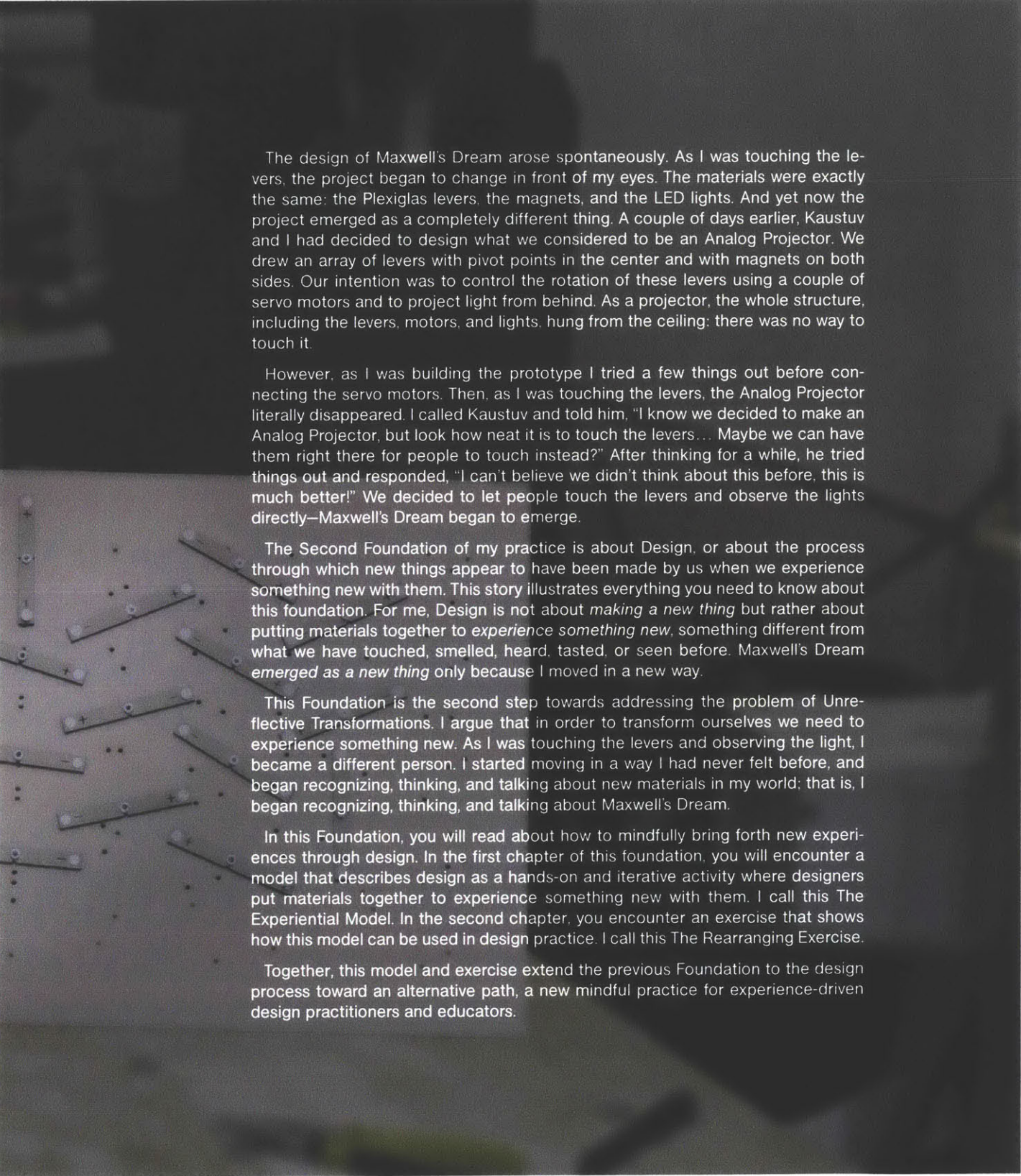
| Figure 3.28 |

Participants trying out the *Seeing-the-wind*

SECOND FOUNDATION : *Design*

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A photograph of a prototype for 'Maxwell's Dream'. It shows a collection of black levers of various lengths and angles, each with a small white LED light at its end. The levers are arranged on a dark surface, possibly a table or a board, and are connected to a central point. The background is dark and out of focus.

The design of Maxwell's Dream arose spontaneously. As I was touching the levers, the project began to change in front of my eyes. The materials were exactly the same: the Plexiglas levers, the magnets, and the LED lights. And yet now the project emerged as a completely different thing. A couple of days earlier, Kaustuv and I had decided to design what we considered to be an Analog Projector. We drew an array of levers with pivot points in the center and with magnets on both sides. Our intention was to control the rotation of these levers using a couple of servo motors and to project light from behind. As a projector, the whole structure, including the levers, motors, and lights, hung from the ceiling: there was no way to touch it.

However, as I was building the prototype I tried a few things out before connecting the servo motors. Then, as I was touching the levers, the Analog Projector literally disappeared. I called Kaustuv and told him, "I know we decided to make an Analog Projector, but look how neat it is to touch the levers... Maybe we can have them right there for people to touch instead?" After thinking for a while, he tried things out and responded, "I can't believe we didn't think about this before, this is much better!" We decided to let people touch the levers and observe the lights directly—Maxwell's Dream began to emerge.

The Second Foundation of my practice is about Design, or about the process through which new things appear to have been made by us when we experience something new with them. This story illustrates everything you need to know about this foundation. For me, Design is not about *making a new thing* but rather about putting materials together to *experience something new*, something different from what we have touched, smelled, heard, tasted, or seen before. Maxwell's Dream emerged as a *new thing* only because I moved in a new way.

This Foundation is the second step towards addressing the problem of Unreflective Transformations. I argue that in order to transform ourselves we need to experience something new. As I was touching the levers and observing the light, I became a different person. I started moving in a way I had never felt before, and began recognizing, thinking, and talking about new materials in my world: that is, I began recognizing, thinking, and talking about Maxwell's Dream.

In this Foundation, you will read about how to mindfully bring forth new experiences through design. In the first chapter of this foundation, you will encounter a model that describes design as a hands-on and iterative activity where designers put materials together to experience something new with them. I call this The Experiential Model. In the second chapter, you encounter an exercise that shows how this model can be used in design practice. I call this The Rearranging Exercise.

Together, this model and exercise extend the previous Foundation to the design process toward an alternative path, a new mindful practice for experience-driven design practitioners and educators.

4. Experiential Model

In this chapter, I introduce a set of words and a diagram you can use as a means of experiencing something new with the materials you are putting together in design. I call this the Experiential Model. This model is part of the Second Foundation of Transformational Design, wherein I extend my Mindful Vocabulary to the design process.

This model is drawn from my own reading of Shape Grammars, a design theory developed by George Stiny¹, Professor of Architecture at MIT, and one of my advisors (Stiny and Gips 1972). I reflect and elaborate on his writings by considering my own design practice and what I have learned over my studies with him and other students and professors in the MIT Design & Computation Group.

You will learn about this model through reading words but also through observing a diagram that illustrates the relationships between the words. Together, these words and diagram will show you how to become mindful of your experience, and how to talk and think about it as you are bringing this experience forth within and throughout your hands-on design process. Once you become mindful of this experience, you can begin reflecting about it.

In this chapter, you first encounter the *Primary Moves*, namely *Rearranging* and *Freemoving*. Through these design moves, or operations, you will learn about what I mean by design. For me, design is a hands-on activity where you bring forth new experiences spontaneously by rearranging

¹ Shape Grammars was first proposed by George Stiny and James Gips, a computer scientist, in a paper they wrote together in 1972 (Stiny and Gips 1972). This theory was further developed by George Stiny, Terry Knight, and other professors in the MIT Design & Computation Group (Knight and Stiny 2001).

materials and moving in new ways with them, in ways you have never seen, heard about, or moved before. Next, you encounter the *Ancillary Moves*, namely *Thinking*, *Expressing*, and *Naming*. Through these design moves you will learn how to define and redefine your design intentions, when and how to reflect on the experiences you are bringing forth, and when and how to project possible ways to rearrange the materials and move your body with them. You will also learn how to express the experiences you are bringing forth in terms of my vocabulary, and how to name the materials you have rearranged once you bring forth a new experience. Finally, you will encounter the *Stream of Design*, which shows you how the experience of design unfolds from moment to moment.

This model is my response to the growing interest in promoting creativity and innovation through a hands-on design practice—an interest I have seen ingrained in the discourse of contemporary practitioners, who are putting together interactive technologies. I offer this model to them, to these hands-on designers desiring to come up with the next big thing. However, I also warn them that this model is experiential, where new things appear to have been made by us only as a result, when we experience something new with them.

4.1. Primary Moves

When I am designing, I rearrange some materials that I find around me, and I try them out by moving with them, touching, and observing them. Since I am moving freely, I may bring forth a new experience—an experience I have never felt before. Rearranging and moving freely (what I call *freemoving*²) are the only design moves, or operations, that I need for designing in this way. Consequently, I call them the *Primary Moves*. The new experience appears as a mindful insight. As I am freemoving, I can become aware of what I am doing and feeling with the materials, and then realize

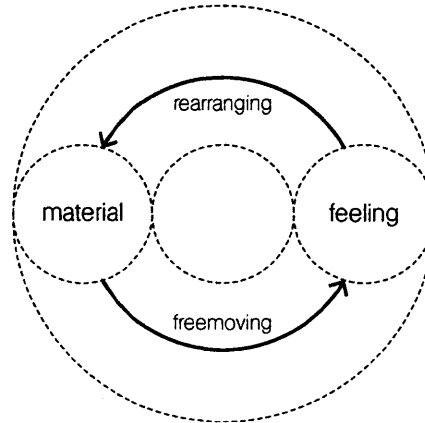
Design

Hands-on and iterative activity where I bring forth new experiences spontaneously by rearranging materials and freemoving with them

New Experience

Mindfully feeling a doing with materials for the first time (never having seen, heard about, nor felt before)

² *Freemoving* is a new verb, a label that I created to describe an open and exploratory sequence of bodily postures. Freemoving is ambiguous and open, and it allows designers to try things out in new ways without following the movements they already know. There are no *right* type of movements and, as a designer, I am free to move as I want.



I am experiencing something for the first time³. Thus I may say to myself, “what I am doing with these materials is new for me; I have never felt this before. I have brought forth a new experience.”

Together, these Primary Moves begin building up my Experiential Model. You learn about this model by reading words, and also by observing the model as a diagram, an image with the lines and shapes between the words, showing you the sequence and relationship between them (Fig. 4.1).

In the diagram, you can see an open-ended loop with two experiential moments, showing what I feel and do with the materials as I am designing: I feel myself rearranging the materials and, then, I feel myself freemoving with them (Fig. 4.1). My Experiential Model is based on my Mindful Vocabulary. Consequently, I build this new diagram by extending the diagram from the previous Foundation to the design process. In this new diagram, I am including all the words, lines, and shapes from the previous diagram. The only difference is that I am duplicating the previous diagram

| Figure 4.1 |

The Experiential Model

Rearranging

Sensing my body and the materials as I am picking them up (finding, choosing, extracting), modifying them (cutting, melting, molding), or putting them together (assembling, mixing, fusing)

Freemoving

Sensing my body and the materials as I am moving freely with them

³ Newness always arises as a surprise, as something I had not expected. Newness is relative, because what is new for me may not be new for you. And newness is not a property of physical things, because materials arise as *something new* when I realize that I am experiencing something that I have never experienced before.

by including two experiential moments, as they respond to one another in a loop, specifying the doings in those moments with two verbs, rearranging and freemoving.

Even though I emphasize the moving category, rearranging and freemoving are actually *doings*, or actions of body and mind. I describe *rearranging* as a doing where I am sensing my body and the materials as I am picking them up, modifying them, and putting them together. I describe *freemoving* as a doing where I am sensing my body and the materials as I am moving freely with them, without trying to follow movements I already know. This kind of sensing includes touching, smelling, hearing, tasting, and observing⁴.

This Experiential Model is inspired by Shape Grammars, a design theory developed by mathematician and MIT professor George Stiny. Shape Grammars is a computational system for designing with shapes using algebraic rules (Knight and Stiny 2001, 362). Four propositions within Shape Grammars are particularly relevant to my model. These propositions are: *exploring*, *open-ended loop*, *reconfiguring*, *embedding*. I use these propositions to support my model, clarifying what I mean by design, building my diagram, and describing the Primary Moves in more detail.

Exploring

The first proposition of Shape Grammars is to understand design not only as an analytical activity but as an exploratory one. Using Shape Grammars, I do not know what I am going to design before I design it. In this sense, designing is not about optimizing a solution that I already know. It is about bringing forth unexpected results throughout the design process (Knight and Stiny 2001, 364). In other words, if I know what I am going to end up designing before designing it, why bother designing it at all? As I am

⁴ I want to clarify that freemoving is not about sensing my body visually or as an external object, but rather feeling myself moving from within. I like how psychologist James J. Gibson describes the *sensitivity to the self* from a first-person's perspective. He says, "An individual not only sees himself, he hears his footsteps and his voice, he touches the floor and his tools, and when he touches his own skin he feels both his hand and his skin at the same time. He feels his head turning, his muscles flexing, and his joints bending. He has his own aches, the pressures of his own clothing, the look of his own eyeglasses—in fact, he lives within his own skin" (Gibson 2014, 108).

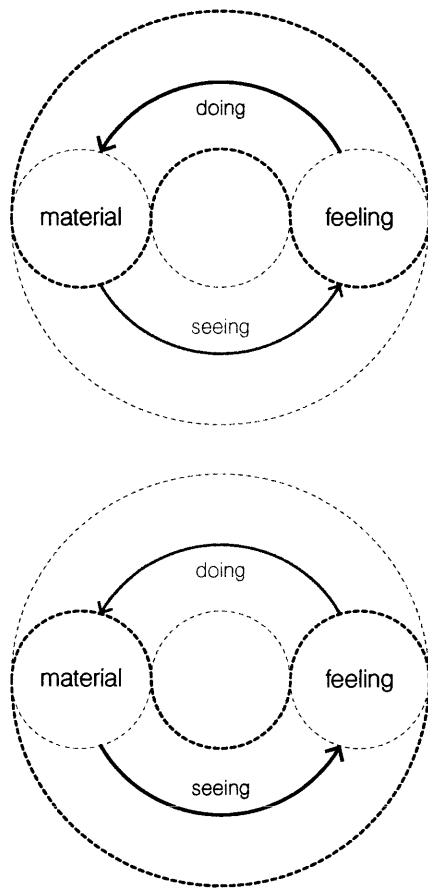
drawing, the shapes that I see emerge spontaneously. Shape Grammars do not offer magic recipes with instructions for designers to blindly follow in order to become more creative, but rather offer a way of thinking and doing that allows designers to catalyze their natural creative capacity.

Similarly, in my model, I engage in an open-ended exploration, where I bring forth new experiences spontaneously and where, through reflecting on these experiences, I may decide to stop for a while or keep going. I see designing as *cooking without a recipe*, where the chef is mixing ingredients as she is tasting, without knowing what the result will be. In other words, this chef is not cooking something specific: not pizza, nor empanada, nor ratatouille. This chef is exploring openly. She is picking up ingredients she finds in her worlds (water, milk, and basil, for example), mixing them, and trying them out. And when she tastes something she has never tasted before, she may give his mixed ingredients a new name: *Bruheheu*. The chef knows pizza, empanada, and ratatouille are just *labels* for mixed ingredients she has seen and tasted before. Thus she does not see a problem calling her mixed ingredients anything she wants to. The chef simply realizes, “I have cooked a *Bruheheu*.”

Likewise, the designer is not designing something specific –not a bicycle, a house, nor a smartphone. Like the chef, this designer is exploring openly. She is picking up materials she finds in her world (stones, wood, and metal, for example), putting them together, and trying them out. And when she is moving in a way she has never experienced before, she may give her rearranged materials a new name. She knows a bicycle, a house, and smartphone are just *labels* for rearranged materials she has seen and moved with before. Thus she does not see a problem calling her rearranged materials anything she wants, even *Bruheheu*.

Design is often expressed in terms of designing a *thing*, a bicycle, a house, or a smartphone. Yet to me, this *thing* can only be known retrospectively. In this way, the *Bruheheu* emerged after the fact as something that I *had designed*. Only after I experienced something new with the materials and gave them a label was I able to say “I have designed a *Bruheheu*.”

Open-ended Loop



| Figure 4.2 |
Shape Grammars as Seeing and Doing

The second proposition of Shape Grammars is to describe design using explicit rules, comprised of *seeing* and *doing*. I see a shape and then I do something to that shape, which is expressed as: See (x) → Do (g). And, according to my reading of Shape Grammars, as I am applying these rules (from one moment to the next) I am configuring an open-ended loop that includes seeing and doing (Fig. 4.2): what I see defines what I do, and what I do defines what I see next (Stiny 2011, 15). For Shape Grammars, this shape is neither a thing nor a physical material, but a geometric abstraction of the drawing, described as points, lines, planes, and solids. Again, I see a shape (a square or a triangle, for example) and then I do something to that shape (move, rotate, or scale, for example). The application of these rules is not symbolic but phenomenological, because I am free to see any shape I want, without limiting myself to fixed and predefined geometric descriptions (Stiny 2011, 15).

I use this proposition to build the diagram of my model. While with Shape Grammars I bring about unexpected shapes through *doing* and *seeing*, with my Experiential Model I bring forth new experiences through *rearranging* and *freemoving*. Similarly to Shape Grammars, my model is open-ended because it is always possible to come back, move in a different way, feel something new, and start over: how I move defines what I rearrange, and what I rearrange defines how I freemove next (Fig. 4.3).

However, this iteration between rearranging and freemoving is much slower than the one between seeing and doing. In Shape Grammars, I can see shapes as I am drawing them, and I can react to what I see by doing something right away, erasing or drawing over the initial shape. With my model, I cannot freemove with the materials until I have rearranged them (or at least some of them). I cannot drink and taste the juice before picking up an orange, cutting it and squeezing it. Thus, in my model the iteration takes more time, because both rearranging and freemoving may include several doings. As I am rearranging the materials, I may search for them, cut them into pieces, and glue them. Then, as I am freemoving with these

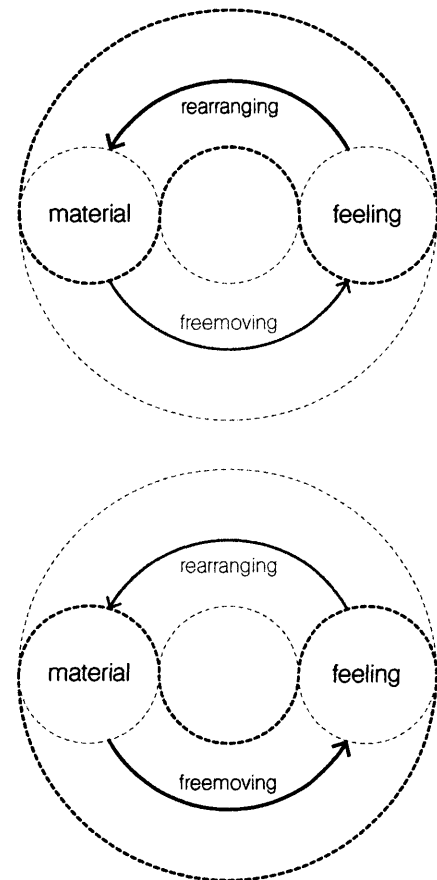
materials, I may observe them, walk towards them, sit on them, wear them, and transport my body with them.

You could argue that *seeing* and *doing* are also at play in both *rearranging* and *freemoving*. And you may be right. As I am rearranging the materials I am also observing and doing something to them. For example, as I am crumpling paper I may *see* the materials as a *ball*. However, this *seeing* is not *freemoving*. My model is not about *seeing* things with my eyes, but about moving with the materials directly with all my senses. Actually, seeing the crumpled paper as a ball could limit my chance to move in a new way, preventing me from bringing forth an experience I have never heard about nor felt before.

Reconfiguring

The third proposition of Shape Grammars is to use the rules to help me reconfigure what I see next. In this sense, the rules become useful mnemonic devices to learn, practice, and teach design as an exploratory process. Although the rules are comprised of seeing and doing, they have been given labels/words that suggest *doings*: the *part* rule, the *transformation* rule, and the *boundary* rule (Stiny 2011, 16). With the part rule, I can extract specific parts out of the original shape. These parts can be of any dimension and do not depend on the original parts of the shape (Stiny 2011, 17). With the transformation rule, I can modify the shape's position, orientation or proportions. These transformations can be Euclidean, such as a rotation, or linear, such as a deformation (Stiny 2011, 17). With the boundary rule, I can select the borders of the shape. These borders are points for lines, lines for planes, and planes for solids.

For me, the *doing* is the actual operation through which I mess things up and create the conditions to see things differently in the next iteration. The *doing* is like throwing paint with a sponge on the canvas, so that then I can see some patterns and keep going by throwing more paint as a response to what I see. In my model, rearranging is like this *doing*, where I mess things up and change the material conditions of my world. In this way, I can then move differently in the next iteration.



| Figure 4.3 |

Design as Rearranging and Freemoving

Transformational Design

Rules of Shape Grammars

See (x) → prt(x) I see a shape and extract part of it

See (x) → t(x) I see a shape and transform it

See (x) → b(x) I see a shape and select its boundary

Picking up materials

Changing bodily postures and sensing them, while searching for materials in my world, choosing, and extracting them

Modifying materials

Changing bodily postures and sensing them, while cutting, melting, or molding the materials (that I have picked up)

Putting materials together

Changing bodily postures and sensing them, while assembling, mixing, or gluing the materials (that I have modified)

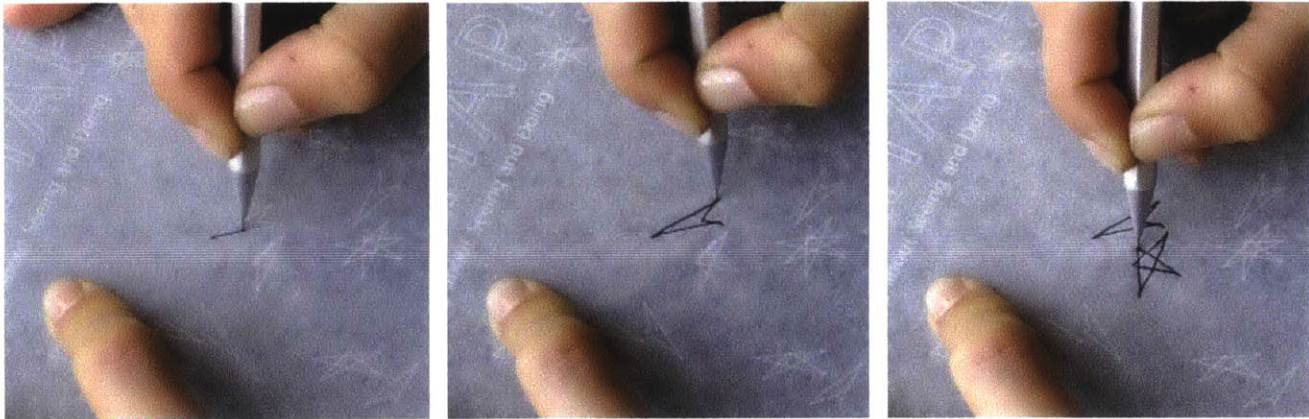
With my model, rearranging includes three sub-operations: *picking up*, *modifying*, and *putting materials together*. I search, find, and extract materials in my world—for example stones, wood, and metal. I modify them by cutting them, melting them, or molding them. I then put them together by assembling them, mixing them, or gluing them. I can combine these operations freely to rearrange materials in ways I have never touched, heard about, and seen before. In other words, rearranging helps me go beyond my habits or fixed ways of experiencing the materials in my world.

In most of the classes I have taken as a design student, I have been taught how to make things: how to make 2D or 3D models, how to use the machines to cut materials, how to assemble materials by hand by printing them, or by using robots. I now see how this *making* is actually equivalent to *rearranging* the materials, the technical or know-how dimension of design. However, by rearranging I am not actually making a *thing*. I do not create or make anything in my world; every material is already there. Even if I pick up molecules or fuse things together, I am only rearranging materials already there.

Rearranging materials is in design what writing words is in poetry; what mixing ingredients is in cuisine; what playing an instrument is in music. However, without *freemoving*, there is no design, in the same way that without reading there is no poetry, without tasting there is no cuisine, without listening there is no music. Rearranging is the know-how, the skill, or craft dimension of design, which only becomes meaningful in my design process when I move my body with the materials I am rearranging.

Embedding

The fourth proposition of Shape Grammars is to describe seeing as *embedding*: a seeing that is always fresh, open to seeing shapes in new ways. Seeing is embedding because you can always come back and see a new shape on top of the previous one you saw before (Fig. 4.4). Whatever you see in the moment is allowed to be seen, independently of what you saw in the previous moment: “What you see is what you get” (Stiny 2006, 31). Whatever the designer sees, therefore, is phenomenological and does not depend on



| Figure 4.4 |
Embedding Shapes

fixed and predefined descriptions. For example, a predefined description can specify a square as four lines between four points. However, by seeing I can embed an infinite number of lines, different lengths and shapes (such as L shapes) on top of the original shape. Embedding works as a tracing paper. I can place this tracing paper on top of the initial shape, a *square* for example, and trace anything I want on top of it, such as a *two L shapes*. I can then keep going and use a new layer of tracing paper and embed anything I want.

However, embedding is not arbitrary but is defined by the properties of shapes. Moreover, these properties are empirical, they depend on what I can do and see. For example, I can trace an infinite number of lines on top of a straight line, but I cannot trace a polygon, square or a triangle on top of it. For Shape Grammars, there are three main shape properties. First, I can see that all shapes contain the same basic elements, including points, lines, planes, and solids (Stiny 1999, 7). Second, I can combine these elements in equivalent or greater dimensions. For example, I can see a point as a boundary of a line, a line as a boundary of a plane, and a plane as a boundary of a solid. And third, when shapes go together I can divide them or fuse them freely. They lose their identity every time I do something to them and see them again (Stiny 2011, 16).

In terms of my model, what is critical is not *seeing new shapes* but rather *feeling new bodily postures as they change in relation to the materials*. Freemoving is not embedding, because I am not really tracing new movements on top of previous ones (as I do when embedding shapes). However, freemoving keeps the embedding character or intention: it is a moving that is always

fresh, open to moving in new ways. There is no *right* type of movement and you are free to move as you want. I say, what you experience is what you get.

While rearranging is an operation directed to change the materials in my world, moving is directed to change what I do and feel with those materials. Through freemoving with the materials, these materials *emerge* and *appear* as what they are, and this movement is felt through sensory and emotional sensations.

Similarly to *embedding*, which depends on shape properties, freemoving is defined by the operational coherences of our bodies as they engage with materials in our worlds—objects, spaces, and other beings. Designers mostly focus on rearranging materials to extend our basic moving capabilities. For example, designers have rearranged metallic, plastic, and glass materials in such a way as to allow them and other people to fly. However, any doing, any action of body and mind, also involves rearranging materials. Basic movements such as walking, sitting or lying down involve particular rearrangements called buildings, chairs, and beds. Other movements such as talking, writing, and drawing, involve particular rearrangements called telephones, notebooks, pencils, canvases, brushes, and paint.

Freemovements do not have to follow predefined postures that are known and have words to evoke them. That is, freemoving is not restricted to pre-existing verbs, such as sitting, jumping, or walking. Freemoving refers to the bare configuration of bodily postures as they change from moment to moment. When designers bring forth a new experience by feeling a movement they have never felt before, they have to come up with new words—new verbs for the movements along with new labels for the materials. For example, *biking* and *bicycle* were new words coined in France in the 1860s (originally in French), in order to talk about the movement of the body while seated (*biking* as verb for moving) on top of a wooden frame with two wheels arranged consecutively (*bicycle* as label for materials).

4.2. Ancillary Moves

As I am designing, I may stop *rearranging* and *freemoving* to take a couple of moments to do something else: think about what I am experiencing, express what I am doing and feeling, find a word to talk about the materials that I am putting together. After doing so, I may come back to rearranging and freemoving again, with a fresh direction, and maybe with new intentions and names for the materials. *Thinking*, *Expressing*, and *Naming* are the auxiliary design moves that feed the design process. Consequently, I call them the *Ancillary Moves*.

These Ancillary Moves are also doings, or actions of body and mind. Thinking is sensing through the mind's sense-organs and sense-objects (thoughts). This faculty of the mind involves all senses: touching (moving), smelling, hearing, tasting, and seeing (using our mind's senses). Expressing is describing what we feel and do using different materials. For example, drawing and writing can be described as movements performed to express experience using ink and paper. Naming refers to making up labels to recognize and talk about the new rearrangement of materials (names for objects, spaces) and new movements (verbs) brought forth through design. For example, bicycle and biking, hammer and hammering, google and googling.

Thinking

Sensing through the mind's sense-organs and sense-objects (thoughts)

Expressing

Describing what I feel and do by talking, writing, or drawing

Naming

Making up labels to recognize, think, and talk about new materials and new movements

Thinking

In my model, as I am designing I do not actually need to be thinking, because I am bringing forth new experiences spontaneously by rearranging materials and freemoving with them. Therefore, my mind should be busy enough being mindful of feeling these doings without leaving space for thinking. However, as I describe in my Mindful Vocabulary, the natural tendency of the mind is to wonder by reacting and commenting about what has just happened, or by analyzing and making up facts about the past and future. My strategy is to take advantage of this natural tendency and use it in a skillful way to nurture the hands-on and spontaneous process of rearranging and freemoving.

Transformational Design

Intention

Thinking about temporary, flexible, and ambiguous goals or desires

Reflection

Thinking about the experience I am bringing forth through design

Projection

Thinking about possible ways to rearrange materials and freemove with them

Questions for Intention

What feelings and doings are important to me?

What do I wish to feel and do?

Which feelings and doings do I want to change and which conserve?

Questions for Reflection

Do I like what I feel and do?

Is this new experience changing or conserving what I intended to change and conserve?

Questions for Projection

How can I rearrange these materials?

How can I move with them in a different way?

This skillful thinking is about being able to *change my mind freely*. As I am designing, I cannot get trapped by fixed ways of thinking, by known labels or stereotypes provided by perception, or by goals defined once at the beginning of my design. In my model, I describe three skillful ways of thinking that nurture my design: *Intention*, *Reflection*, and *Projection*. By thinking with Intention, I am nurturing my design process by feeding the loop through goals that are temporal, flexible, and ambiguous, that is, with goals that I can always redefine. By thinking with Projection, I am nurturing my design process by constructing thoughts (involving all senses) about possible ways to rearrange materials and freemove with them. And by rethinking through Reflection, I am nurturing my design process by asking myself questions about the experience I am bringing forth spontaneously through design. But again, I emphasize that thinking is always supplemental and attendant to the actual experience.

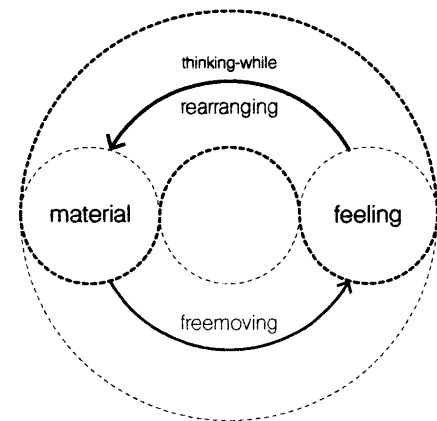
Intention, Reflection, and Projection are skillful ways of thinking that manifest themselves in terms of my Mindful Vocabulary. In the case of Intention and Reflection, thinking manifests itself as an internal conversation involving *questions* and *answers* about what I feel and do. These questions and answers arise as thoughts (sense-objects) in the form of *words* that I listen to using my mind's ears. Regarding Projection, thinking also manifests itself as questions but the answers arise as thoughts involving all my mind's senses. My mind can answer by *listening* to words (using my mind's ears), but also by *seeing* images of the materials and the bodily movements (using my mind's eyes), as well as by *touching* the body as it moves with the materials (using my mind's body).

In my model, in order to think, I need to stop rearranging and freemoving. I can take a moment and postpone whatever I am doing in order to redefine my initial intentions, reflect on the experience I have brought forth, or project different ways I can rearrange materials and freemove with them. This is necessary, because *I can only be mindful of one doing at a time*. For example, I cannot become aware of how the rearranging feels while I am thinking, because I am going to be busy feeling my intentions, reflections, and projections as they arise and fade away in my mind.

However, I can also think *while* I am rearranging materials. That is, I can rearrange without being aware that I am rearranging, in a kind of *autopilot* mode (Langer 1990, 13). For example, I can be mindful of different doings while driving. I can listen to music, talk to my friend, think about the meeting I have to prepare for tomorrow, and feel all these doings without actually feeling the driving. Then, I arrive home and wonder how I actually got there. Similarly, I can feel myself thinking without actually feeling myself rearranging the materials. *However, as I am rearranging, I can come back from this autopilot mode and directing my awareness towards feeling myself rearranging. That is, while rearranging I can move back and forth between feeling myself thinking and feeling myself rearranging.* When I am thinking while rearranging, my design process becomes a loop between *thinking-while-rearranging*⁵ and *freemoving* (Fig. 4.5). While rearranging materials I can project how I am going to rearrange the materials next, how they are going to look, or how I am going to freemove with them.

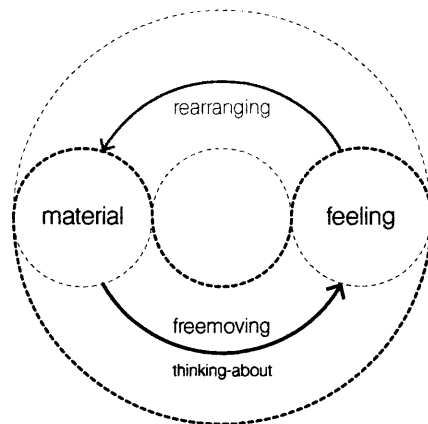
I can think while rearranging the materials, but I cannot think while freemoving with the materials. My model describes a mindful practice and, thus, I need to be fully aware of feeling my movements in order for the movements to *appear*. In other words, if I do not feel the movements, they are not there. And if I am busy thinking about my intentions, reflections, or projections, I am not going to feel the movements.

Nonetheless, I can still project my freemoving without actually changing my bodily postures: I can listen to descriptions of the movements (with my mind's ears), observe the movement (with my mind's eyes), or sense the movements (with my mind's body). While in the first two ways of thinking I am contemplating from a third-person perspective (seeing myself from the outside as I move, for example), in the last one I am thinking from a



| Figure 4.5 |
Thinking-while-rearranging

⁵ Reflecting-while-rearranging is similar to *reflection-in action*, a concept introduced by Donald Schön, a design theorist, in his book *Educating the Reflective Practitioner* (Schön 1990). He describes reflection-in-action as thinking in the “midst of action without interrupting it,” a reflection that “serves to reshape what we are doing while we are doing it” (Schön 1990, 26). Although similar to reflection-in-action, when I am thinking-while-rearranging I can only be mindful of one thing at a time: I feel myself thinking or I feel myself reflecting. I can still rearrange in autopilot mode and *reflect in the midst of action without interrupting it*, but when doing so I am not actually feeling myself rearranging the materials in the moment.



| Figure 4.6 |
Thinking-about-freemoving

first-person perspective (sensing my body as I move). Therefore, the last approach is more challenging but more effective if I really want to feel my movements. When I am thinking about freemoving instead of the actual moving, my design process becomes a loop between *rearranging* and *thinking-about-freemoving* (Fig. 4.6).

Even though I show how to integrate thinking in design, I claim that thinking is limited and that *freemoving* directly is the design move that brings about the *new*. Thinking is limited by my previous experiences and, thus, I can only think about what I already know⁶. For example, have you ever tried sea urchin? Sea urchin is one of my favorite foods, and with all the capacity of your mind and with all the detailed descriptions I could give to you, if you have not tried sea urchin you are not going to be able to feel the taste of sea urchin using your mind’s tongue. In order to know something new you have to experience it directly. In design, by rearranging the materials in new ways I can actually feel a movement I have never experienced before. Thinking can be useful for projecting possible movements according to what I already know; however, feeling the actual movement will make the difference, and will surprise me with something truly new, an experience I have never felt before.

Expressing

Traditionally, designers have used different means to describe, think, and talk about the materials they are designing⁷. However, in the context of my model, where the subject of design is an *experience*, the expression is not about the materials but about what I feel and do with them.

In my model, **Expressing** is writing and talking about or drawing my

⁶ In *What Is It Like to Be a Bat?* Thomas Nagel states: “Our own experience provides the basic material for our imagination, whose range is therefore limited”(Nagel 1974, 439)

⁷ *Representation* is the word traditionally used by designers to describe the process of making an *image* of the *object* been designed. For example, Donald Schön, a design theorist, describes representation as images of physical objects to be “brought to reality” conceived in visual, spatial, or plastic terms (Schön 1990, 41). Even though I do not argue against the use of the word *representation* in design, I use the word *expression* instead to emphasize the externalization of an experience that is felt over the depiction of an *image* of the materials or physical objects.

experiential moments as they arise and fade away⁸. I express these experiential moments using other materials (not the ones I am rearranging), including sounds, gestures and facial expressions (when I am talking), and ink, paper, or pixels (when I am writing or drawing). However, through expressing I am not actually capturing and externalizing my actual experience, but rather constructing a story, a coherent narrative about what I feel and do.

After freemoving, I may want to take a few moments to express that experience as a sequence of coherent experiential moments. For each moment, I express what I have done (doings), what I have felt (feelings), and what I have recognized in my world (materials). For the doings, I express the moving, sensing, and thinking as bodily postures changing from moment to moment. For the feelings, I express the sensory and emotional sensations in terms of their feeling tone (pleasant, unpleasant, or neutral) and bodily distribution. For the materials, I express the context: the spaces, objects and other people through which these doings and feelings take place.

Expressing nurtures my design process in two ways. First, Expressing fosters mindfulness: knowing that I am going to express in terms of my vocabulary, directs my awareness towards feeling what I am doing in the moment. Consequently, as I am freemoving I can *see things clearly*, and then respond in the next iteration, by rearranging the materials according to what I *see*. Second, Expressing nurtures my design process by complementing the design move of Thinking. As I am designing, I can express my (constructed) experience and then use these expressions as a means to redefine my design intentions, project possible experiences, or reflect on the experience that I am bringing forth.

Although Expressing and Thinking modulate one another, they are not the same. I express in response to what I am thinking, and I think in response to what I am expressing. However, while expressing takes place *externally* through sense-objects that I sense with my body, thinking takes place *internally* through sense-objects (thoughts) that I sense with my mind. For

Questions for Expression

Expressing the Doings: What I am doing (moving, sensing, and thinking) with my mind and body?

Expressing the Feelings: How do these doings feel and where in my body do I feel them?

⁸ Completing the Expressing Exercise in the First Foundation, motivates me to write now about Expressing as a design move or operation. My intention here is to describe Expressing in more detail and show how this design move nurtures the design process.

example, when I am drawing shapes I am observing them in the page using my *body's* eyes, and when I am thinking about shapes I am observing them using my *mind's* eyes. Because expressing takes place *externally*, I can express my (constructed) experience to others, while through thinking I cannot.

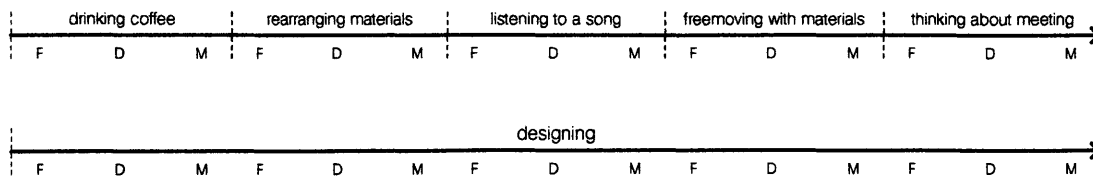
Naming

Most designers claim that they design *material things*: bicycles, houses, or a smartphones⁹. In my model, however, these *things* are only learned labels thorough which I recognize the materials in my world according to what I do with them. As I am rearranging material and bringing forth a new experience with them, I would not recognize the materials and, consequently, would have to make up a new label for them.

In my model, *Naming* refers to making up labels so that I can recognize, think, and talk about the rearrangement of materials with which I do something new—something I have never heard about or felt before. In some cases, Naming is also about making up new verbs in reference to these materials; for example, biking for bicycle, hammering for hammer, googling for google. Moreover, I can name the materials and the verbs freely, without necessarily using labels or combination of labels that I already know.

In a way, Naming crystalizes my design process, at least momentarily. As I am coming up with a new label, the materials begin *emerging* in front of me as what they *are*, and *seem* to have been made or designed by me. However, it is important not to name too early; in other words, it is best to suspend the use of labels as I am designing. And this suspension is important because

⁹ Most design theorists describe the design process as the making of physical objects, either directly or through a plan that informs that making. For example, for Donald Schön, a design theorist, designing is making physical objects. He says: “Architects, landscape architects, interior or industrial or engineering designers, make physical objects that occupy space and a plastic and visual form” (Schön 1990, 41). And for John Habraken, a design theorist, design is a planning that informs the making of physical objects. He says: “in this culture of people and things, the designer has appeared as someone who produces a plan for what is to be made. Designing is one of several activities in which we engage to supply ourselves with the artifacts we want around us” (Habraken 2014, 9). My proposition does not contradict these views directly, but rather the operation of *naming* the materials demonstrate how these physical objects seem to have been made experientially, when we recognize them after feeling what we do with them.



it nurtures my design process in two ways. First, this suspension fosters *mindfulness*: instead of talking or thinking about designing a *thing* (a bicycle, a house, or a smartphone), I can direct my attention towards what I am actually doing and feeling with the materials. I can say to myself, “Why bother using a label now, when I am going to make up a new label later anyway?” Secondly, this suspension fosters *freemoving*: instead of responding to labels that evoke experiences that I already know about (biking, sleeping, texting), I can create space for moving in ways that are not prescribed by what I have experienced before.

Although through naming the materials they begin emerging as what they *are*, I need to be aware that this appearance is *impermanent*. I can still move with the materials in a different way, and then name the materials once more. The problem lies in using known labels in the first place and then being limited by them. For example, if I begin designing a *bicycle* and I stick with that label for my materials, how could I ever design anything different from a *bicycle*?

4.3. Stream of Design

My description of design, so far, has referred to two particular moments where I feel what I am doing with materials: I feel myself *rearranging* materials and *freemoving* with them. However, as I am designing in this way, I could also be thinking about design intentions, drinking coffee, projecting possible rearrangements, expressing what I feel and do, listening to a song, reflecting on the new experience, thinking about a meeting, or naming the materials (Fig. 4.7). What I feel when I am designing corresponds to a sequence of experiential moments, each one arising, staying for a while, and

| Figure 4.7 |
Stream of Design

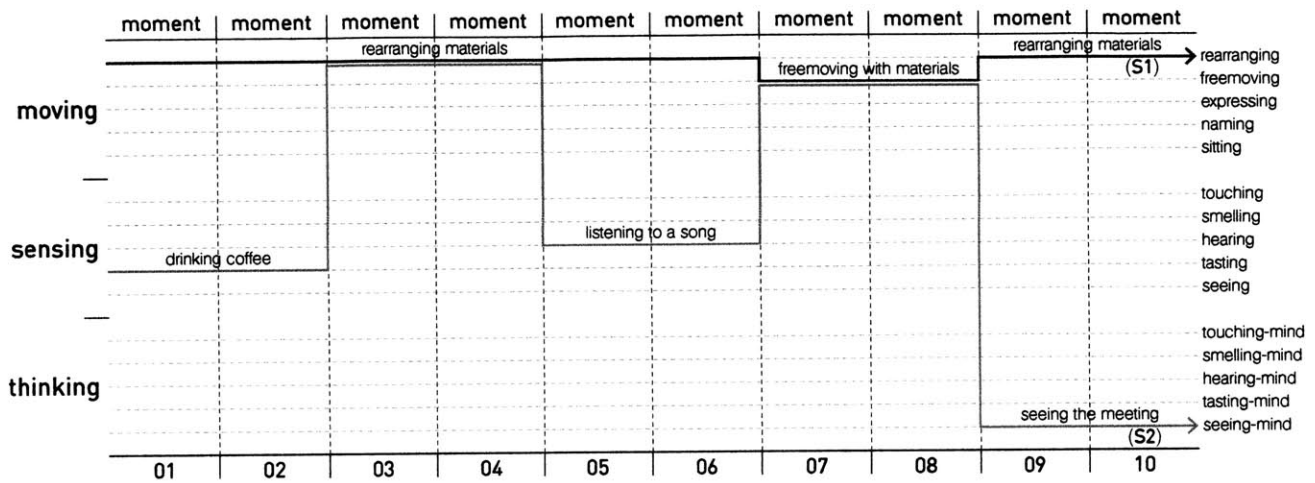
fading away, one after another. I call this sequence of experiential moments the Stream of Design.

This stream does not replace my diagram, but rather complements it by unfolding the loop and allowing us to become aware, talk about, and reflect on the details and nuances of the design experience as it unfolds from moment to moment: I can compare different *rearrangings* and *freemovings*, describe how *thinking*, *expressing*, and *naming* are actually nurturing design, and include other experiential moments taking place while I design, such as drinking coffee, listening to a song, or thinking about a meeting. Even though I use this stream to express, talk about, and compare design experiences, the stream does not replace the actual experience of design. The stream is only an abstraction that allows me to explain how the experience of design changes from moment to moment.

In Figure 4.8 you can see a graph with a Stream of Design (S1) as it unfolds through the three subcategories of doing: moving, sensing, and thinking. For each of these subcategories, I include five possible doings that can take place. In the case of design, these possible doings are the design moves: rearranging, freemoving, expressing, and naming. But I could include other things I do while I am designing, such as sitting on a chair.

The graph illustrates the possible streams but the actual Stream of Design follows a unique path. However, I could still construct a different narrative according to what I distinguish retrospectively. For example, throughout the actual flow of experience, I may have felt myself drinking coffee without actually paying attention to my body as I rearranged materials (S2). Still, I may distinguish that I have rearranged the materials because I see them *now* in a different configuration, and I know that in order for these materials to be in this new configuration, I must have rearranged them. In that case, I may ignore the fact that, in the moment, I was feeling myself drinking coffee and only consider the fact that I was rearranging (S1).

The diagram (as a loop) and the graph (as a stream) are just different abstractions of the same process. I can describe my diagram as a stream, because *rearranging* and *freemoving* are two experiential moments arising and then fading away in response to one another. I can describe my graph as a



| Figure 4.8 |

Stream of Design traversing the Doings

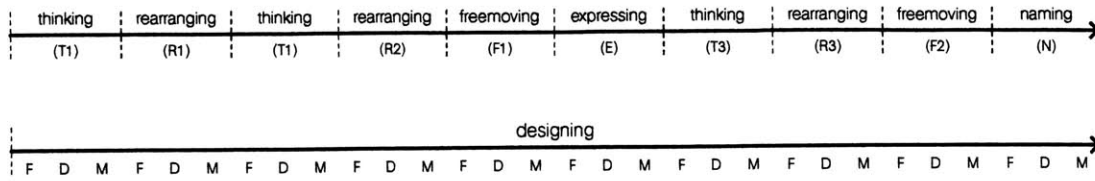
loop because *rearranging* and *freemoving* are the most recurring experiential moments and because they drive the design experience. In a Stream of Experience, some experiential moments may condition one another: listening to the wind on the trees may trigger thinking about my ex-lover. In design, after freemoving I may not like what I have felt and respond by rearranging materials in a different way. In my model, design is like cooking, where *rearranging* is mixing ingredients, and *freemoving* is tasting them: I mix some water, tomatoes, onions, olive oil, salt, and pepper, and then I move my harm, open my mouth, and taste the *soup*. If I like what I taste, I may want to keep tasting for a while, otherwise I may include some rosemary, more water or milk, and taste things out again.

In Figure 4.9 you can see a Stream of Design with ten experiential moments. By describing my design process as a stream, I can pay attention to the different design moves, count and compare them, as well as observe how they respond to one another. For example, I could use this stream to count how many moments I was rearranging materials (R1, R2, and R3) and how many moments I was freemoving with them (F1 and F2). I could also use this stream to realize that I expressed (E) and named the materials (N) after freemoving with them (F1 and F2 respectively). And I could use this stream to differentiate between the three thinking moments: thinking about initial design intentions (T1), projecting possible rearrangements (T2), and reflecting about the new experience (T3).

The different ways to think about, talk and reflect about my experience allow me to explore the incommensurable details and nuances of what I do when I am designing. I can observe my doings through different lenses or scales. There are no *right* units to divide my experience, and everything depends on what I am attending to. Therefore, an experiential moment can become a stream if I shift my awareness and illuminate other experiential moments within that experiential moment. This is how *rearranging* becomes the Stream of Rearranging and *freemoving* the Stream of Freemoving, both streams within the Stream of Design.

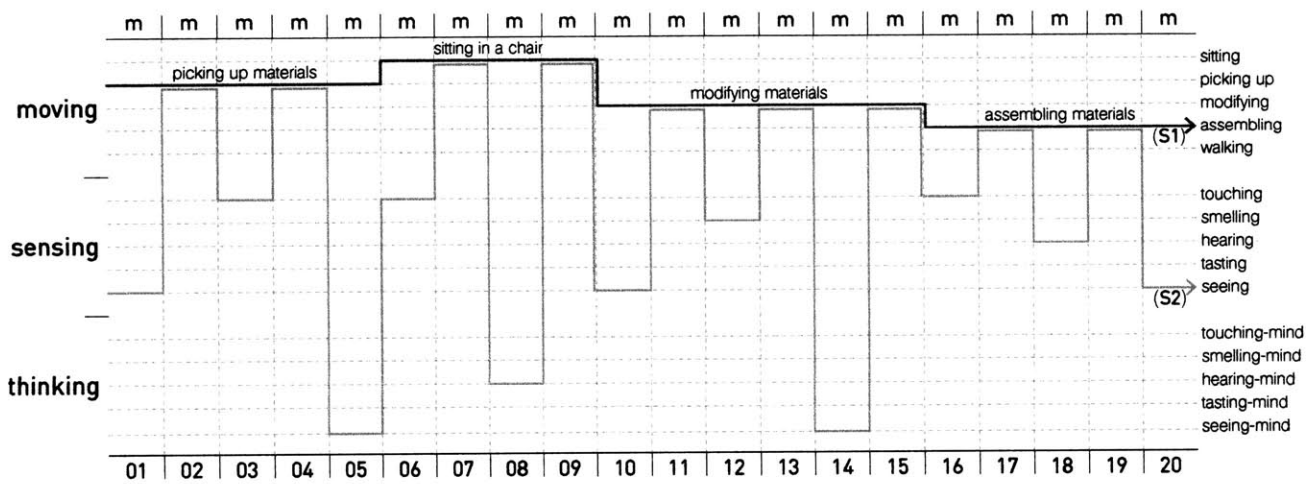
In Figure 4.10 you can see the Stream of Rearranging, which includes the three experiential moments: picking up materials, modifying them, and assembling them. As a designer, I can just take one moment to pick up materials and then right away freemove with them. Or, I could pick up materials, and take some additional moments to modify them, assemble them in different ways, and then freemove with them (S1). However, while *moving* I can also be sensing and thinking: when I rearrange materials I am also touching them, seeing them, and thinking about them (S2). I can feel my body while moving as I pick up materials, but I can then shift my awareness and take a moment to feel myself touching the actual materials as well.

In Figure 4.11 you can see the Stream of Freemoving, which is open to include any verbs, or names for an operation involving a sequence of bodily postures: standing, sitting, laying down, crawling, walking, running, jumping, holding, throwing. After rearranging the materials I can freemove with the same materials in unlimited ways. I can stand, sit on the materials for a couple of moments, and then stand again (S1). By doing so the rearranged materials may appear as a *chair*. Or I could walk towards the materials, hold them for a while, throw them away, and then run towards them and hold them again (S2). By doing so the same rearranged materials may appear now as a *ball*. In this Stream of Design, I am expressing the movements using words. However, the sequence of experiential moments can be expressed using a series of bodily postures as well. Walking can be described as changing our body's overall position by touching the floor and stepping forward, one foot after another, moment after moment.



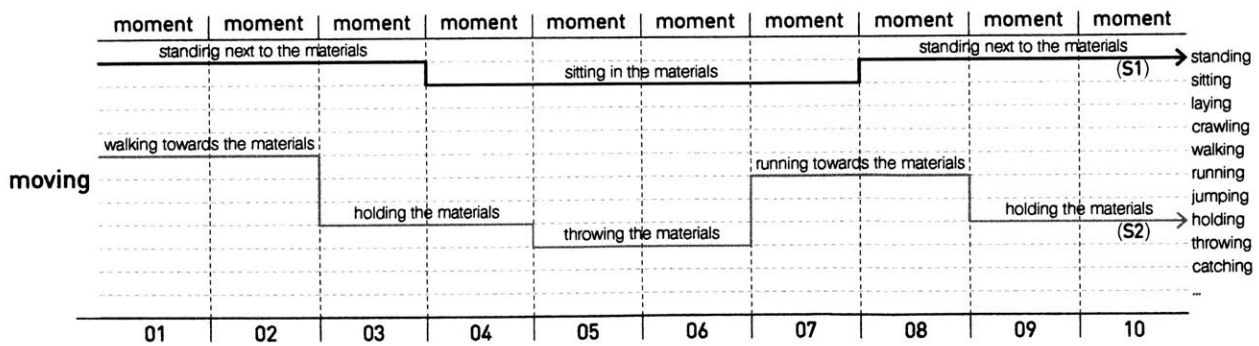
| Figure 4.9 |

Stream of Design with ten experiential moments



| Figure 4.10 |

Stream of Rearranging



| Figure 4.11 |

Stream of Freemoving

5. Rearranging Exercise

In this chapter, I introduce an exercise in which participants put together interactive and recycled materials, explore these materials directly by moving with them freely, and then demonstrate these rearranged materials to one another in silence, without giving each other any instructions or labels for the rearranged materials. I call this the Rearranging Exercise. This exercise is part of the Second Foundation of Transformational Design, wherein I put my first model into actual practice and establish the grounds for the exercise in the Third Foundation.

This exercise is partially inspired by the Silent Game, a collective activity where some participants design by moving pieces on a board, while other participants observe in silence. (Habraken and Gross 1987, 2-1). However, while in the Silent Game participants observe one another throughout their design process, in my exercise participants do not observe one another but instead demonstrate their designs in silence at the end of the activity.

You will learn about this exercise through reading words but also through observing images of people doing things: cutting cardboard, connecting cables, and moving with materials assembled by others. First you encounter the setup of the exercise including its phases and rules so that you can practice the exercise directly or conduct the exercise with people. The phases of the exercise are *Learning*, *Designing*, and *Demonstrating*. Next, you will encounter the evidence that resulted from two exercises: one where participants rearranged the Screen-based Toolkit and one where they rearranged the Spaghetti Toolkit, both of which I developed as interactive materials (sensors and effectors) for participants to design with. Finally, you encounter the findings of the exercise: when participants rearrange materials with which they experience something new, these materials are not recognized

by people who did not rearrange these materials and did not see how these materials were rearranged.

The evidence consists of my own observations, after documenting the exercises by writing notes, taking photographs, and recording audio and video. The findings consist of my own reflection on the evidence in the light of having directly observed people participating in the exercise.

As I was developing Transformational Design, I was using this exercise to explore some of the propositions of my model. In particular, I wanted to see how certain design moves are appropriated by people, and whether they are useful for them as a means of mindfully bringing forth new experiences in design.

5.1. How to Rearrange

In this section, I describe the general setup for the exercise, which I organized in three phases: Learning, Designing, and Demonstrating. In the first phase, participants are introduced to my Experiential Model, are informed about the specific format of the exercise, and learn the basics of analog and digital electronics. In the second phase, participants engage in a hands-on design activity where they rearrange materials and freemove with them. In the third phase, participants demonstrate their rearranged materials to one another.

In the Learning Phase, participants are introduced to the Experiential Model, which includes explaining the Mindful Vocabulary. The model and vocabulary can be explained by drawing the diagram with the Primary Moves (Rearranging and Freemoving) on a whiteboard, and then describing them in terms of the Primary Categories: I feel myself rearranging materials and I feel myself freemoving with them. In this exercise, participants are not introduced to the Ancillary Moves (Thinking, Expressing, and Naming).

This exercise does not require participants to have practice in design and, consequently, in this phase it is also necessary to clarify that the model is just a model and that design is learned by practice. I recommend describing

Phases of the Exercise

1. Learning

Understanding the Experiential Model, details of the exercise, and basics of electronics

2. Designing

Putting materials together and freemoving with them

3. Demonstrating

Showing the rearranged materials to one another

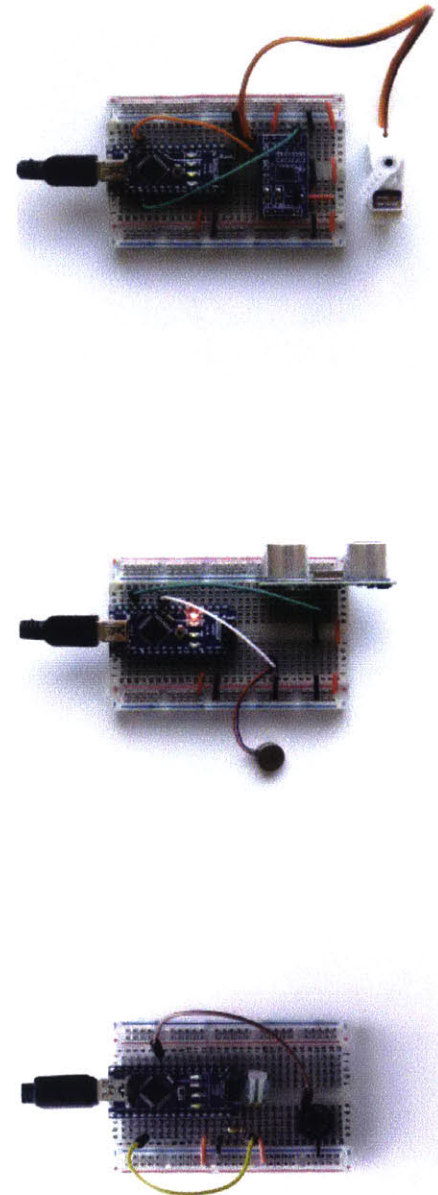
design as an exploratory activity by giving the example of cooking without a recipe, where the chef is mixing ingredients freely while tasting them, without knowing what the result will be.

After being introduced to my model, participants are informed about the format of the exercise: the type of interactive materials (sensors and effectors) they are going to rearrange and how they are going to demonstrate their materials. For the exercise, I develop two sets of interactive materials, which I call the Screen-based Toolkit and the Spaghetti Toolkit. Both toolkits include one microcontroller, three type of sensors (acceleration, pressure, distance) and three types of effectors (buzzer, vibration-motor, servomotor).

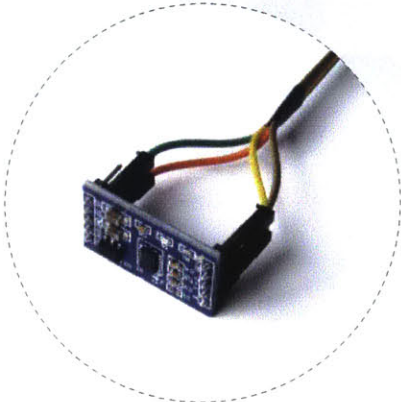
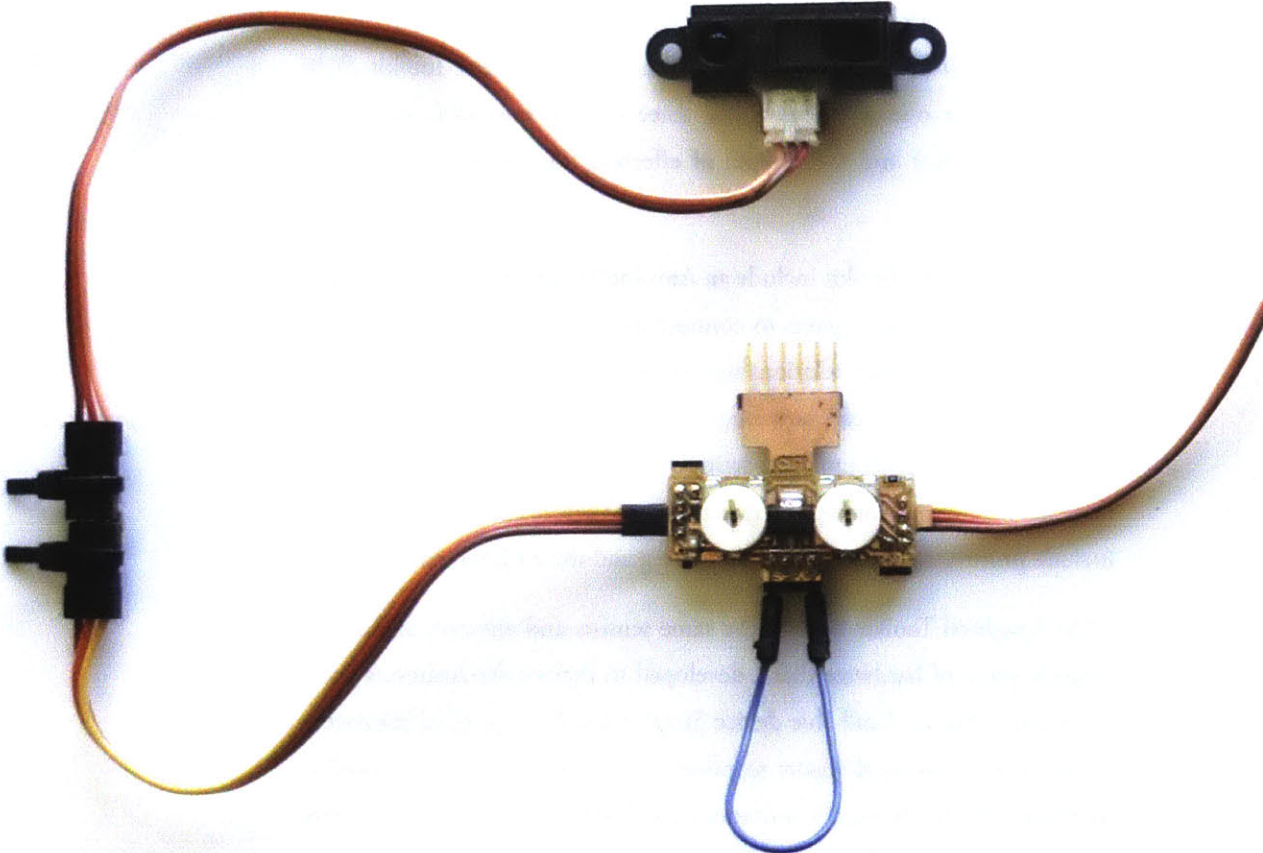
The Screen-based Toolkit include an Arduino Nano on a breadboard (Fig. 5.1) which allows participants to connect sensors and effectors (hardware) and then program their relationships using the Personal Computer (software). These materials can only be programed visually by interfacing with the screen of the computer and writing text (code) in English. I develop three lab sessions in which participants practice before designing. These labs include printouts with images of the wiring and the Arduino code.

The Spaghetti Toolkit include the same sensors and effectors and a fully tangible piece of hardware that I developed to replace the Arduino's hardware and software. I call this device Spaghetti: a fully tangible microcontroller that allows participants to program by touch without the need to interface with the Personal Computer via software. In Spaghetti, the microcontroller is integrated into a cable including two knobs that can be rotated manually to define the ranges and map out the relationships between sensors and effectors.

The manipulation of interactive materials (sensors and effectors) is direct and intuitive, allowing constant and immediate experiential feedback. I develop three lab sessions in which participants practice before designing. These labs include the actual materials and participants learn directly by touching the sensors and effectors and by rotating the knobs of the Spaghetti (Fig. 5.2).



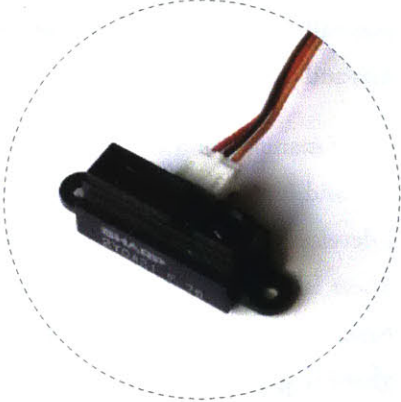
| Figure 5.1 |
Screen-based Toolkit



Sensor 1: Acceleration



Sensor 2: Pressure



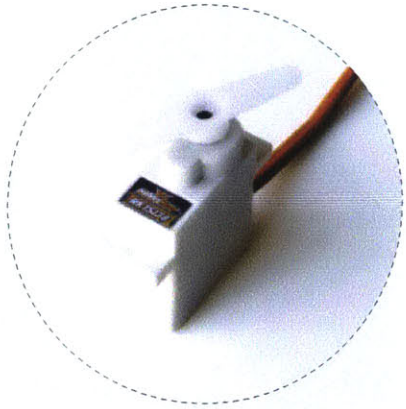
Sensor 3: Distance



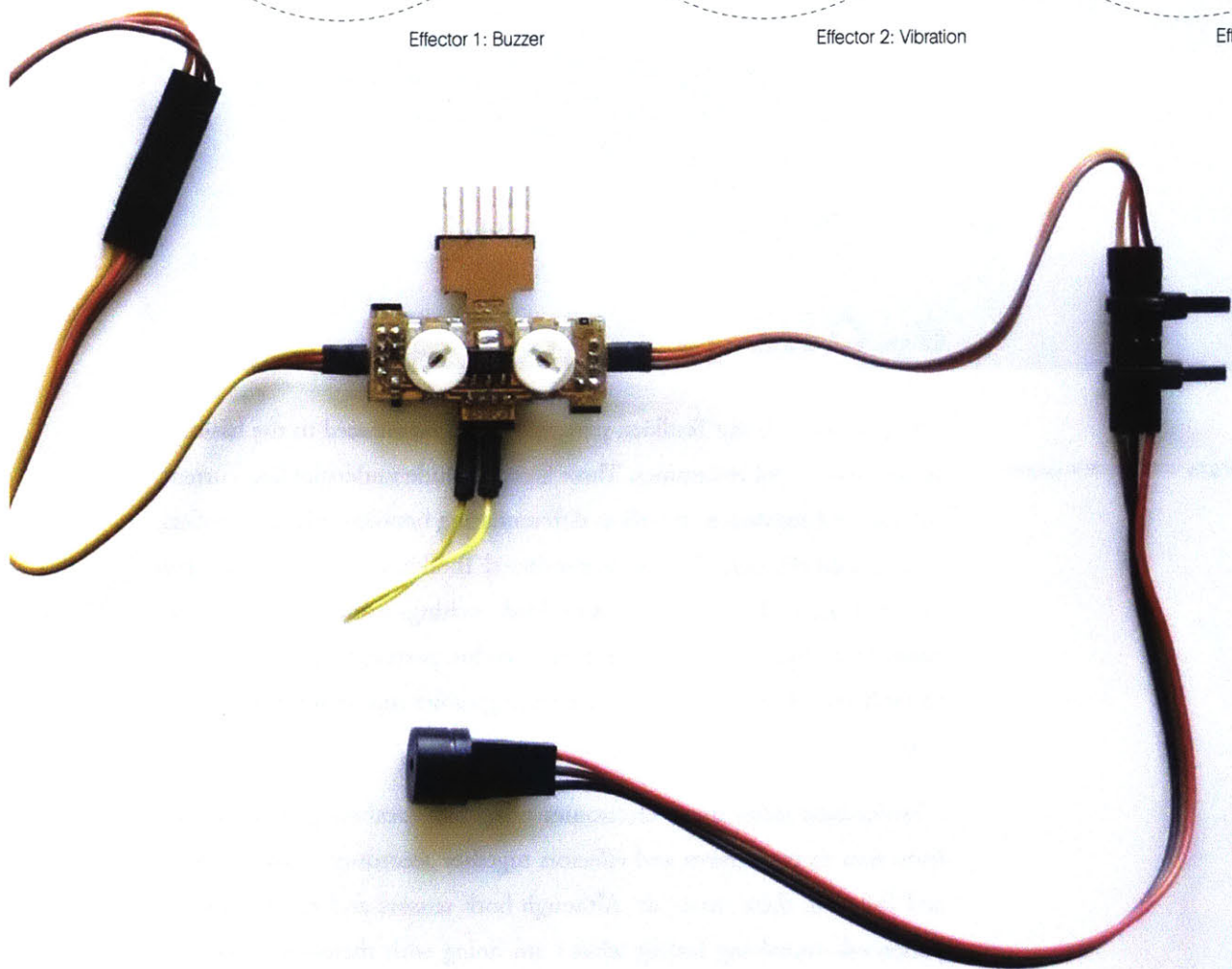
Effector 1: Buzzer



Effector 2: Vibration

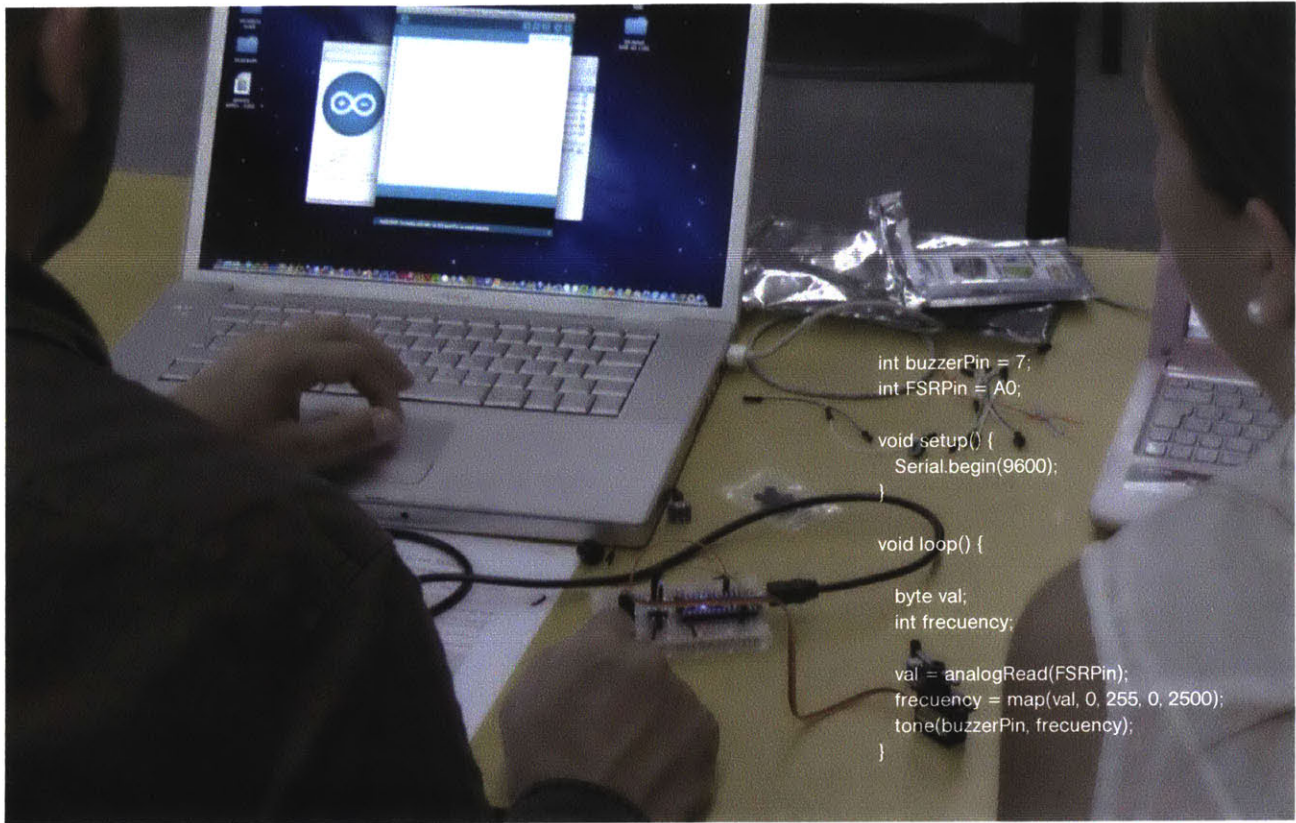


Effector 3: Servomotor



| Figure 5.2 |

Spaghetti Toolkit (Scale 1:1)

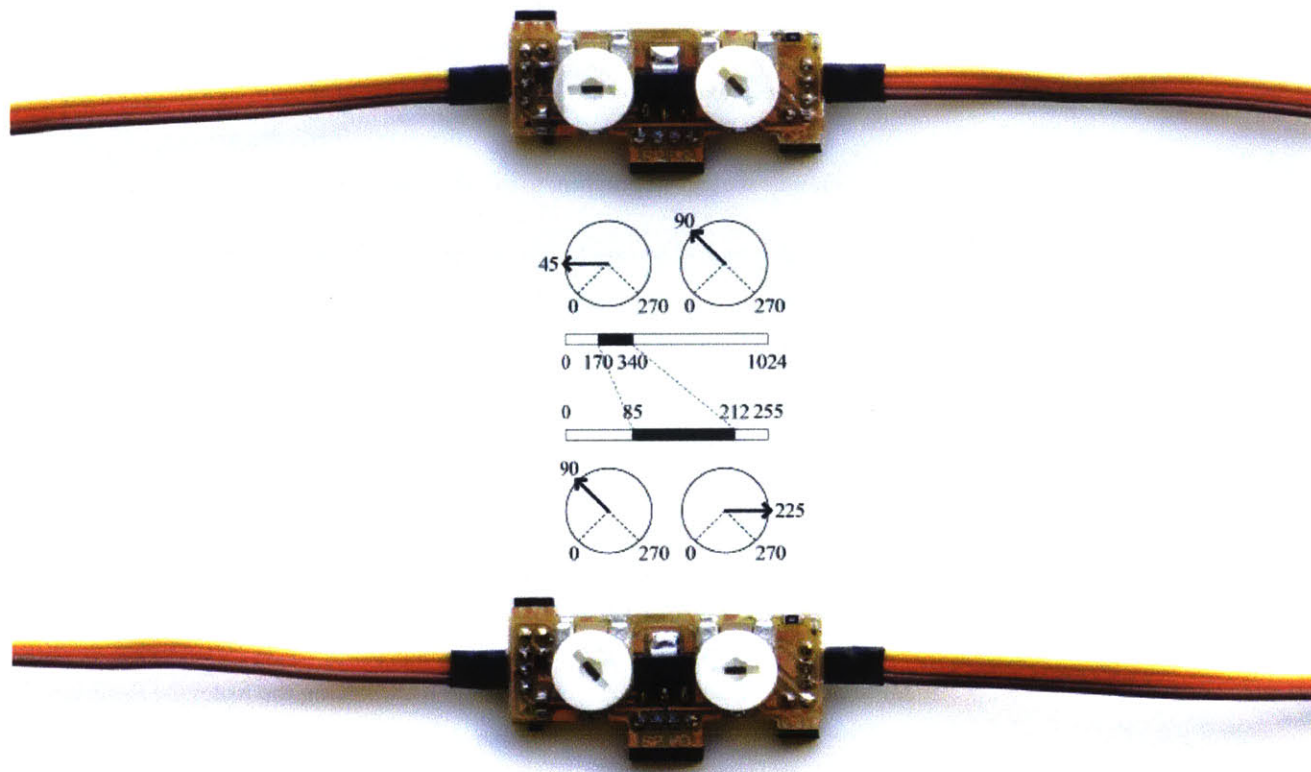


| Figure 5.3 |

Learning programming by writing code in English

By playing with my Toolkits, participants are introduced to the basics of analog and digital electronics. These basics include understanding current, voltage, and resistance, as well as differentiating between microcontrollers, sensors, and effectors. For the Screen-based Toolkit, participants are introduced to the basics of programming (code writing) using the Arduino environment (Fig. 5.3). For the Spaghetti Toolkit, participants are introduced to the basics of programming by connecting cables and rotating knobs (Fig. 5.4)

Participants learn about electronics using my vocabulary. That is, they learn how to put sensors and effectors together according to what they do and feel with these materials. Although both sensors and effectors are experienced—involving feeling what I am doing with them—sensors focus more on what I do and effectors on what I feel. With sensors, I *do* things: I move my head, arms or torso with them (accelerometer); I press them with my hands or feet (pressure sensor); I move away or close to them (distance sensor).



With effectors, I *feel* things: I feel the sound with my ears (buzzer); I feel the vibration on my skin (vibrator-motor); I feel the rotation with my eyes and hands (servomotor).

In the Designing Phase, participants engage in a hands-on design activity where they put together recycled materials along with the interactive materials. These recycled materials include any supplies that participants can find in their worlds, including cardboards, bottles, paper, cans, aluminum foil, and pieces of fabric. They rearrange these materials by cutting them with scissors or knives, and by assembling them with masking tape, hot glue guns, or screws.

Regarding the recycled materials, I clarify that the exercise can also be practiced with new materials, such as cardboard, Plexiglas, wood, fabric, or metal sheets. However, I recommend using recycled materials for a reason. I have seen how designers produce a great deal of waste as a result of their design activities and, consequently, I propose designing by reusing waste that has already been produced.

| Figure 5.4 |
Learning programming by rotating knobs

Regarding the interactive materials, I clarify that participants have to rearrange these type of materials because the exercise explores how designers put together interactive technologies. These type of technologies are built out of interactive materials, including microcontrollers, sensors, and effectors: materials we feel responding to us when we do something with them.

In this phase, participants can work individually or in teams. My model describes the design process of one person and, thus, the advantage of working individually is that it is easier for the person running the exercise to observe closely the model in action. On the other hand, the advantage of working in teams is that the person running the exercise can observe and listen to how participants engage and talk to one another, which can be used as complementary evidence. Still, when players work in teams, they are engaging in their own personal streams, feeling themselves expressing or rearranging.

Participants rearrange these materials by following the Rules for Rearranging, which promote a mindful, hands-on, and exploratory design activity. Participants are encouraged to rearrange the materials freely by exploring what they can do and feel with them. For example, after learning that they hear a sound when pressing a material, they can include some pieces of cardboard, and then try things out directly. They can rearrange these materials in different ways and press them with different parts of their bodies (fingers, feet, and head) trying out different movements and sensations.

These rules are the actual instructions that participants have to follow in order to practice my Experiential Model. In other words, the exercise is a reenactment of my model. The exercise explores how participants put together new *things*, that is, something that participants have never heard about or experienced before. Therefore, the rules specify to begin without using a known label, without trying to make a *thing* they already know. Also, the underlying assumption behind my model is that design does not need a representation of the *thing* been designed, and that instead designers can design by direct engagement with the materials and their bodies. For this reason, the rules do not allow using visual representations of the thing *to be designed*. That is, participants cannot use digital design tools, such as

Rules for Rearranging

1. Begin rearranging without using a known label for the materials you are going to rearrange
2. Rearrange materials freely according to what you can do and feel with them
3. Use the materials you have at hand: recycled and reprogrammable materials
3. Try things out by freemoving with the materials you have rearranged and pay attention to what you do and feel (be mindful)
5. Note that visual representations of the designs (drawings or digital models) are not allowed
6. Note that you should not draw labels or signs on your materials (words, arrows, symbols) to indicate what to do and feel with them

2D and 3D modelling¹. Instead of understanding the design in terms of known labels and representations, my assumption is that participants can become mindful, talk about their experiences, and reflect in terms of my Mindful Vocabulary.

In the Demonstrating Phase, participants show their products to one another. By products, I mean the rearranged materials that the designers decide to deliver, either because they run out of time, or because they are satisfied with what they have put together.

Participants demonstrate in silence, without giving each other explanations or labels for the materials. This phase is silent, so that people who did not rearrange these materials could encounter them without knowing what they are (their labels) or the intentions of the participants who rearranged them.

This silent demonstration can take place in two ways. First, participants can demonstrate by presenting their products as isolated objects or spaces. They place their materials in a space and wait for other people to come, encounter the materials, and experience them directly. Alternatively, participants can demonstrate by sensing and moving with them around the space while other people observe.

5.2. Rearranging the Toolkits

In this section, I present the evidence that resulted from two exercises: one where participants rearrange the Screen-based Toolkit and one where they rearrange the Spaghetti Toolkit. In the first example, participants rearrange these materials and then demonstrate them as isolated objects or spaces. In the second example, participants rearrange these materials and then demonstrate by moving with them.

¹ By digital design tools, I mean Computer-Aided Design (CAD) software, which requires the Personal Computer interface including the screen, the keyboard, and the mouse. Example of these type of software are AutoCAD, Rhino, Solidworks, 3DS Max. For a detailed description of the history of CAD, theory, and practice see (Kalay and Mitchell 2004).

The evidence consists of what *I observe* participants doing from my own perspective, from a third-person position. I document the process by taking notes, photographs, and recording audio and video. For each example, I also include the context by describing the background and age of participants, the location where the game is taking place, and the type of hosting institution.

As I was developing Transformational Design, I was invited to conduct a three-day workshop with professionals in a University, and a one-day workshop with visually-impaired people in a School for the Blind². The time frame and type of participants specified by the invitations seemed appropriate for trying out the model and the materials that I was putting together. I thus decided to use these workshops to explore the second exercise of my practice.

Screen-based Toolkit

In the first exercise, professionals rearrange the Screen-based Toolkit, and then demonstrate them as isolated objects or spaces. These professionals are adults in their mid-twenties and thirties, studying a Masters of Innovation at the Catholic University of Chile³. For the exercise, I ask them to work in teams of two or three, and to design freely by rearranging interactive and recycled materials. In this exercise, participants use the personal computer to program their interactive materials.

The Designing Phase takes place in a studio, a room with chairs and tables, and is completed in four hours, which includes rearranging and

² I was particularly interested in working with visually-impaired people. This interest, however, was not about developing assistive devices for their *disability*, but rather learning from their natural mindfulness of other senses rather than the visual. I consider them as sensory-developed, with a natural intentional and directed awareness towards feeling the sense of touch (their bodies and movements), smell, hear, and taste.

³ This exercise was conducted with 18 participants as a workshop I taught in 2013 at the Master of Innovation of the Catholic University of Chile, in Santiago. This Master is an interdisciplinary graduate program held by the School of Administration or Business School. I was invited to teach design and electronics by Cristobal Garcia, a Chilean sociologist, professor at the Master of Innovation, and holding a Master of Science in Comparative Media Studies from MIT.

programming the materials. The Demonstrating Phase takes place in an open space (by moving the chairs and tables), and is completed in approximately half an hour, which includes placing the materials in silence and inviting other people to observe them. I tell participants that this phase is like encountering a found object/space, a rearrangement of materials that has just arrived from another world, or from outer space.

In this section, I present evidence for two teams in detail. While in the first team, Manuel, Andre, and Francisco are undergraduate students in Architecture; in the second team, Miguel and Beatriz are graduate students in Product Design. I observed both teams throughout their design processes, took photographs, and recorded video and audio. I first present the photographs and descriptions of what I observed. Then, I include a short description of the design process of two more teams to demonstrate that the evidence is consistent among participants.

In the Designing Phase, the first team is moving with the materials while talking about what to do and feel with them. Manuel, Andre, and Francisco are trying to follow the first Rule for Designing, which asks participants to begin designing without using a known label for the materials. Manuel is rearranging the servomotor with the accelerometer sensor. He moves his arms and shows Andre and Francisco how the servomotor is imitating his movements (Fig. 5.5). Manuel moves his arm back and forth while holding the accelerometer, and observes how the servomotor is moving in the same way.

They still do not know *what* they are designing, but after realizing that the accelerometer can measure rotation in two axis, their *design* begins to appear. Andre connects an additional servomotor and the other pin of the accelerometer. He reprograms their relation using his computer, and tries things out: He observes how one servomotor rotates when he moves his arm back and forth and how the other one rotates when he moves his arm from left to right (Fig. 5.6).

Exercise 3: Screen-based Toolkit

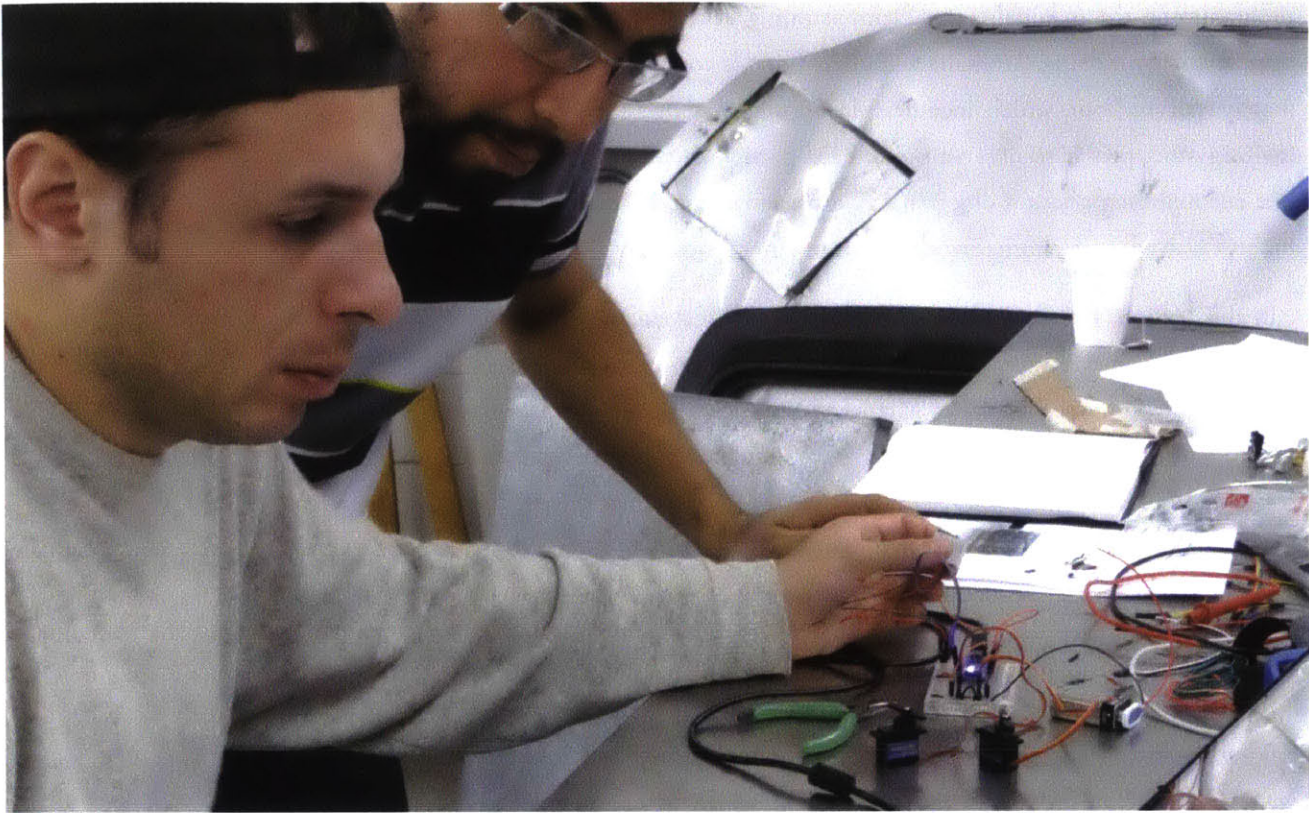
Materials: Screen-based Toolkit

Participants: 18 Graduate Students from Engineering, Business, and Administration

Institution: Master of Innovation (Catholic University of Chile)

Location: Santiago, Chile

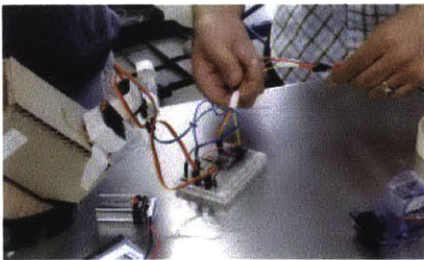
Date: January 21 to 26, 2013



| Figure 5.5 |

Manuel, Andre, and Francisco freemoving with the materials

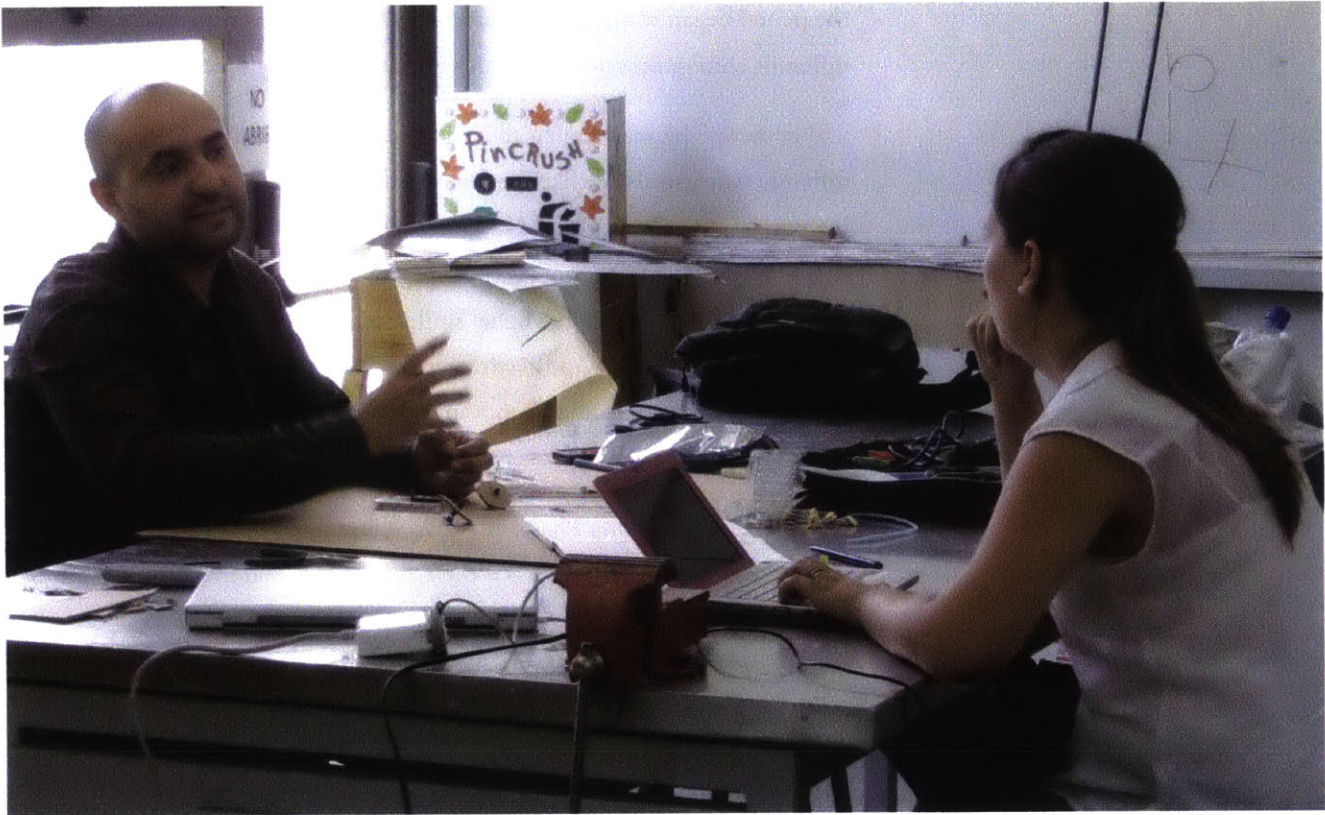
After observing Andre moving with the materials, they begin talking about the rearranged materials as the *thing-that-imitates-our-hand-movements*. Then, Manuel places the servomotors one on top of the other, and shows Andre and Francisco how these materials are imitating his hand movements in both directions. After finding a laser pointer and some fabric bands, Francisco places the laser pointer on top of the two servomotors and fastens these rearranged materials to his shoulders using the bands. Lastly, by wearing the materials in this way, Manuel, Andre, and Francisco observe how the light on the wall is following Francisco's movements. Consequently, the *thing-that-imitates-our-hand-movements* disappears, and from this point on they talk about the *laser-arm-controller*.



| Figure 5.6 |

Manuel, Andre, and Francisco rearranging the materials

Meanwhile, in the second team, Miguel and Beatriz are talking about what to do and feel with the materials before rearranging them. As they talk, they describe their movements using gestures. They talk about attaching a color pencil to the servomotor and using their hand movements to draw from a distance (Fig. 5.7). As they do this, a new thing begins to *emerge*:

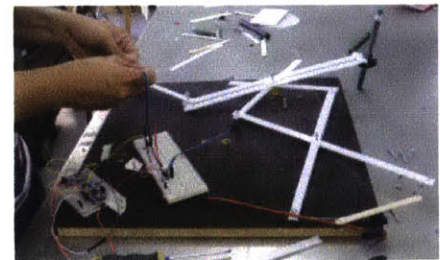


| Figure 5.7 |

Miguel and Beatriz talking about freemoving with the materials

even though they do not name the rearranged materials explicitly, they refer to the materials as a *machine-with-which-we-could-draw-by-moving-our-hands*. Miguel begins rearranging the servomotor with the accelerometer sensor. They also include an additional servomotor and the other pin of the accelerometer. As they rearrange these materials they talk about moving the color pencil in two directions—to the left and to the right—following their arms movements. Then, after finding a piece of wood, a board of white Plexiglas, and some screws, they start cutting and putting these materials together along with the two servomotors (Fig. 5.8).

Miguel places the piece of wood as a base and begins cutting out the board of white Plexiglas into bars. Then, he makes holes in the bars and uses the screws to connect them in different configurations. Beatriz finds a holder, a piece of plastic they use to hold the pencil in place. Finally, Miguel attaches all these materials to the wooden base, and Beatriz tries things out. She places the pencil in the holder and a piece of paper below the pencil. She then moves the accelerometer with both of her hands while observing how



| Figure 5.8 |

Miguel and Beatriz rearranging the materials

the pencil began to trace color patterns in front of her. They realize that the different configurations of the bars generates different types of drawings.

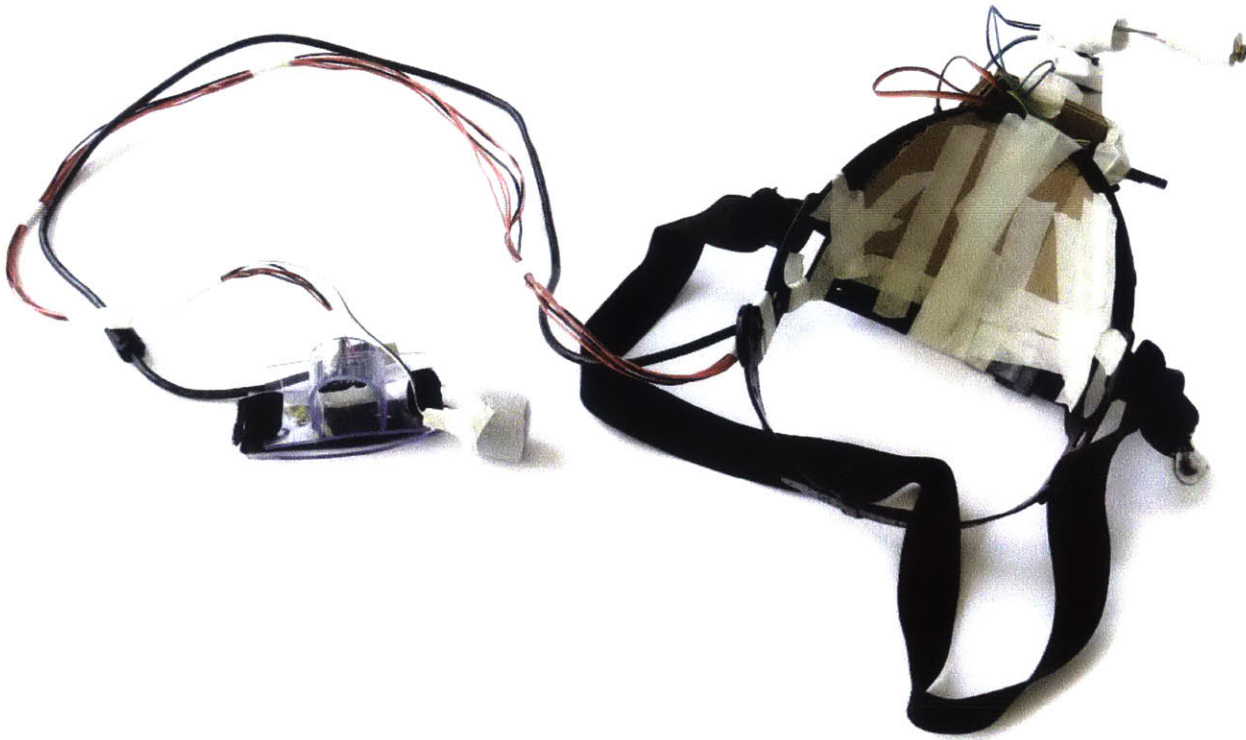
They iterate by rearranging the bars and by moving the accelerometer in different ways until they like the drawing they are able to make. When moving with the materials Beatriz says, “by moving in this way it is difficult to control the drawing as it occurs”. After observing her movements and the drawing she is producing, Miguel smiles and responds, “Hehehe... but it is still interesting, no?” And Beatriz replies, “This is a new way of drawing!” They were not expecting the movements with the materials to produce a drawing in the way it was *being* produced.

In the Demonstrating Phase, after two hours rearranging materials, Manuel, Andre, and Francisco place their rearranged materials on a table in silence and wait for people who had not rearranged the materials to observe and move with them (Fig. 5.9).

A couple of participants from another team approach the rearranged materials (Fig. 5.10). They seem confused, they laugh and ask one another what to do. Sebastian picks up the materials and tries to wear them on his head in different ways. Carolina then comes and tells him to try them out on the shoulders. They do not seem to notice the laser, and because they place the laser pointing towards the other direction, the movements of the laser are inverting the movements of their arms. Finally, Sebastian moves his arms while holding the accelerometer in order to scratch his head from a distance. He smiles and opens his arms to express he has figured out what to do with the materials.

Then, Miguel and Beatriz also place their materials on a table (Fig. 5.11). Vivian and Mauricio, from another team, approach the rearranged materials (Fig. 5.12).

They do seem not confused but intrigued. After seeing the accelerometers, the servomotors, the pencil and the piece paper, they smile and tell each other what to do. Mauricio places the pencil in the holder and the piece of paper below the pencil, and tells Vivian to move the accelerometer. As Vivian holds the accelerometer and moves her arms, the pencil begins moving



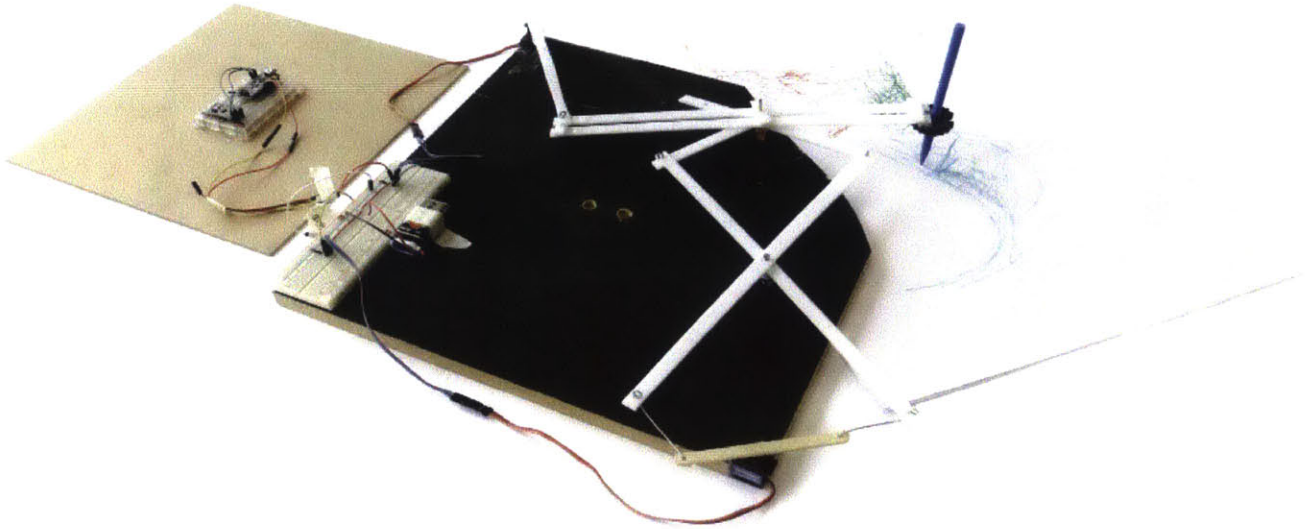
| Figure 5.9 |

Rearranged materials by Manuel, Andre, and Francisco



| Figure 5.10 |

Sebastian freemoving with the materials rearranged by Manuel, Andre, and Francisco



| Figure 5.11 |

Rearranged materials by Miguel and Beatriz



| Figure 5.12 |

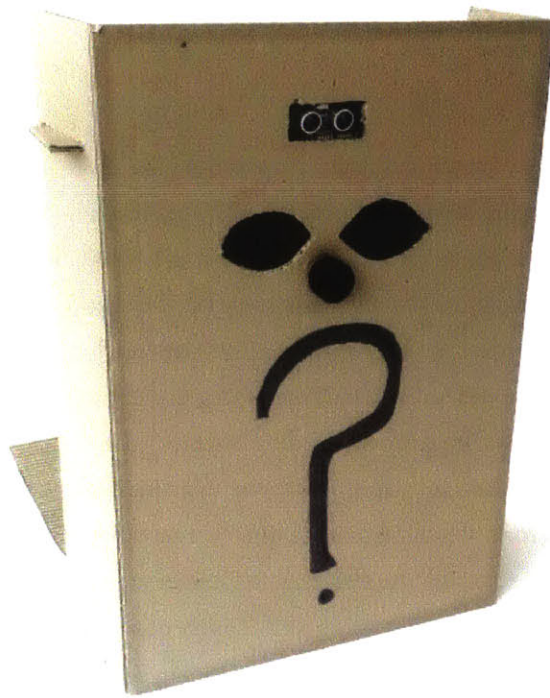
Vivian freemoving with the materials rearranged by Miguel and Beatriz

and tracing lines in front of them. Even though they seem to know what to do with the rearranged materials, they also seem surprised about the way the materials are responding to Vivian's movements. Still, both smile and seem proud to have figured out what to do.

While Manuel, Andre, Francisco, Miguel and Beatriz are rearranging the materials, other teams are also engaging in a similar process. In a third team, Natalia, Carolina, and Zinnia are rearranging a distance sensor, a buzzer, and an LED light. They begin talking about listening to a sound as they get closer to the materials and then seeing a blue light turning on as they reach them. However, after finding a cardboard box and cutting and folding these materials, they begin talking about the "mystery-box-hiding-a-secret." Zinnia makes two holes in the front of the cardboard, places the light inside, and the sensor and buzzer on the front. Carolina draws a question mark on the front of the materials. Then, after placing the materials in another table, Natalia begins moving around them, while Carolina and Zinnia observe (Fig. 5.13). She walks in front of the rearranged materials pretending she is not noticing them, but after hearing the sound she pretends to express surprise, and she reacts by walking towards the materials. As she gets closer the sound begins to fade away. Finally, she looks inside the hole and discovers the secret: she observes how the light is turning on (Fig. 5.14).

Meanwhile, in a fourth team, Jose, Sebastian, and Carolina (another Carolina) spend most of their time reprogramming the Screen-based Toolkit. Jose is an engineer with experience in hardware and electronics, and he modifies my toolkit by including a switch sensor. He rearranges and reprograms these electronic materials and shows Sebastian and Carolina how to hear a sound when connecting two metallic materials (a switch). He then proposes to make a *bag with an alarm*.

They decide to use Jose's bag and attach the switch sensor to the zipper, in order to hear a sound when unzipped. Carolina also finds a plastic bottle and after cutting it in half, uses the top to place the buzzer. Finally, after attaching these materials they try things out (Fig. 5.15). They listen to the sounds and reprogram their tone and frequency, until they liked what they hear (Fig. 5.16).



| Figure 5.13 |

Rearranged materials by Natalia, Carolina, and Zinnia



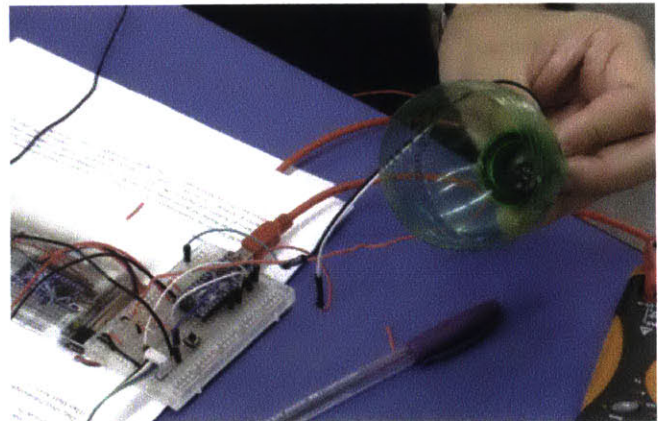
| Figure 5.14 |

Natalia, Carolina, and Zinnia rearranging materials, and then moving with them



| Figure 5.15 |

Rearranged materials by Jose, Sebastian, and Carolina



| Figure 5.16 |

Jose, Sebastian, and Carolina talking about the materials, and then rearranging the materials

Spaghetti Toolkit

Exercise 4: Spaghetti Toolkit

Materials: Spaghetti Toolkit

Participants: 8 visually-impaired villagers (multiple ages)

Institution: Cealivi (School for the Blind)

Location: Quillota, Chile

Date: February 1, 2014

In the second exercise, visually impaired people rearrange the Spaghetti Toolkit, and then demonstrate these materials by moving with them. These visually impaired people are children and adult members of the Cealivi School for the Blind in Quillota, Chile⁴. For the exercise, I ask them to work in teams of two or three, and to design freely by rearranging interactive and recycled materials. In this case, however, participants are visually-impaired and they spontaneously propose to design their own and personal *assistive technologies*. Described experientially, an assistive technology is a rearrangement of materials that extends the participants' basic moving capabilities by allowing them to sense and feel their bodies and their environments in new ways. In this exercise, participants do not need to use a Personal Computer to program their interactive materials.

The Designing Phase takes place in a studio, a room with chairs and tables, and is completed in two hours, which includes rearranging and programming the materials. The Demonstrating Phase takes place in the school's corridors and lobby, as well as in main entrance and street. This third phase is completed in approximately half an hour, which includes showing their own rearranged materials, as well as trying out the materials rearranged by participants from other teams.

In this section, I present evidence for two teams in detail. In the first team, Francisca has a severe impairment in both of her eyes, and Rodrigo has an impairment in his right eye. In the second team, Rodrigo (another Rodrigo) is fully blind, and Katherine and Carolina both have a slight visual impairment. I observed both teams throughout their design processes, and took photographs, and recorded video and audio. I present photographs, descriptions of what I observed, and audio transcriptions. In this case, I have the guidance and assistance from a professional who works with

⁴ This exercise was conducted with 9 participants as a workshop I taught in 2014 at Cealivi School for the Blind in Quillota, Chile. This School fosters the social integration of people with disabilities in all aspects of daily life, including family, education, and work. Cealivi was founded in 2001 by Carolina Carvajal, a graduate in Differential Education, and Gabriel Villalobos, a graduate in Family Therapy. Carolina and Gabriel are married and both have visual disabilities.

visually-impaired people at the school. We both help the participants to rearrange materials that is, picking up, cutting, and assembling the materials. I also have a teaching assistant with practice in electronics (my dad) helping with the interactive materials.

Throughout the exercise using the Spaghetti Toolkit, Francisca and Rodrigo are talking to one another, rearranging the materials, and demonstrating them by moving with them. Although Francisca has a severe impairment in both of her eyes, she can still see from very close and distinguish light and shadow from far away. While Rodrigo has an impairment in his right eye, it is difficult to tell because he has learned how to move around without showing his impairment. I have recorded what they did and said to one another throughout their design process. I present the photographs taken from those videos and the transcription and English translation of what they said to one another (originally in Spanish).

Before the Designing Phase, Francisca and Rodrigo are talking about what to do with the materials. They have learned already how to reprogram the Spaghetti Toolkit, and they are talking about wearing them in different ways. Although they cannot fully observe one another, they make gestures while they talk, as if they were already trying things out, freemoving with their bodies (Fig. 5.17) .

Francisca holds the Spaghetti and asks Rodrigo, “What can we do with this?”

Rodrigo moves his arms back and forth and replies, “We can put this somewhere and then when you get close you hear a sound.”

Francisca touches her head with both of her hands and says, “Yes, but maybe as a hat... so that it is more discreet, you wouldn’t want all people to notice it.”

While touching his chest, Rodrigo asks, “What about a brooch here?”

Francisca touches her chest, forehead, wrist, and neck in a sequence, while she says, “Or maybe something you could wear here, like this, or here like that... and then when you get close it produces a sound.”



| Figure 5.17 |

Francisca holding the Spaghetti and talking to Rodrigo

Rodrigo

Then, for the Designing Phase, Francisca and Rodrigo move to another table where they find other materials: cardboard, masking tape, fabric, cans, wool, and a glove. They begin rearranging these materials along with the Spaghetti Toolkit. My technical assistant (my dad) is helping them to pick up the materials and rearrange them. Even though Francisca and Rodrigo initially talked about using sounds and wearing the materials on the head, chest, forehead, wrist, or neck, they seem to forget now about their initial propositions. Without even talking about it, after encountering a glove and the vibration motor, they start rearranging these materials (Figure 5.18).

Picking up the vibration motor, Rodrigo says, “We need to decide where to put this...”

Francisca picks up the glove and while touching her hand says, “We can put it here... on the palm so that you can feel it like this: vrvrvrvrvrv.”

Rodrigo touches his fingers and replies, “Or on the fingertips, you’ll feel it much more...”

Francisca disagrees. She touches the table with her fingers and responds, “No... it has to be below, because it would be a problem if you need to use your fingers for other purposes.”

Rodrigo agrees and replies, “...and on the wrist?”

And with the help of my assistant, Francisca picks up the glove and the vibrator and says, “Better to give it a try!”

Rodrigo rearranges the materials with her while saying, “It came out... better to put it directly so that you can feel it”. Rodrigo picks up her hand, places the vibration motor on her finger, and then uses masking tape to fasten the vibration motor around her finger.

In the Demonstration Phase and right after they had rearranged the materials, Francisca jumps out of her seat, stands up, and starts walking (Fig. 5.19). She seems excited, and she smiles and tells other people to look at what she is doing—she is freemoving with the materials and at the same time demonstrating her design. Although she is visually impaired, she can still see light and shadow, so to be fully aware of how the materials feel, she



| Figure 5.18 |

Francisca picking up glove, then touching her palms, and Rodrigo placing the vibrator on Francisca's hand

| Figure 5.19 |

Francisca demonstrating their rearranged materials



covers her eyes with a piece of black fabric and wears sunglasses. Rodrigo also stands up and follows her while she walks with the materials.

Rodrigo says, “Be careful! There is a table there...”

Francisca stops and replies, “Yes! Here... it is already telling me strongly that there is something very close.”

She keeps moving towards the table and exclaims, “Wow! Touch my finger! Touch me and feel how it vibrates! Do you see how it sounds too?”

Rodrigo comes closer and, after touching her finger, says, “ Yes! I can feel it...”

Francisca turns and walks in another direction, and says, “Look, I feel something but very low... there is something, but something very far... and there is someone there, who is there?”

Rodrigo laughs and says, “It’s me! I moved... hahaha.”

While Francisca and Rodrigo are rearranging the materials and then demonstrating them, another team is engaging in a similar process. Rodrigo (another Rodrigo), Katherine, and Carolina are talking to one another, rearranging the materials, and demonstrating them by moving with them. Because Rodrigo is fully blind, he needs the help of others to move around, including Katherine and Carolina, both of whom have a slight visual impairment. Before the Designing Phase, Rodrigo, Katherine, and Carolina are talking about what to do with the materials. They are not including other materials yet, but only holding the Spaghetti and placing them around Rodrigo’s arms, wrists, and hands. While they do so, they talk about where to place the vibration motor and the distance sensor. They also make gestures as if they were already trying things out, already freemoving with their bodies (Fig. 5.20).

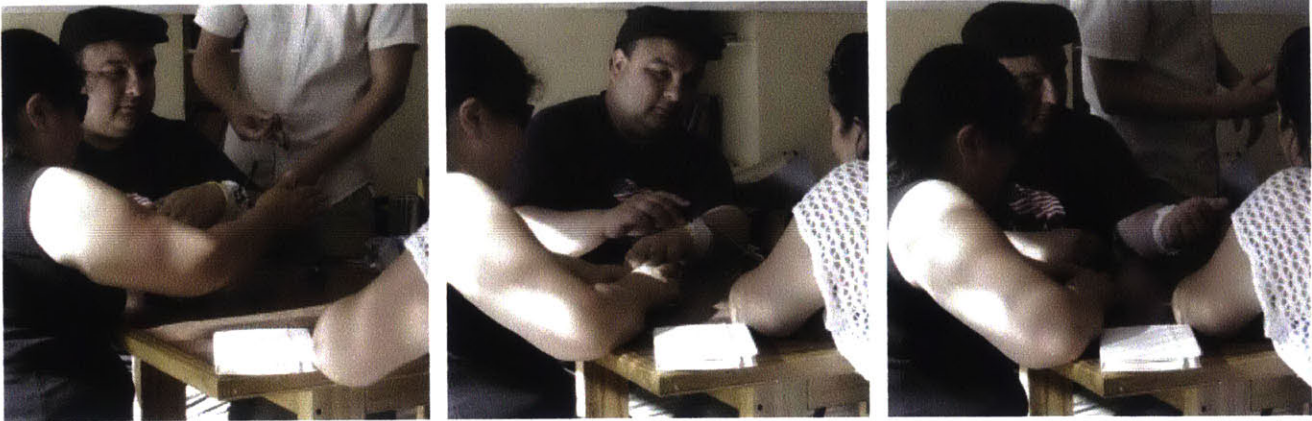
Katherine picks up the distance sensor and asks, “Where should we put this?”

And Carolina, as she places the sensor on top of Rodrigo’s left wrist, and replies, “What about here?”



| Figure 5.20 |

Rodrigo touching the connections and talking to Katherine



Rodrigo agrees and while moving his left hand says, “Yes, it could be like a watch or a wristband... and I could move like this.”

Katherine agrees and says “OK, so the sensor on the top of the wrist, but what about the vibration motor?”

Rodrigo touches below his wrist and says, “Everything should go in the same wristband, the sensor on top and the vibration motor below the wrist.”

Then, for the Designing Phase, Katherine and Carolina bring other materials to the table and begin rearranging them around Rodrigo’s wrist (Fig. 5.21). In this phase, I help them to rearrange the materials, to bring them to the table, to move them around, to cut them, and to secure them. However, I try not to interfere in their conversation and creative process.

Katherine picks up a piece of cardboard and says, “We could use some cardboard around the wrist.”

And Rodrigo says, “Let’s do a simple test first, by wrapping some masking tape around my wrist... like this.”

Carolina disagrees and replies, “I think it will be better to use a piece of fabric...”

Then, with my help, Carolina picks up the fabric glove and, after cutting the bottom and placing it on Rodrigo’s wrist, exclaims, “All right, we have a wristband!”

Rodrigo likes it and says, “Good, let’s try it out as an autonomous device...”

| Figure 5.21 |

Rodrigo wearing the wristband, placing the distance sensor, and then feeling the vibration

like this in itself with everything inside.” Then, with my help, they secure the wristband and attach the vibration motor and the battery on the fabric using masking tape.



| Figure 5.22 |

Rodrigo standing up, and then demonstrating his rearranged materials

In the Demonstrating Phase and right after Rodrigo begins feeling the vibration below his wrist, he stands up and begins to walk, describing what he is feeling to Katherine and Carolina (Fig. 5.22). He seems excited and proud to be able to move around by himself. Rodrigo is a fully blind person, and in most cases he needs help to walk around spaces he is not familiar with. Katherine and Carolina smile and observe how Rodrigo walks around the room carefully, pointing the top of his wrist in different directions.

Rodrigo walks towards a wall and says, “I want to know how far or how close the wall is” (Fig. 5.23). Katherine smiles and asks, “Do you feel it?”

Rodrigo keeps walking and replies, “Yes! It is telling me... it is very gradual and I think this could be easily trainable.” Finally, Rodrigo finds his way to the door, and exclaims, “Did you see? I was able to get out of the room!”

| Figure 5.23 |

Rodrigo walking towards a wall



5.3. The Unrecognizables

In this section, I present my findings, which are the result of reflecting on the evidence in the light of having directly observed the participants rearranging materials. In the exercise, I find that when participants rearrange materials with which they bring forth a new experience, these materials are not recognized by the people who have not rearranged them. I also find that designers do not recognize their own materials before rearranging them, but rather begin recognizing the materials gradually by freemoving with them. I call these rearranged materials the *Unrecognizables*.

These Unrecognizables allow me to reflect upon my second hypothesis: *With my Experiential Model, designers are able to bring forth new experiences in design, experiences they have never felt before.* In the exercises, the fact that participants did not recognize the rearranged materials using known labels, demonstrates that their designs did not evoke an experience they knew. Consequently, I conclude that my model (enacted through the exercise) is useful for participants as a means to bring forth new experiences and, consequently, design *something* never seen, heard about, nor felt before.

I present the findings of the Demonstrating Phase first, so that I can include you, the reader, as an eligible participant, before you read the results of the Designing Phase. In this phase, I find that participants who encounter the materials without having rearranged them and without knowing how they were rearranged, do not recognize them.

Then, I present the findings of the Designing Phase, where I find that participants begin recognizing the materials gradually, as they rearrange and freemove with them, using long phrases (proto-names) or gestures (proto-movements) to express their designs in terms of the experiences they are bringing forth.

Unrecognizing when Demonstrating

In the Demonstrating Phase, I have found that when participants rearrange materials in order to experience something new with them, these materials are not recognized by people who have not rearranged them and have not seen how designers have rearranged them. I have observed how these people, when confronted with the rearranged materials for the first time, expressed confusion, asked for clues or for the labels of the materials, and did not know what to do with them. That is, the *shape* of the design did not evoke an experience they had lived before. For the designers, however, these materials were recognizable because they knew the experience they could bring forth with them, and had made up new labels for them.

I want to demonstrate my findings experientially, so I am extending the Demonstrating Phase to the here and now by asking you, the reader, to observe the rearranged materials directly and decide for yourself whether you recognize them or not: that is, whether the designs appear as *new* for you. In the Demonstrating Phase, participants showed their rearranged materials as isolated objects/spaces without explaining anything about their designs, neither names nor intentions. Here, we are going to do the same: I am showing you the photographs of the participants' rearranged materials as isolated objects/spaces (Fig. 5.24) and for each one of them, I am asking you the three following questions:

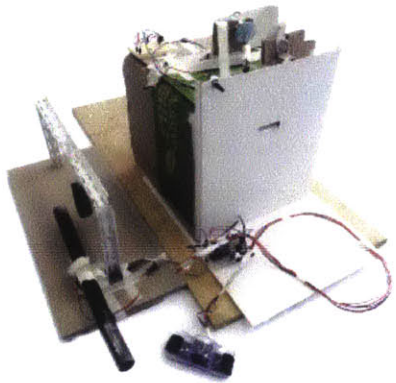
What is *this*?

Do you know what to do and feel with *this*?

What would you do and feel with *this*?

You may argue that you are only seeing one image of the materials, taken from a single point of view, and that this is not the same as encountering the actual materials. Although I agree with you, I am trying include you in the exercise as best as I can, considering the limitations of working with words and images.

Please, take a couple of moments to observe the rearranged materials and ask yourself these three questions. Then, come back to the text.



1



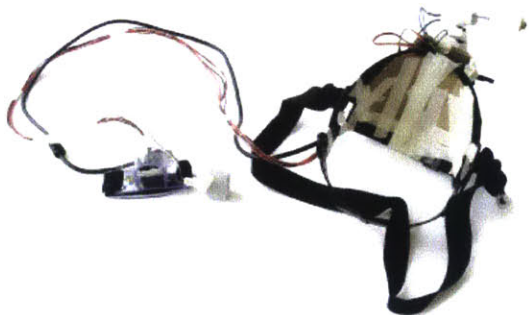
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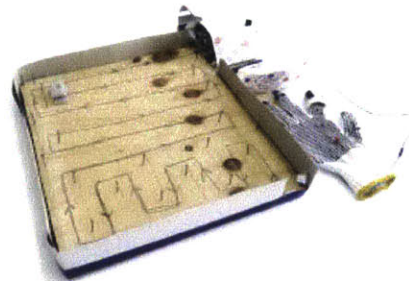
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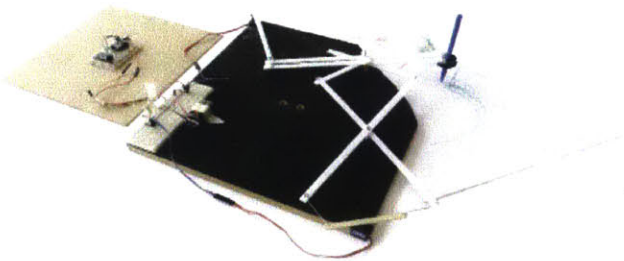
4



5



6



7



8

| Figure 5.24 |

Participants' rearranged materials

You probably did not recognize most of the rearranged materials, though you likely recognized the rearrangements number 3 and 7. Regarding number 3, you probably said to yourself, “This is a *bag*.” And regarding number 7, you probably said, “This is a *drawing-machine*.” How do I know what you said to yourself? I have also shown these photographs to around a hundred people, including colleagues, professors, and students. When shown the same images, they do not recognize most rearranged materials except from number 3 and 7. Why is that? I argue that both the bag and the drawing-machine evoke a known experience.

Regarding the bag, I argue that it is not a *new object*, in the sense that most of us have already experienced these rearranged materials before. Most people in our culture have learned from others how to call these materials (bag) and what to do and feel with them (holding and carrying things). Therefore, when we see these materials we recognize them and say, “Yeah, this is a bag.” In my case, when I was a child my mother gave me a very similar rearrangement of materials. She placed an apple, some books, and color pencils inside these materials and, while placing the bag strap around my neck, said, “Take the *bag* to kindergarten.”

I conclude that the team that designed a *bag* did not follow the first Rule for Designing, which asks participants to begin designing without using a known label. In their case, however, they began designing a *bag*: because they started designing a *bag*, they ended-up designing a *bag*. Although the materials may seem like a new type of bag (especially with all the wires), we would both agree on calling the materials a *bag*.

In Figure 5.25, you can see the actual exercise where Francisco, who did not rearrange the *bag*, encounters the *bag* for the first time. What does he do? Does he seem confused or surprised? He does not. Francisco simply encounters the materials and recognizes them immediately because he clearly knows what to do with them: after placing some paper inside the bag, he wears the bag strap around his neck, and walks around carrying the paper. In short, any participant would recognize the materials because these materials evoke a known experience.

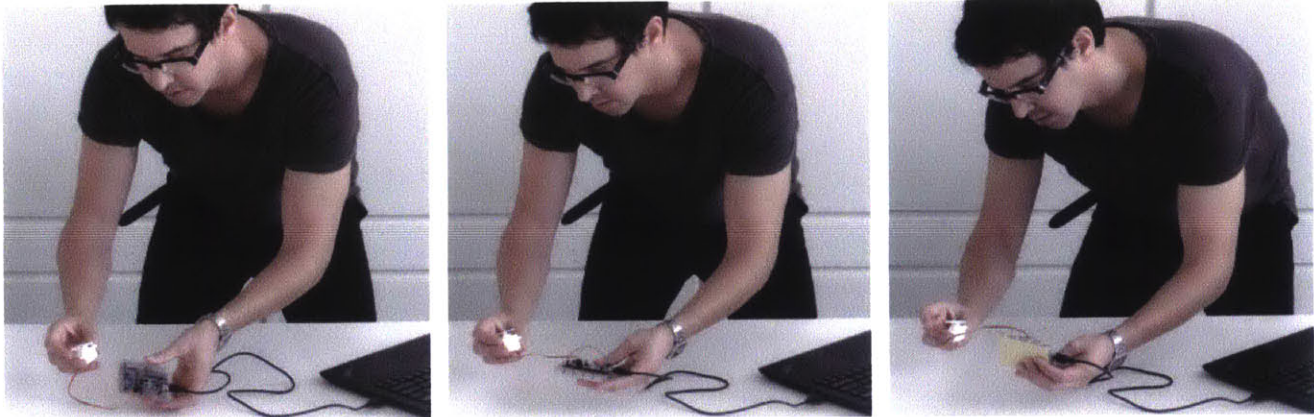


| Figure 5.25 |

Francisco freemoving with the materials rearranged
by Jose, Sebastian, and Carolina

Now, regarding the *drawing-machine*, I claim that you and most people did not actually recognize these materials with a known label, but rather recognize the materials by making up a new label that evoked an experience: what you and they saw themselves doing with these materials. A *drawing-machine* is a label that directly evokes an experience: *feeling yourself drawing*. Calling these materials a *drawing-machine* would be like calling the bag a *carrying-device*. When people do not recognize the materials they try to find clues. In this case, the clues are the pencil, the paper, and the white Plexiglas machinery that holds them together. You probably saw these materials and thought about drawing with them.

I have asked you to observe the rearranged materials and reply to three questions for each: What is *this*? Do you know what to do and feel with *this*? What would you do and feel with *this*? I argue that, in cases such as recognizing the *drawing-machine*, people are answering the first question by way of the third: you know what the materials *are* according to what you would do with them. In other words, by answering the third question you can make up a label for the materials, and then use your own created-word to recognize them. Consequently, what will happen if you take a couple of moments again, and try to answer the third question for all rearranged materials? I argue that all rearranged materials can be named and, thus, recognized in different ways if I take a couple of moments to think about how to move with them. And if I do so, I would be actively *designing*.



| Figure 5.26 |
Moving with the Screen-based Toolkit

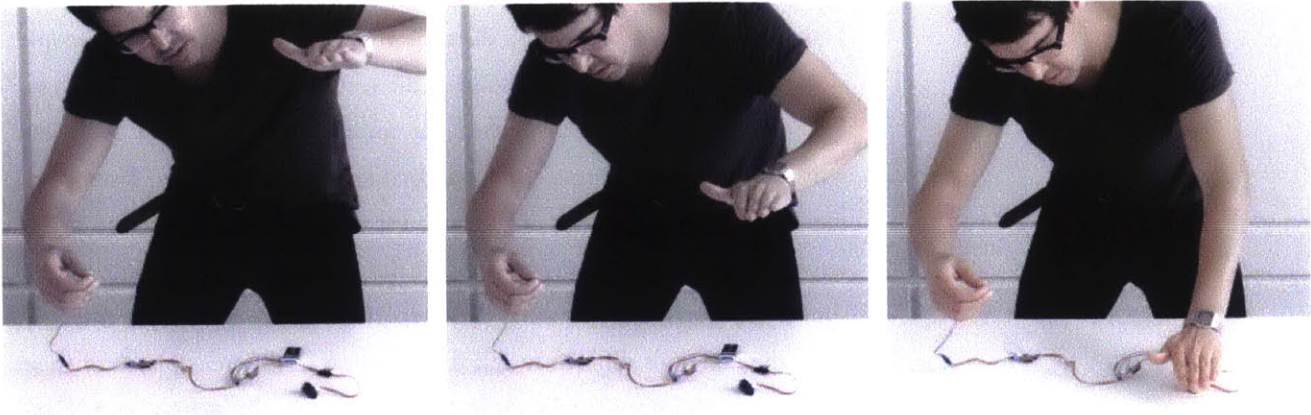
Unrecognizing throughout Rearranging

In the Demonstrating Phase, the rearranged materials were recognized by the designers because they had rearranged them and knew what experience they could bring forth with the materials. Within the Designing Phase, however, I found that these participants did not recognize their materials before designing them, but rather began recognizing the materials gradually by freemoving with them. I observed a kind of a shift, where participants did not recognize their materials and then, through freemoving, began to recognize them. In other words, I found that unrecognizing and recognizing were part of the same process: freemoving, through which *things disappeared and others began to emerge*.

Unrecognizing

Unrecognizing the materials, within the actual design practice, is exactly what happened to you in the *Demonstrating Phase*: by unrecognizing the rearranged materials, you opened the door for unlimited opportunities. You could have moved with the materials in many ways without preconceptions, bringing forth unexpected experiences and, consequently, creating space for new *things* to appear spontaneously. I conclude that unrecognizing is an initial stage which sparks freemovement.

In the exercises, I observed how participants unrecognize the materials I gave them. In the exercise rearranging the Screen-based Toolkit, I gave



| Figure 5.27 |

Moving with the Spaghetti Toolkit

participants a servomotor, an accelerometer, and an Arduino, wired together on a breadboard. Then, I showed them how to observe the rotation of the servomotor while flipping the accelerometer back and forth (Fig. 5.25). In the exercise rearranging the Spaghetti Toolkit, I gave participants a vibration-motor, a distance sensor, wired together through the Spaghetti I/O. Then, I showed them how to feel the intensity of vibration in one hand while moving the other hand back and forth (Fig. 5.27).

Regarding the exercise using the Screen-based Toolkit, even though both teams rearranged these exact same materials that I had given them, they brought forth completely different designs by moving with them in different ways. In the first team, Manuel moved his arm back and forth while holding the accelerometer, and observed how the servomotor was imitating his movements. In the second team, Beatriz moved the accelerometer with both of her hands and observed how the pencil began to trace color patterns in front of her. While the first team explored their movements directly by rearranging the materials and trying them out, the second team talked about the movements before rearranging the materials. Still, as they talked, Miguel and Beatriz in the second team made gestures to one another as if they were moving directly with the materials.

Regarding the exercise using the Spaghetti Toolkit, the two teams also rearranged the same materials that I had given them. However, they also brought forth different designs by wearing the same materials on different places of their bodies. In the first team, Rodrigo and Francisca attached the

materials around Francisca's fingers, and while moving around the room, Francisca felt the table from a distance and the presence of other people via vibration on her fingertips. And in the second team, the other Rodrigo, Katherine, and Carolina, attached the same materials around Rodrigo's wrist, and while walking around the corridor, Rodrigo felt the distance to the walls and the presence of the door via vibration on the bottom of his wrist. Even though you may argue that the two teams were bringing forth similar experiences, I claim that these experiences were quite different: they wore the materials differently, felt the vibration in different places of their bodies, and did not actually move around space in the same way, nor express the same emotional sensations.

I argue that in both of these exercises, using the Screen-based and Spaghetti Toolkits, the participants *unrecognized* the materials that I had given them. And that this unrecognition allowed them to move with the same materials in new ways, which were different from the ones I had shown them. We recognize the materials in our worlds according to what we do and feel with them. Although I had showed participants how to move with my rearranged materials, they unrecognized them by forgetting about this *known* experience and moving with the same materials freely without pre-conceptions. In so doing, they designed four different *things*. Consequently, I conclude that unrecognized drove the participants' freemoving, which fostered their creative process.

Recognizing

After you unrecognized the rearranged materials in the Demonstrating Phase, you may have asked yourself the third question: What would I do and feel with *this*? Then, by answering this question, you may have begun recognizing the materials with a new label. Using this new label would then have allowed you to keep designing by rearranging the materials further. I conclude that recognizing is a gradual stage which fulfills freemoving and allows designers to keep iterating.

In the exercises, I found that when participants moved in new ways, they began talking about the materials either using phrases or gestures. I observed how participants used these phrases or gestures to express their designs in



| Figure 5.28 |

Andre moving the sensor, Francisco wearing the fabric bands, and Manuel moving with the *laser-arm-controller*

terms of the experience they were bringing forth: what they were doing or wanted to do with the materials. The phrases were like proto-names, such as: the *thing-that-imitates-our-hands-movement*. And the gestures were like proto-movements, such as touching the hand while saying “We can put it here... on the palm so that you can feel it like this: *vrurvrurvrur*.” In other words, I found that participants began recognizing their materials by proto-naming them, and their movements by proto-moving with or without the materials.

The designs were *new* because participants could not use known labels to talk about them. Instead, they had to proto-name them with long phrases that described their experiences with their designs. Similarly, the movements were also new, because participants could not use known verbs to describe them. Instead, they had to proto-move with or without the materials in order to show what they would do with them. However, these proto-names and proto-movements did not fix the participants’ creative process, but rather allow them to keep iterating: by coming up with new labels for the rearranged materials, they could talk about them as such, which in turn suggested a way or ways with which to continue rearranging them.

Regarding the exercise using the Screen-based Toolkit, while the first team changed its proto-names on multiple occasions, the second team kept their initial proto-name. In the first team, Manuel, Andre, and Francisco, initially began talking about the *thing-that-imitates-our-hands-movement*. However, after finding a laser-pointer and some fabric bands, they started talking about the *laser-arm-controller* (Fig. 5.28). If they had not recognized



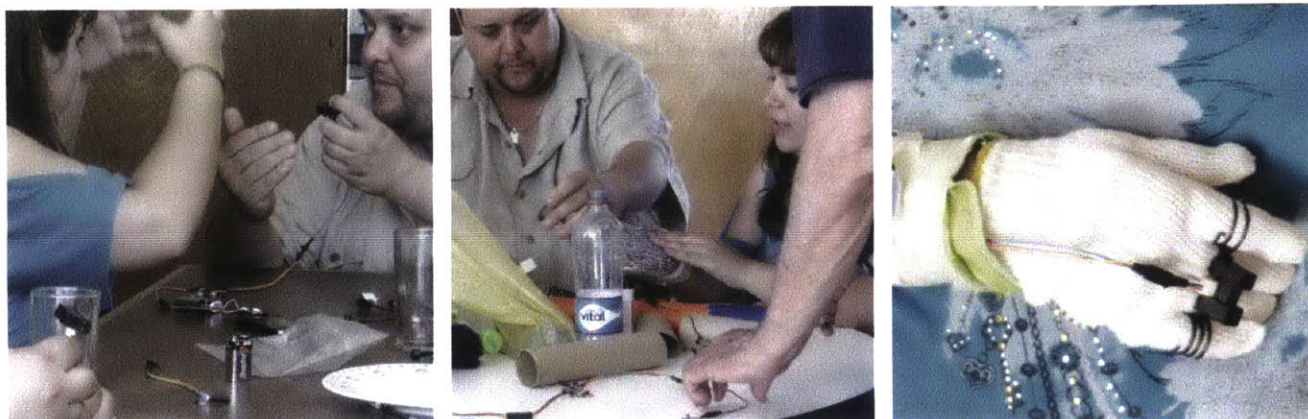
| Figure 5.29 |

Miguel rearranging the materials, Beatriz moving with them, and then showing the unexpected result

the *thing-that-imitates-our-hands-movement*, they would not have found the laser-pointer and the *laser-arm-controller* would not have appeared. Recognizing the materials using proto-names allowed them to keep iterating, looking for other materials and keep rearranging them.

In the second team, Miguel and Beatriz began talking about a *machine-with-which-we-could-draw-by-moving-our-hands*. These proto-name allowed them to talk about how to make this *thing* and what materials to look for. Without expecting to, they found a piece of wood and a board of white Plexiglas. They picked up, cut, and assembled these materials together, and they tried out different configurations. After a while, even though they kept talking about a *machine-with-which-we-could-draw-by-moving-our-hands*, the actual drawing they were producing appeared as a surprise. Beatriz said, “This is a new way of drawing!” They brought forth an unexpected experience, because they found materials that they had not anticipated, and because they iterated by rearranging them in different ways (Fig. 5.29).

Regarding the exercise using the Spaghetti Toolkit, while the first team did not name their materials, the second team named them with a known word that did not evoke the experience they were bringing forth. In the first team, Rodrigo and Francisca engaged in an open conversation without naming their materials. I was surprised, going over the recordings again and realizing that they had not named their materials. Yet they did not seem to have a problem rearranging them while talking about what they were making.



| Figure 5.30 |

Francisca making gestures, showing how to rearrange, and then moving with the materials

They only talked about a “something” and made the gestures while saying “Or maybe something you could wear here, like this, or here like that...” My assumption is that they recognized their materials without words, by naming them using the gestures directly. They used proto-movements instead of names for the verbs (Fig. 5.30). As an observer, however, after I saw them rearranging the glove, I named and recognized the materials as the *glove-with-which-they-could-feel-the-space-on-their-fingers*.

In the second team, Rodrigo, Katherine, and Carolina started talking about something “like a watch or a wristband.” This label, nonetheless, did not evoke the actual experience they were bringing forth, but only the fact that the materials were placed around Rodrigo’s wrist. I argue that this label did not evoke the actual experience because I saw how Rodrigo expressed surprise and excitement right after feeling the vibration on his wrist for the first time.

I conclude that although they talked about a watch or a wristband, the experience of moving his hand and feeling the presence of the space on his wrist was not expected. Rodrigo spontaneously stood up, walked around, and found his way out of the room. Then, and only then, by feeling what he was doing, did he bring forth the actual experience. Still, the words or labels that they used before trying things out allowed them to talk about *what* they were making and what type of materials they were looking for (Fig. 5.31).



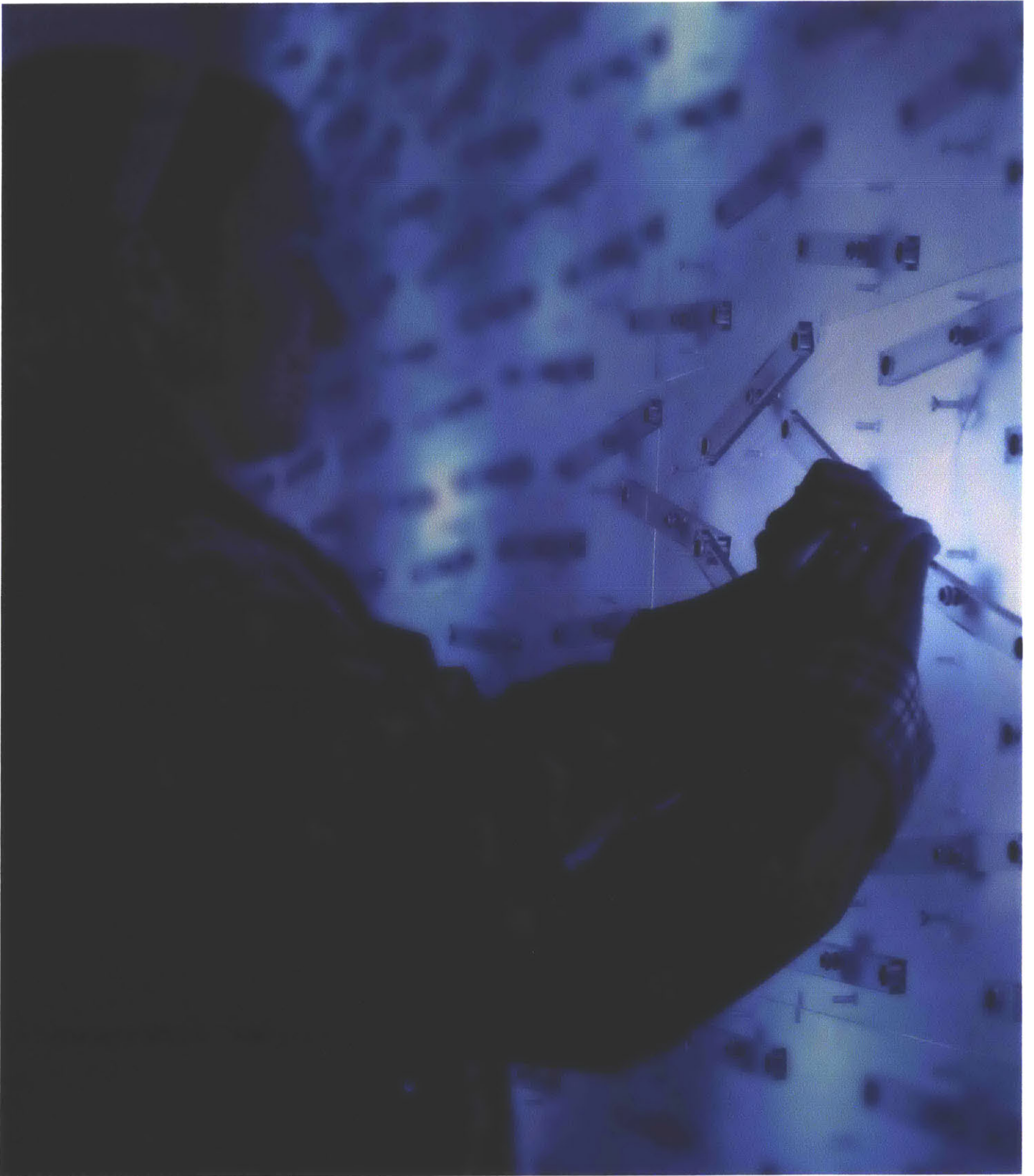
| Figure 5.31 |


Rodrigo making gestures, showing how to rearrange, and then moving with the materials

I argue that in both of these exercises, using the Screen-based and the Spaghetti toolkits, the participants recognized the materials gradually by moving with them in new ways or by talking about moving with them in new ways. In some cases, they used words that evoked the experience explicitly—proto-names—and in other cases gestures—proto-movements—that showed the movements directly. Recognizing the rearranged materials allowed them to talk about what they were making, and what other materials they would need, and how to rearrange them next. Consequently, I conclude that recognizing the rearranged materials fulfilled the participants' freemoving and allowed them to keep designing by rearranging in the next iteration.

THIRD FOUNDATION : *Transformation*

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While walking through the Infinite Corridor at MIT, I was thinking about the previous day. Everything had turned out perfectly, and I was happy because visitors seemed to like Maxwell's Dream very much. However, my satisfaction did not last for long. As I entered the room, I found a surprise. During the night, MIT students had forced the levers, loosening up the pivots, stacking the magnets on top of one another. By doing so, they had created immovable shapes, impeding other visitors from rotating the levers and creating the light patterns.

As a designer, I was frustrated and spent the whole morning repairing what they had done, by separating the levers, repairing the pivots, and tightening up the connections. But every morning I would find a new surprise, a different pattern that I had to repair all over again. One night I arrived and found a girl forcing the levers. I wanted to know why she was destroying my design, so I asked, "Why are you doing this? You are supposed to rotate them and create light patterns." The girl smiled at me and replied, "I liked to rotate them, but this is much more fun... we came up with this new game instead, piling up the handles so we could make these beautiful shapes."

The third Foundation of my practice is about Transformation, or about how we change together as we design for one another. The story illustrates everything you need to know about this Foundation. For me, collective design is not about *prescribing* the experience of others, but rather about *learning* by undergoing different experiences and observing one another. I showed the students how to rotate the levers to create light, and they showed me how to affix the levers to create shapes.

This Foundation is the third step toward addressing the problem of Unreflective Transformations. I argue that in order to reflect on our own and others' transformations in design, we need to observe these transformation explicitly. After talking to the girl, I observed her movements again and compared them with my own. We were both bringing forth different experiences and transforming ourselves in our own unique ways. She was learning because of me (by playing with the materials I had rearranged for her) and I was learning because of her (by observing her playing with the materials in a way that was new for me).

In this Foundation, you will read about how to transform through design, together with the person you are designing for. In the first chapter of this Foundation, you will encounter a model that describes collective design as a collaborative process where the designer and the person she is designing for transform individually as well as in response to one another. I call this The Transformational Model. In the second chapter, you will encounter an exercise that shows how this model can be used in design practice. I call this The Transformational Game.

Together, this model and the exercise extend the previous two Foundations into the collective domain, completing an alternative path, a new mindful practice for experience-driven design practitioners and educators.

6. Transformational Model

In this chapter, I introduce a set of words and a diagram you can use as means to bring forth your own new experience in design, and observe the experience of the person you are designing for. I call this the Transformational Model. This model is part of the Third Foundation of Transformational Design, wherein I integrate the vocabulary and the previous model into a design process where the designer is designing *for another person*.

This model is drawn from my own reading of the *Biology of Cognition*, a theory about living systems developed by Humberto Maturana, a biologist and neuroscientist (Maturana, 1970). I reflect and elaborate on his writings by considering what I have learned over the past four years working with him and his collaborators at the Matriztica School of Santiago.

You will learn about this model through reading words but also through observing a diagram that illustrates the relationships between the words. Together, these words and diagram will show you how to become mindful of your own experiences (as you are bringing them forth in design), and how to observe another person's experience in the light of your own. In this way, you can begin comparing, seeing the differences, and reflecting on them.

In this chapter, you first encounter what I call the *Collective Principles of Experience*, namely the *Observer*, the *Transformation*, and the *Coordination*. Through these principles, you will learn about how to observe, and how to talk and think about the experience of another person in terms of the vocabulary I have proposed. Next, you will read the *Collaborative Moves*, namely *Delivering* and *Observing*. You will also read about the *Co-Ancillary Moves*, namely *Thinking about Another*, *Expressing to Another*, and *Naming with Another*. Through these design moves, you will learn about what I mean by collective design. For me, collective design is a hands-on and collaborative

activity in which you rearrange materials, deliver them to another person, and observe how that person moves with them. It is an open-ended activity where you and the other person bring forth your own individual experiences and transform together by learning from one another. Finally, you will encounter the *Stream of Collective Design*, which shows how the experience of design unfolds from moment to moment for you—the designer—and for the person you are designing for.

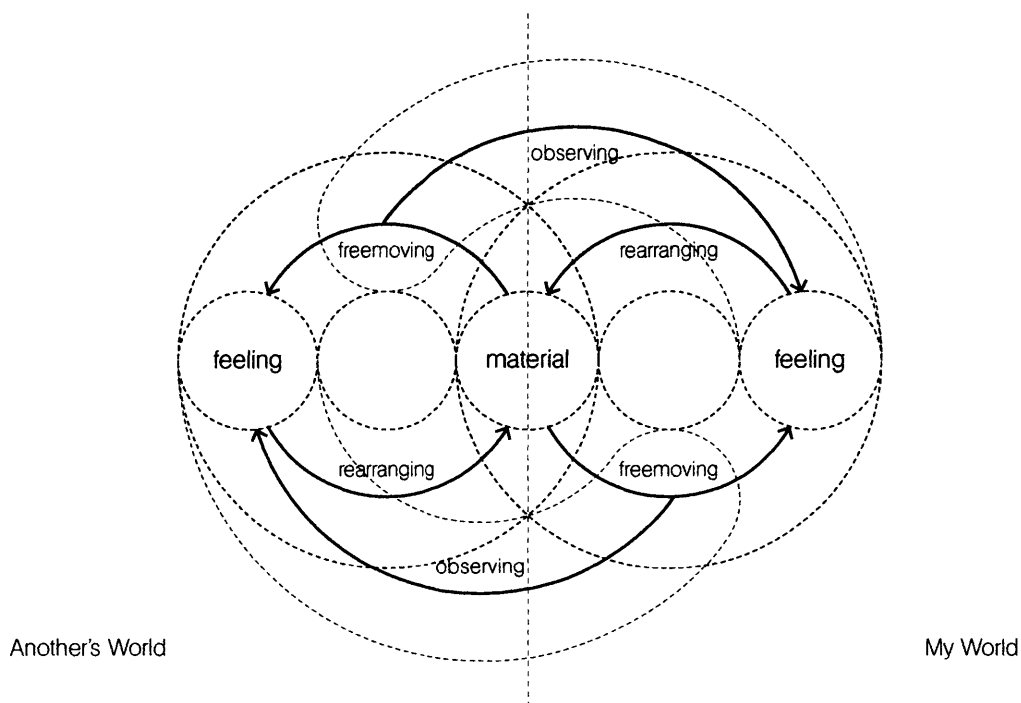
This model is my response to the growing interest in promoting creativity and innovation through a more human-centered design—an interest I have seen ingrained in contemporary practitioners putting interactive technologies together. I offer this model to them, to these human-centered designers desiring to come up with the next big thing. However, I also warn them that this model is transformational in the sense that as we design for another person, we are part of the loop, changing together with that person by experiencing something different and learning from one another.

6.1. Collective Principles

As I am designing for another person, I need to keep in mind that I am observing another person, transforming with that person, and coordinating my experience with that person. In collective design, these are the principles that I need to follow if I want to observe, talk, and think about the experience of the person I am designing for. Consequently, I call them the *Collective Principles*. I use these principles to reframe my Categories of Experience as collective and to add new concepts, which together expand my Mindful Vocabulary to fourteen complementary concepts.

These principles are drawn from the Biology of Cognition, a theory about living systems and the phenomenon of knowing, developed by biologist and neuroscientist Humberto Maturana (Maturana, 1970). Even though this is a scientific theory, it applies biology to human concerns, explaining the human way of living. This background is non-ontological and can be understood directly through observing the coherences of our living¹.

¹ This theory does not contradict the non-ontological epistemology of my Buddhist background and can



The Observer

| Figure 6.1 |

The Transformational Model

My first principle is the *observer-dependent* nature of any description of another person's experience: I cannot objectify another's experience because I can only know about the experience of others by observing what they do, and observing corresponds to my own experience. In my First Foundation, I describe experience as feeling what I am doing with materials in the flow of the present, right here right now. This description of experience is valid, for every one of us, when we are mindful of our own experience. However, what another person experiences corresponds to *what I observe* that person is doing with materials. Consequently, I can only talk about the experience of others from my own experience of observing what they do: I feel myself observing another person moving with and sensing the materials.

expand my Mindful Vocabulary. My Buddhist background describes the experience of others as external phenomena, which is correlated to the internal phenomena, or personal experience (Analyo 2004, 95). And these external phenomena are limited to contemplating another person's body and not his feelings and states of mind (Analyo 2004, 95). However, this background does not explain in detail how we can observe, think, express, and talk about another person's experience. And, consequently I have to bring in a complementary background.

(My) Experience

Feeling what I am doing with material

(My Experience of) Another's Experience

Feeling myself observing another person moving with and sensing the materials

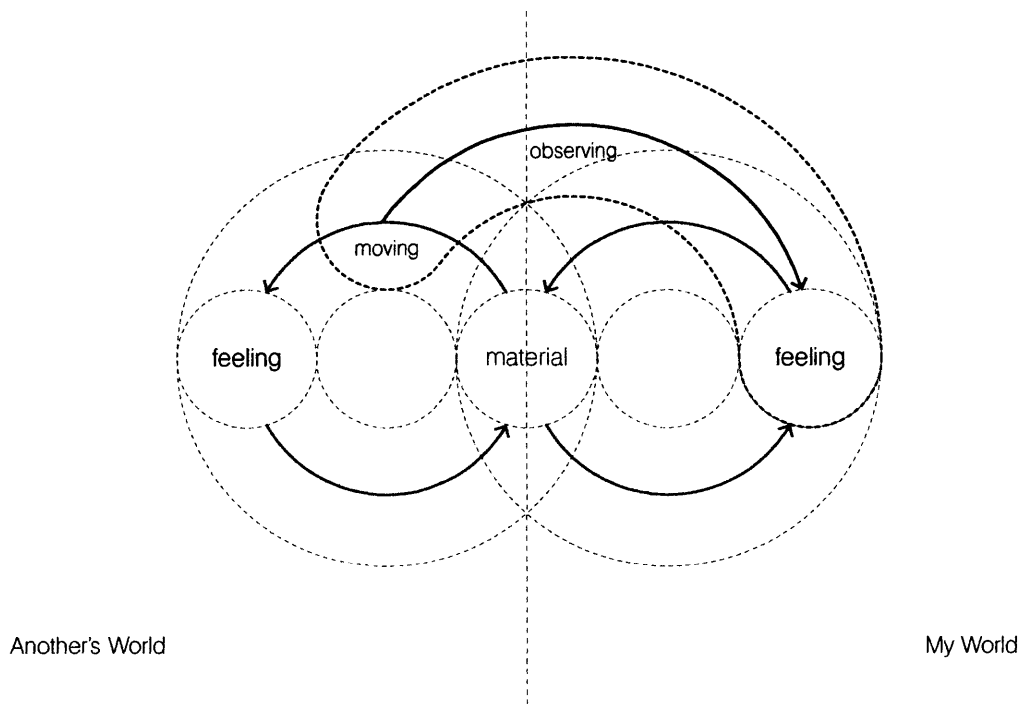
Thus, another person's experience cannot be separated from my own experience. Another person's experience is not an object that can be captured, matched with solutions, and delivered. I cannot talk about an observer-independent experience because there is always an observer: a person observing and talking, and that person can be you, can be me, or can be the anthropologist, or the scientist. This is not a limitation—I can still observe, think, remember, project, reflect, and talk about the experience of others considering myself as an observer, as part of a collective process.

This collective description of experience implies reframing my Primary Categories as *another's feeling*, *another's doing*, and *another's materials*². I can only talk about the categories of another person if I consider myself as an observer who contemplates what the other person is doing from a distance, from a different body and mind (Fig. 6.2). I describe the feeling as the complex of bodily sensations, including sensory and emotional ones. But can I feel what another person feels? No, but I can project what that person feels in the light of what I feel. That is, I can feel my own sensory and emotional sensations that are triggered according to what I observe. When I see someone crying, I can make sense of how these movements and expressions feel in terms of how I have felt when I have cried myself. Although what I feel has been triggered by another person's movements (including gestures, facial expressions, and postures), I still can only feel what I feel³.

I describe the doings as actions of body and mind, including sensing, moving, and thinking. But can I know what another person is doing? No, because I cannot actually touch, smell, hear, taste, see, or think as the other person does while he moves, but I can observe his bodily postures from

² This distinction between *my world* and *the world of another person* relates to the concept of *worldmaking* proposed by philosopher Nelson Goodman in his book *Ways of Worldmaking* (Goodman 1978). He says, "The world of the Eskimo who has not grasped the comprehensive concepts of snow differs not only from the world of the Samoan but also from the world of the New Englander who has not grasped the Eskimo's distinctions" (Goodman 1978, 8).

³ You may argue that my Collective Principles relate to the term *empathy*. In my model, however, I do not talk about empathy because this term has been used in many ways (Davis 1996), some of them suggesting that we can feel directly, understand, or share another person's feelings. Empathy is a new term coined in 1909 by psychologist Edward B. Titchener (Rifkin 2009, 12), who combined the Greek words *em* ("into") and *pathy* ("feeling").



a third-person's perspective. I can observe how a person walks around a garden, approaches a flower and, after seeing, touching, and smelling the flower, takes a moment to think. However, I am not actually doing what that person is doing but only observing his movements. Moreover, I cannot know whether the other person is actually mindful of what I see he is doing. Even though I may assume he is thinking, I cannot know what the other person is actually thinking about.

Finally, I describe the materials as objects, spaces, and beings I recognize by doing and feeling something with them. But can I know what another person is recognizing in his world? No, but I can project what the other person is recognizing by what I am recognizing (while I am observing that person moving his body with materials). I remember observing my friends in school, kicking a crumpled piece of paper in the corridor. After asking them what the object was, they laughed at me and said: "Don't you see the soccer ball!" After realizing they were not just kicking a piece of paper around but actually playing soccer—which was a doing that I had done before—the object suddenly emerged as a soccer ball and the space as a soccer field. At that very moment, the piece of paper and the corridor literally *disappeared*.

| Figure 6.2 |
Experiencing Another Person's Experience

Another's feeling

Feeling my own sensory and emotional sensations when I observe another person sensing and moving with materials

Another's doing

Observing another person sensing and moving with materials

Another's materials

Recognizing another person's objects and spaces by observing what this person is doing

For design, this first principle implies placing the designer at the core of a collective process. When designing for others, designers become active *observers*, contemplating the experience of others in light of their own. When designers go into the field to analyze their *users*, by observing or conducting interviews, they are not grasping the user experience but they are actually experiencing their own experience—they are observing the *user* moving with materials and observing with their own bodies, feeling their own sensations, and recognizing their own materials. However, this principle does not imply that everything is *subjective* and that, therefore, there is nothing designers can do. On the contrary, this principle empowers designers by placing them as protagonists of the creative process, by freeing them from a passive, detached, and mechanistic attitude, and by showing them how to operate accordingly. That is, this principle is operational, allowing designers to observe and project what others are feeling, doing, and recognizing. Designers can then talk about what they observe, think about it, express it, and talk about it with others.

My first principle is based on the *Observer*, an epistemological construct proposed by the Biology of Cognition, a theory that explains how humans know what they know. This theory argues that in any description of a phenomenon there is always someone observing and talking: “anything said is said by an *observer* to another observer, who may be herself or himself” (Maturana, 1970, p. 8).

The Observer

A person who observes and describes a phenomenon (for example, the experience of another person)

According to the Biology of Cognition, in order for any *reality* to be observed there must be someone to observe and describe this *reality*, and therefore, we cannot talk about an external reality that preexists independent of us observing this reality (Maturana and Poerksen 2004, 28). This approach is also aligned with the Buddhist non-ontological epistemology, where it is not about how things *are* independent of us, but rather how things *appear* to us directly. Therefore, this theory does not contradict the Primary Categories, so I can use it to expand my Mindful Vocabulary.

This observer-dependent reality comes from understanding human beings as closed and structure-determined systems. That is, everything that happens to us is determined by our structure, by our bodies and nervous systems, by

what we are made of. The Biology of Cognition explains how living systems originated when molecules separated themselves from their medium, forming operational boundaries and working as autonomous closed networks of self-production (Maturana 2002, 7). As living systems, we are comprised of a nervous system that is closed and, therefore, everything we experience is determined by our nervous system's internal structure. That is, our nervous system does not gather and process information coming from the outside world, but rather external factors only trigger internal changes in our nervous system (Maturana and Poerksen 2004, 60).

What is a color? A color is not an external phenomenon but something happening *to us*. When light reflects on a material and reaches the retina, an activity in the retina is triggered according to the structure of the retina itself and not according to the structure of the light. The color is not out there for us to see: “a color is what we see, what we experience” (Maturana and Poerksen 2004, 60). In the same way, when a person is talking to me, I am not actually listening to what the person is saying, but rather to what the sounds (vibrations in the air) are triggering in me. In other words, I listen to myself. I hear the sounds, feel my hearing of the sounds, and recognize what I am hearing⁴.

Revisiting my first principle, even though I use *the Observer* as a background, I focus more on the act of *observing* than on who is observing. For me, this *observing* is actually *sensing*, because I am not only *seeing* others, but also touching them, smelling them, hearing their movements, and listening to what they say. The Biology of Cognition describes us, human beings, as structure-determined systems from a biological perspective, in reference to what we are made of: our molecules, physiology, and nervous system. In my case, I am interested in considering our structure-determinism experientially, in terms of what we can observe, feel, do and recognize in our worlds.

⁴ The fact that I can only *listen to myself* can be explained through the story of the *beetle in the box* (Floyd 2006, 20), introduced by the philosopher Ludwig Wittgenstein in his *Philosophical Investigations*. He says, “Suppose that everyone had a box with something in it which we call a ‘beetle’. No one can ever look into anyone else’s box, and everyone says he knows what a beetle is only by looking at his *beetle*.— Here it would be quite possible for everyone to have something different in his box” (Wittgenstein 2009, 106). Although I am listening to another talking about *her beetle*, I am in fact *listening to my own beetle*.

Transformation

My second principle is the transformational nature of human experience: I cannot grasp the experience of another person because, not only can I not know the experience of another, but because that experience is always changing. When I talk about transformation I am basically describing a *change* or a *difference* in something. However, describing transformation as change is not enough. When I talk about transformation there are three conditions to keep in mind.

First, transformation is not absolute but relative. Transformation is something that I observe and, consequently, transformation is basically a commentary of an observer. For example, when I talk about interactive technologies having transformed our experience, I am talking about a personal *observation* and I do not mean that this transformation is absolute or universal. I have observed changes in my life and changes in the lives of people around me. I see how my friend Christine is texting as we are having dinner, and after realizing that she did not do that before, I may say to myself, “the smartphone has changed her.” However, what for me may be a transformation may not be for her. This, does not preclude me telling people what I have observed and convincing them that there is a transformation taking place.

Second, transformation is a balance between change and conservation. In order for me to observe a change in something, some properties of this something have to be conserved. Otherwise, I would not see a transformation but only something completely different or unrelated. For example, when I say that my friend Christine has been transformed, I am still recognizing her as Christine and as a person. She did not become my friend Claire, and she did not become a cat. An evil magician may have transformed Christine into a cat, but even then, in order to see a transformation and not simply a replacement, I need to recognize a *Christine-ness* in this cat (maybe the cat would conserve Christine’s red hair, for example).

This balance between change and conservation shows how a new experience is always a transformation. When I am experiencing something new, I am actually observing how my experience is changing. I am still conserving

my experience, but this experience appears as new only in reference to other experiences I have undergone before. Because I see no distinction between our experiences and who we are, as I am experiencing something new I am also becoming a different person. I still conserve something, a sense of who I am, but this *new me* seems different in reference to what I used to do and feel before. Not only am I experiencing something I have never felt before, but I am also able to recognize this experience when it arises again, think about it (with all my mind's senses), and talk about it with others.

And third, transformation results from an *interaction*. I do not change in isolation but in relation to materials in my world and, particularly, in relation to other people. Everything I do and, consequently, feel in my body and recognize in my world I have learned from others by transforming individually but in response to them. For example, as I am observing Christine she may tell me, "Daniel, listen to me, this is how you pronounce *idea* in English, repeat after me: *idea*." As I am observing and listening to Christine, I am becoming a different person. I am learning to pronounce *idea*. I can now move my mouth, tongue, and lungs in a new way, and I can talk about *ideas* with other people in English (without having to repeat myself because of faulty pronunciation).

I talk about *transformation* as a collective process, or more precisely as an interpersonal process. As human beings we have transformed our experiences together in a history of doing things in coexistence: I feel what I do, but I have learned to do what I do from other people, from my parents, siblings, friends, teachers, and the people I see on the streets, television, and the internet. Our experiences are individual; they do not mingle with the experience of other people and cannot be *shared*, but they have transformed in mutual correspondence with one another. This collective transformation also takes place generation over generation. I have learned from my parents, my parents have learned from their parents, and so on. In other words, what I am experiencing right now as I am writing these very lines, is a result of a history of continuous transformations that occurred in the evolution of my lineage as a human being (phylogeny), as well as the transformations that occurred in my own development as an individual (ontogeny). I can walk because I have legs and because I have learned to walk by observing others.

Transformation

Observing a change or a difference in something

Transformation of Experience

Observing a change on my experience, or on the experience of another person

For design, this second principle implies realizing the limitations of analysis in design. As a designer, analyzing current conditions is not going to take me too far, because through design I am going to change things. I am going to observe how I am transforming and how others are transforming with the materials I have rearranged. As a designer, I am rearranging the materials and transforming by moving in ways I have never seen, heard about, nor felt before. But also, when I deliver the materials to another person, this transformation becomes collective: I am transforming in response to the person I am designing for, and that person is transforming in response to me. We both transform individually but in reciprocal relationship with one another. That's is, we transform ourselves together, in a dance mediated by the materials.

This principle, however, does not mean I cannot stop my design process and take a moment to observe my own transformations and think about what I am changing and what I am conserving. This principle does not mean I cannot think about how my materials may transform others, the people I am designing for. I can see the transformations of others in the light of my own, and talk about them, and make decisions.

Throughout history, our way of rearranging the materials around us has changed, along with our experiences and ourselves. We are not like other animals that keep a fixed way of living, generation over generation, but rather we strive for change, diversity, and sophistication. Compare the beehive, the bird's nest, and the beaver's dam, with the richness and diversity of human architecture throughout history and culture. Compare what the lion, monkey, and dog like to eat with the sophistication and variety of human cuisine, such as Indian, Peruvian, and Japanese. Can we explain this richness, diversity, and sophistication of human creations by analyzing human experience as fixed and universal? No, we have plastic experiential structures and we like to learn and transform by doing and feeling things we have never done and felt before. And *architects* and *chefs* are active agents in this process of transformation.

My second principle is based on *Structural Coupling*, an abstraction proposed by the Biology of Cognition to explain how living systems transform

their structures in coexistence (Maturana and Varela 1998, 75). According to the Biology of Cognition, living systems have transformed together and have coupled by changing their structures through a history of repetitive and recursive interactions. Structural Coupling can be explained through the example of using a new pair of shoes (Maturana and Poerksen 2004, 83). When I buy a new pair of shoes, they may not feel completely comfortable. Then, in a few weeks, my shoes somehow feel differently; they feel much more comfortable. What has happened? Have the shoes adapted to my feet? Have my feet adapted to the shoes? No, what happened is that both have changed together in mutual correspondence through a history of repetitive and recursive interactions (Maturana 2002, 17). There is now a structural congruence between the two. My shoes and feet are independent and separate entities. That is, they do not mingle; they are still closed systems that are structure-determined: everything that occurs to the shoes is determined by the structure of the shoes, and everything that occurs to my feet is determined by the structure of my feet. However, both have plastic and variable structures and, consequently, they have transformed their structures together.

However, what happens if the shoes break in half? If they do, I cannot wear them and walk in them anymore. Have the shoes transformed? Are they still shoes then? Structural Coupling defines transformation in the context of living systems. Transformation is not about an arbitrary type of change, but rather a change in the structure of a system that is undertaken to conserve the organization of the system. For example, the organization of the class *shoe* corresponds to a specific relationship between their parts so that wearing them and walking in them is possible. But there are many types of shoes. The structure of a particular pair of shoes corresponds to the realization of the organization *shoe*, through specific materials, shape, texture, and color. After a few weeks of interaction, I have changed the structure of my shoes in order to conserve their organization by allowing me to walk in them comfortably. If the shoes are not flexible enough and do not change their structure with my feet, I may throw them away and buy new ones.

Revisiting my second principle, even though I use *Structural Coupling* as a background, I am not interested in the biological structure of living systems. My second principle focuses on how humans have transformed themselves together through designing for one another. When I talk about transformation, I am not talking about two physical bodies coupled as objects. For me, the coupling is experiential and it arises for every person, experientially, by feeling and doing something with materials. Transformation is not about the physiological changes of my body and brain, but rather the changes of what I feel, do, and recognize in my world.

Coordination

My third principle is the coordinated nature of human experience: I cannot share the same experience with another person, but I can observe what this person is doing and coordinate my experience with this person, as we are transforming in response to one another. I describe coordination as *a spontaneous and harmonized dance between two individuals*. This coordination explains why the material world appears to us as one external object we can all grasp and share.

My observer-dependent principle implies that we are all bringing forth our own worlds by feeling our own sensations, doing our own movements, and recognizing our own materials. There is no way for me to *access* the world of another person (his feelings, doings, and materials) because I can only know about his world by living my own world. However, I can turn this principle around and explain how, by observing one another, we are actually coordinating our doings, which consequently brings about the illusion that we are sharing the same experience. My principle about transformation implies that we have changed ourselves and our own individual experiences. However, we can also turn this principle around and show how we are actually transforming in response to one another, which harmonizes what we do and feel together.

Our experiences seem to be the same because we have coordinated what we do and feel with materials. As I am talking to my professor Edith, I am

Coordination of Experiences

Harmonized and spontaneous dance between two individual experiences, which results from two individuals observing each other and transforming together

observing her and she is observing me. I am learning from her and she is learning from me. As we talk, we are coordinating what we do, including how we move, what we think, and the words we use to recognize and talk about our worlds. However, I emphasize again that I am not sharing, knowing, or feeling Edith's experience. We are only dancing together in harmony, coordinating our own personal experiences by observing, listening, and learning from one another.

You may still argue that I cannot prove whether people's experiences are different or not. And I would reply that I am proposing an alternative path where this question is irrelevant. Think about the color *yellow*; can we know whether you and I are seeing the same thing?⁵ It does not really matter whether you and I are seeing the same *thing*, but rather whether we can coordinate what we feel and do around what say to each other. In other words, if I tell you to meet tomorrow at the *yellow* building, we will assume we are experiencing the same color because we will be able to coordinate our experiences and meet *there*.

Labels are doings that coordinate other doings. *Yellow* does not describe how the world *is*; yellow is only a series of sounds or vibrations we produce by breathing and moving our mouths and tongues. Saying *yellow* is an expressive movement, it is a doing. This doing triggers our individual evocations. The word *yellow* evokes our own feeling of seeing (with our mind's eyes) *yellow* materials. When you were a baby, your mother may have shown you a yellow toy and told you: "This is yellow, this is yellow." You observed the yellow toy and you learned to recognize *yellow* with the label *yellow*. When your mother then asked you to bring her your yellow toy you were able to find the toy and bring it to her. You coordinated your own experience of *yellow* with your mother's own experience of *yellow*. The problem is that we then grow up, and forget that everything we know we have learned by observing others, and we assume yellow is a *property* of things out there, pre-existing and independent of us.

Labels

Doings that coordinate other doings (through evocation)

⁵ In his *Philosophical Investigations*, the philosopher Ludwig Wittgenstein says, "The essential thing about private experience is really not that each person possesses his own specimen, but that nobody knows whether other people also have this or something else. The assumption would thus be possible—though unverifiable—that one section of mankind had one visual impression of red, and another section another" (Wittgenstein 2009, 102)

For design, this third principle implies blurring the distinctions between design roles; that is, between the designer and the person she is designing for (the so called user or client). As a designer, I become a user. And as a user, I become a designer. Both designer and user are creative and active agents who bring forth their own new experiences and transform together by observing and learning from one another. Design is not unidirectional (pointing from the designer to the user) but rather a reciprocal process involving two individual experiences coordinated in a harmonized dance.

In design, if I am experiencing something new with the materials, I will not have a label to recognize, talk, and think about them. I may be mixing some colors and after showing them to you, I may say, “This is *bluellow*.” And then, after naming the materials we would be able to coordinate our experiences and meet tomorrow at the *bluellow* building. In other words, for materials to *emerge as what they are*, a person (designer or user) has to make up a new label and give this label to the other person (by talking or writing).

The coordination between a designer and the person she is designing for does not occur in isolation. This spontaneous and harmonized dance between two individuals takes place as part of a network of coordinations among other people as well. However, in design this dance is a couple’s dance, because it always involves only a pair of individuals coordinating their doings. I dance with you and then with my collaborator, and then with my user. In design, we do not dance all at once. However, the way I transform with you affects the way I then transform with my collaborator, and then with my user (and vice versa).

My third principle is based on *Language*, as described by the Biology of Cognition to explain how human beings transform in coexistence. According to the Biology of Cognition, language is a consensual and recursive coordination of doings (Maturana, 1989). Language is recursive, because words are also doings—sounds, and noises emitted by the body—that, through their coordination, coordinate other doings (Maturana and Varela 1992, 210). For my vocabulary, therefore, I include language as a doing, as an action of body and mind.

However, language as a doing does not only refer to using words. For example, imagine a person trying to get a *taxi* in a two-lane street (Maturana and Poerksen 2004, 89). On his side of the street, all taxis passing by are occupied, but he finally finds a taxi driving in the opposite direction. What does he do? He performs some gestures, by making eye contact with the taxi driver and drawing some circles in the air by moving his arms. The taxi driver stops and turns around. What has happened here? Did they *transmit information* from one another? Did they *read* each other's minds? No, what happened reads as follows: The person sees the driver doing something (driving in one direction) and he does something (moves his arms). Then, the driver sees the person doing something (moving his arms) and he also does something (turns around). They are just coordinating their doings using their doings.

In the same way, recognizing, saying, or writing a label is a doing that coordinates another doing. However, if I am not aware of this, by using a *label* I may obscure the *doings* that I am actually coordinating: in this case, the word *taxi* obscures the action of *carrying* (Maturana and Poerksen 2004, 91). This is why, for the Biology of Cognition, the *labels* only arise with what we do. The person trying to get a taxi could be only looking for yellow cars, but a black car may stop on his side of the street, and the driver may say: "I am free... I can take you." Suddenly, the black car has become a taxi.

For the Biology of Cognition, we are using language through having conversations. *Conversation* comes from the Latin words *con* (with) and *versare* (to turn), which follows describing conversation as *dancing*, as turning together. We move, make gestures, and emit sounds in response to one another, dancing together (Maturana and Verden-Zoller 2008, 42).

We are social beings changing what we do and feel in response to one another, in order to conserve our existence as a species. Similar to the example of the *shoe* and the *feet*, there is also *Structural Coupling* between human beings: we couple through language, by having conversations. Like the plasticity of the *feet* that permits a structural change in correspondence to the *shoe*, language expands the plasticity of what we can do and feel in correspondence with one another. By gesturing, emitting sounds, observing,

and hearing one another we have transformed and expanded our worlds: not only have we learned how to walk, speak, read, write, and play, but we have also *created tools* that extend the operational capabilities of our bodies (Maturana and Verden-Zoller 2008, 29).

However, how are the taxi driver and the person able to coordinate their doings and feelings if they have never interacted with each other before? For the Biology of Cognition, culture can be described as a closed network of conversations that has been conserved, learned, and developed generation by generation (Maturana 1993, 48). The person and the taxi driver coordinate their doings and feelings as two people coexisting in the same culture, as part of the same network of conversations.

Language

Coordination of doings using other doings (moving, gesturing, speaking, writing)

Conversation

Dancing together using language

Culture

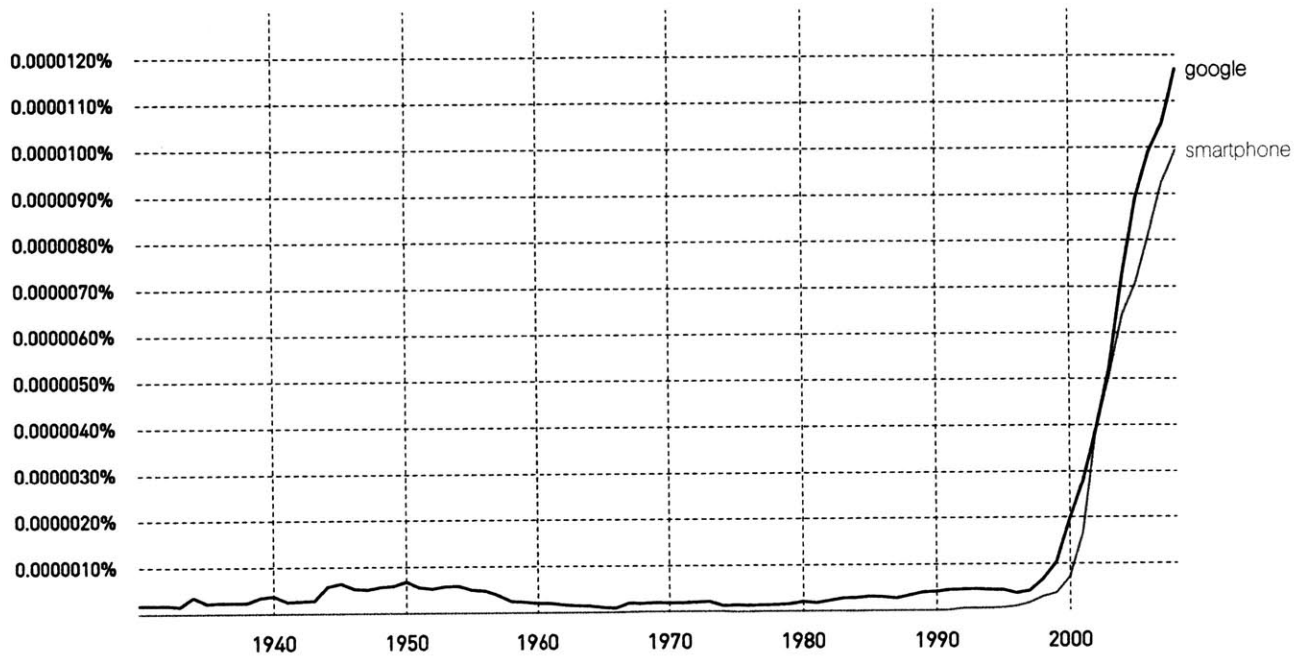
Closed network of conversations conserved, learned, and developed trans-generationally

Revisiting my third principle, even though I use *Language* as a background, I am not focusing on coordinating doings we already know, but rather doings that are new, actions of body and mind we have never felt before. In this sense, through design we are expanding our language, we can converse about new things, and dance together in unforeseen ways. Today, with new interactive technologies proliferating around us, we are increasingly learning new words and coordinating our doings around them. But these words and doings do not come from nowhere. Somebody rearranged materials and then, after showing us what to do with them, told us what to call these materials.

What is *Google* and *Googling*? They are only labels or words that a person (Larry Page or Sergey Brin) made up in order to talk about the materials (Google) and the doing (Googling).

In Figure 6.3, you can see how the words Google and Smartphone basically appeared in the year 2000. The graph plots the percentage that a particular word is found over the total of words within books published in a specific year (Source Google Ngram-Viewer)⁶.

⁶ Ngram-Viewer can be found on the Google Books website, accessed June 27, 2015, <https://books.google.com/ngrams>



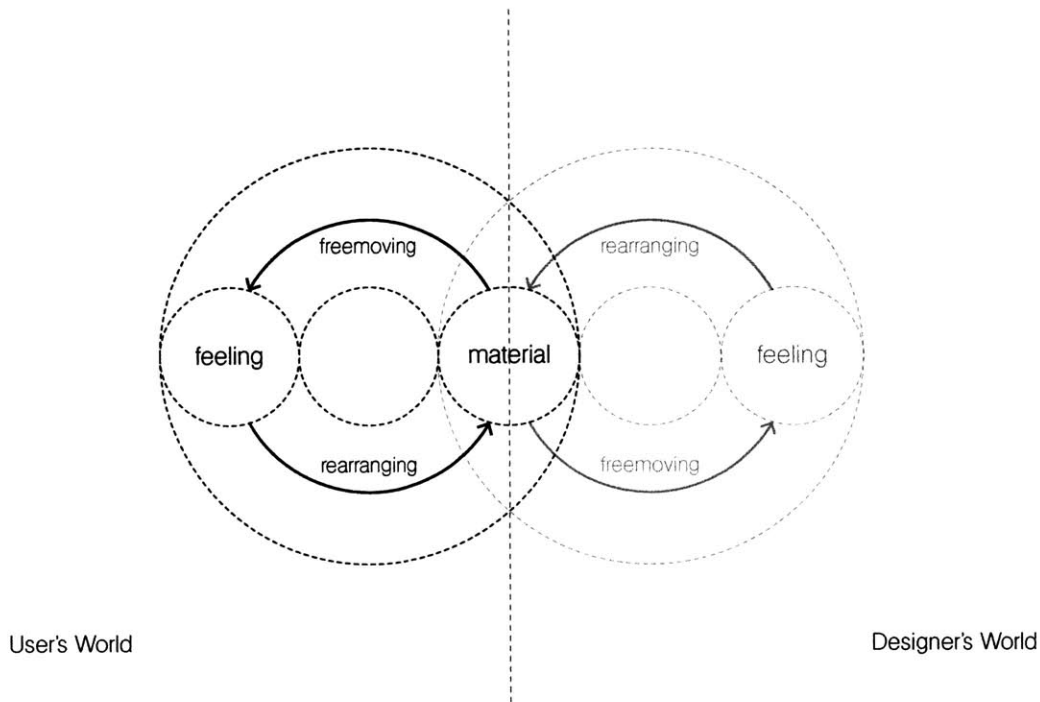
6.2. Designing for Another

I use the Collective Principles to begin building my Transformational Model, a set of words and a diagram I can use as means to bring forth my own new experience in design and observe the experience of the person I am designing for. As I am designing, I rearrange materials, freemove with them, and then deliver the materials to another person and observe. However, I could also take a couple of moments to think about the experience of another person, express my experience to another person, and find a word to coordinate my experience with another person. My Transformational Model includes all these design moves, or operations. In the diagram, however, I only show the recurrent moves, namely Rearranging, Freemoving, and Observing.

My Transformational Model is based on my Mindful Vocabulary and my Experiential Model. Consequently, I build this new diagram by extending the diagrams from the previous Foundations to the collective domain. In this new diagram, I am including all the words, lines, and shapes from the

| Figure 6.3 |

Google and Smartphone appearing in year 2000 (Source Google Ngram-Viewer)

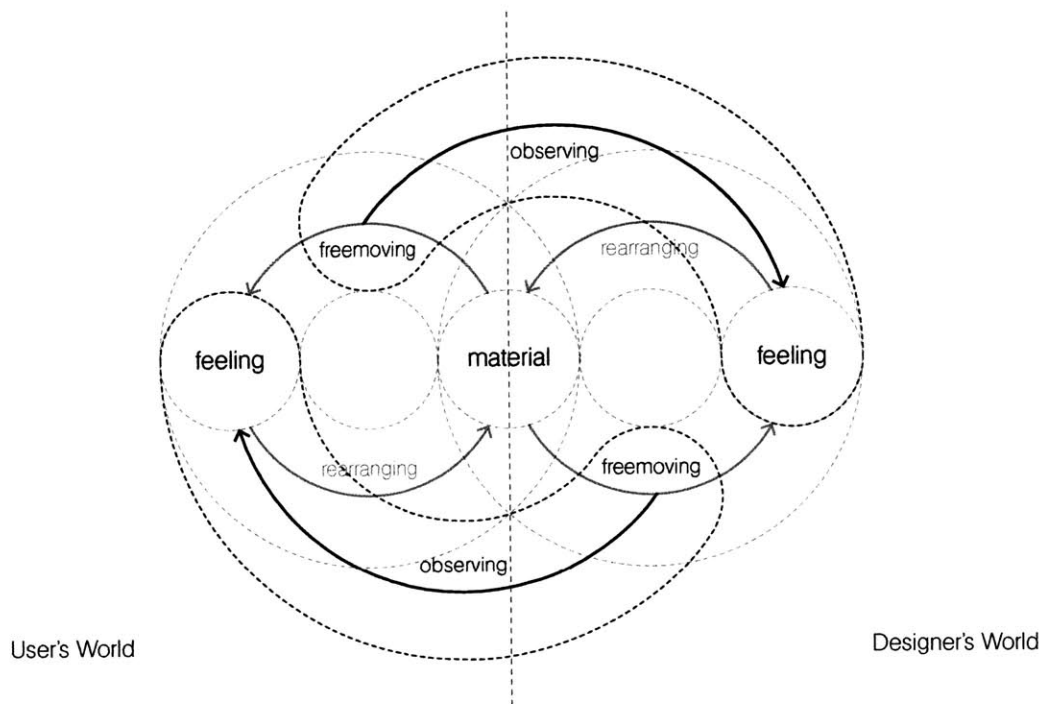


| Figure 6.4 |
Two Individual Loops

previous diagram. There are only two differences. First, I am duplicating the previous diagram by including two individual loops, with the experiential moments of both, the designer and the person she is designing for (Fig. 6.4). Second, I am adding a collective loop with two complementary experiential moments, as the designer and the other person are observing one another (Fig. 6.5).

When describing the model, I call *user* the person the designer is designing for. However, this person can be a client, a professor, a collaborator, or anybody to whom the designer delivers or expects to deliver the materials. Also, when describing the model, I become an *observer* looking at the *designer* and the *user* from a distance, without actually feeling what they are doing. However, when I am not describing but actually practicing my model, I become part of the loop and live the world of the designer or the world of the user. In both worlds I feel myself rearranging the materials, freemoving with them and, then, observing the other person sensing and moving with the materials.

In my model, both designer and user rearrange, freemove, and observe. As a user, I keep rearranging the materials that the designer began putting



together. I may buy and move the furniture, paint the walls, open the doors and windows in different ways, and even demolish or build a new wall. In this sense, you may be wondering about the differences between the designer and the user.

People in the design community talk about the *designer* as a creative person who is making something, or planning to make something, and they talk about the *user* as a generic person who is going to receive this something⁷. In my model, I use the same labels—designer and user—as a means to be heard by the people in this design community. However, my invitation is to consider them both as equally creative agents, and to become aware of who is making the distinctions between the two.

For me, the main difference between the two, is that the designer is aware that she is a designer, and that the user is not aware that he is a user. The distinction between designer and user only arises from the point of view of the person who consider herself a *designer*, and who consider the other person to be the *user of her design*. Consequently, as I am practicing my model,

| Figure 6.5 |

Collective Loop (Observing)

⁷ For an historical account of the designer's and user's role in design theory since the 1970s, read (Vardouli 2015)

there is no problem in considering myself a *designer* and the other person a *user*. I only need to be aware that the other person is also a creative agent, and that I am the one distinguishing between these roles.

Collaborative Moves

As I am rearranging materials and freemoving with them, I may want to deliver the materials to another person, and then observe how this person is sensing and moving with them. Delivering and observing are the collective design moves, or operations, that I need for designing in this way. These design moves, however, are performed by me and by the person I am designing for, as we are responding to one another in design. Consequently, I call them the *Collaborative Moves*.

I may have different reasons to deliver my materials. I may have brought forth an experience that I like, and want somebody else to try things out; I may have a deadline and run out of time; or I may be tired and confused and need feedback to keep going. Whichever is the case, when I deliver the materials there is always an encounter between me and the other person, an encounter mediated by the materials. In my model, this encounter does not mean that the design process is over. Quite the contrary, through this encounter the other person and I are actually nourishing the process by learning from one another. We are both bringing forth our own individual experiences and transforming in response to one another. The other person may sense and move in a way I am not expecting and, consequently, I may want to try things out differently in the next iteration⁸.

While Rearranging and Freemoving are the individual moves that I can perform to learn, practice, and teach design as an exploratory process,

⁸ An example of how designers learn from their users can be found in the development of the *Scotch Tape*, which was originally conceived to mend books. Donald Schön, a design theorist, describes, "When 3M put the product out into the market, they discovered that mending books was not the only use that people had in mind. People did bizarre things with Scotch Tape: they wrapped packages, hung posters on the wall, used it to put their hair up in rollers. And then, 3M began to observe what these consumers were doing, and their staff started rethinking the product in the light of what they were getting back" (Winograd 1996, 177).

Delivering and Observing are the collective moves that expand this exploration exponentially by allowing me to learn freely from the other person's unique and natural creative response.

Both Collaborative Moves are actually doings, or actions of body and mind. However, while delivering focuses on the *moving* dimension, observing focuses on the *sensing* dimension: paying attention to the other person moving with the materials using my sense-organs (body, nose, ears, tongue, eye). I describe Delivering as sensing my body and the materials as I am placing them in front of another person, so that the other person can do and feel something with them.

In my model, Delivering does not include talking or writing to tell the other person how to move or what the materials *are* (the labels). Delivering is silent, which gives space for another person's creative response without preconceptions about what to do and feel with the materials. I describe Observing as *seeing* the other person's movements with the materials—a seeing that is nonjudgmental and generous, open to *see* the movements in new ways by giving space for something unexpected to arise. However, this *seeing* involves all senses: I can use my eyes to observe, but I can also touch and hear what the other person is doing, as well as smell and taste.

Delivering

Sensing my body and the materials as I am placing them in front of another person

Observing

Seeing (using all our senses) the movements of the other person without expecting a predefined movement

Co- Ancillary Moves

As I am designing for another person, I may stop rearranging, freemoving, or observing to take a couple of moments to do something else: think about the experience of another person, express my experience to another person, and find a label to coordinate my experience with that of another person. Thinking, Expressing, and Naming are ancillary design moves that become collective when I am designing for or with another person. And, consequently, I call them the Co-Ancillary Moves.

I write about these design moves by extending the Ancillary Moves from the previous Foundations to the collective domain. Thinking becomes about sensing thoughts (sense-objects) about another person's experience. Expressing becomes about describing my experience to another person in

Thinking about Another

Sensing thoughts (sense-objects) about another person's experience

Expressing to Another

Describing to another person what I feel and do

Naming with Another

Making up label and telling this label to another person

Transformational Design

terms of my vocabulary. Naming becomes about making up a label and telling this label to another person to coordinate my experience with this person's experience.

Thinking about Another

In my model, as I am designing I do not actually need to be thinking, because I am bringing forth new experiences spontaneously by rearranging materials and freemoving with them. However, I can still think about the experience of the person I am designing for, and do it in a skillful way in order to nurture my hands-on and exploratory design process. In my model, I describe three skillful ways to think about another person's experience: *Intention, Reflection, and Projection.*

When I am designing for another person, Intention is thinking about momentary, flexible, and ambiguous goals or desires regarding another person's experience (in terms of my Mindful Vocabulary and Collective Principles). For example, my goal could be the other person's well-being, desiring this person to feel peasant sensations when moving with the materials that I am rearranging.

When I am designing for another person, Reflection is thinking about the experience I am bringing forth in consideration of another person's experience (in terms of my Mindful Vocabulary and Collective Principles). For example, as I bring forth a new experience I can take a moment to ask myself about how another person would respond to this same experience. I cannot know the experience of another person, but I can still *ask myself* whether another person would feel what I feel if that person were in my shoes.

And when I am designing for another person, Projection is thinking about possible ways the other person could move with the rearranged materials (in terms of my Mindful Vocabulary and Collective Principles). For example, by seeing several *images* of the other person moving with materials (using my mind's senses) I can explore different doings.

Intention

Thinking about momentary, flexible, and ambiguous goals and desires regarding the experience of the person I am designing for

Reflection

Thinking about the experience I am bringing forth in consideration of another person's experience

Projection

Thinking about possible ways the other person could move with the materials that I am rearranging

Questions for Intention

What feelings and doings may be important to the other person?

What do I wish the other person to feel and do?

Which feelings and doings of the other person would I want to change and which conserve?

Questions for Reflection

Would the other person like to experience what I am experiencing?

Is this new experience changing or conserving what I intended to change and conserve?

Questions for Projection

How can the other person move with the materials that I am rearranging?

Expressing to Another

In my model, as I am designing I do not write, talk, or draw the *materials* but rather I use these means to express my experience: a sequence of experiential moments, as they arise and fade away. I express the doings as bodily postures changing from moment to moment (sensing and moving), and the feelings as a complex of bodily sensations (sensory and emotional).

When I design for and with another person, we can express our experiences to one another. As a designer, I can produce my own expressions and ask for feedback, but I can also read the expressions of another person and alter the course of my design process according to what I read, listen, or see. Expressing, as part of a conversation, manifests itself in different moments where the designer and the person she is designing for encounter, observe, and talk to one another.

As a designer, I can express in three ways. First, after freemoving and bringing forth a new experience, I can write, talk, or draw what I feel and do. Second, I can go to the field and observe another person sensing and moving with materials, and I can write, talk, or draw what I observe. And third, I can complement the design move of Thinking. As I am projecting possible ways the other person could move with the materials, I can write, talk, or draw what I am sensing with my mind. However, I do not think and then express, but rather I think in response to what I express, and vice versa.

The person I am designing for can also express in three ways. First, I can ask him to live an experience, and then to write, talk, or draw what he feels and does. This experience can be a felt activity that I am interested in, such as going to the park, or having dinner, or touching a flower. However, more importantly, this experience can also be freemoving with the materials I am rearranging. Second, I can ask him to think about an experience he has lived before (remember), and then to write, talk, or draw what he senses with his mind. And third, I can ask him to think about an experience he would like to live (project), and then to write, talk, or draw what he senses with his mind.

All these expressions, however, are only descriptions of an experience and do not replace the actual experience. They are only materials I can use as

evocations to talk about experience within myself and with others. Then, I can learn from these evocations, inform my design process, and try new things in the next iteration. However, this does not mean I am objectifying and capturing either my own experience, as designer, or the experience of the person I am designing with and for.

Naming with Another

In my model, as I am designing I rearrange materials and move with them freely without trying to make *things* I already know (bicycles, houses, and smartphone). I do not attempt to design these *things*, because as I am bringing forth a new experience these *things* would disappear anyway. That is, I would not be able to recognize the materials as *things* that I know, and I would have to come up with a new label for them.

When I design for another person, the materials may not be recognized by the other person either, and we will have to come up with a new label together. As a designer, I can make up a new label myself, or ask the other person to do so. Whoever names the materials does not really matter. What matters is the encounter, where we tell each other the label for the materials as we are delivering them, moving with them, and observing one another. In collective design, Naming is not only about making up a new label but also about telling each other this label. I can say or write the label after I deliver, after the other person freemoves, or after I freemove.

However, as labels may evoke known experiences, is better to tell each other the labels by the end of the encounter, after delivering and observing one another in silent. The other person and I can then move freely, and observe one another without preconceptions about what to do and feel with the materials. For example, after observing the other person sensing and moving with the materials, I may see something I was not expecting, and I may want to make up a new label once more.

In a way, Naming crystalizes my collective design process, at least momentarily. Because through the encounter where we name and tell each other the labels, the materials begin to *emerge* for both of us. I can begin recognizing, thinking, and talking about a *thing* (a label) I have never experienced

before. The other person can begin recognizing, thinking, and talking about a *thing* (a label) he or she has never experienced before. However, this does not mean we are sharing the same experience, but rather it means we are coordinating our individual experiences around what we are saying or writing to one another. In terms of my Collective Principles, we are basically dancing together with our own individual experiences but transforming in response to one another.

In my model, however, this coordination is also impermanent. Even though through naming the materials we begin coordinating our experiences, the other person and I could still move with the materials in a different way. And, as we are doing so, we will have to name the materials and coordinate our experiences once more. Again, the problem is neither using labels, nor speaking or writing about them. The problem is starting with known labels and sticking with them.

6.3. Streams of Collective Design

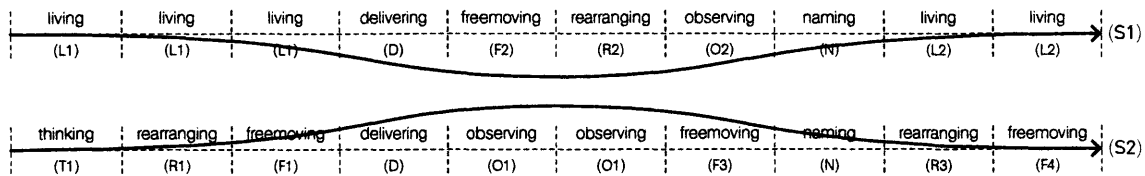
My description of collective design, so far, has referred to four particular moments where I feel what I am doing with materials: I feel myself *rearranging* materials, *freemoving* with the materials, *delivering* them to another person, and *observing* the other person *freemoving* with them. What I feel when I am designing for another person corresponds to a sequence of experiential moments, each one of them arising, staying for a while, and fading away, one after another: designing for another person is a Stream of Experience. However, through observing the other person's movements, I also realize that another sequence of experiential moments is taking place. That is, another person's stream *arises* within my own stream because I am *observing* what another person is doing. I call these two sequences the *Streams of Collective Design*. In collective design, although these two streams are individual and do not mingle, they unfold next to one another, affecting each other's courses in a coordinated dance.

These streams do not replace my diagram, but rather complement it by unfolding the loops and allowing us to observe, talk about, and compare the

details and nuances of the design experience of both, the designer and the person she is designing for. As an external observer, I can compare in parallel the experiences of the designer and the person she is designing for. And, as a designer, I can use the stream as a way to express the experience I observe another person is undergoing or imagine an experience I want him to undergo. Even though I use this stream to express, talk about, and compare design experiences in the collective domain, the stream does not replace the actual experience of design. The stream is only an abstraction that allows me to explain how the experience of design changes from moment to moment.

In Figure 6.6 you can see the stream of the designer (S1) and the stream of the person she is designing for (S2). From a third person's perspective, I can observe the doings of both and how they affect each other's courses in a coordinated dance. I can observe what they do with materials from a distance and make sense of what they feel according to my own feelings. These two streams, consequently, actually appear in a third stream: my own sequence of experiential moments as an observer seeing and hearing the doings of the designer and the person she is designing for. The designer and the other person live their own separate experiences, but after a while they encounter each other in a space where the designer delivers the materials and where both freemove and observe one another. I illustrate this encounter by modifying the courses of the streams (Fig. 6).

Before they encounter each other, the designer thinks about design intentions (T), rearranges materials for a couple of moments (R1), and then freemoves with them (F1). While she does so, the person she is designing for is living his life (L1). When they meet, however, both streams affect one another: the designer delivers the materials (D) and the person she is designing for freemoves (F2) and rearranges them (R2) while the designer observes (O1). Then the designer freemoves as well (F3) while the other person observes (O2). Finally they name the materials together (N) and continue their own separate streams. After the encounter, the designer rearranges (R3) and freemoves (F4) according to what she learned from the other person. The other person continues his life, but now according to what he has learned from the designer (L2).



| Figure 6.6 |

Streams of Collective Design

Even though my diagram is symmetrical, the Streams of Collective Design demonstrate the differences and nuances between the individual experiences of the designer and the person she is designing for: both streams include *rearranging*, *freemoving*, and *observing*, but the way they unfold from moment to moment may be different. The designer is actively designing before the encounter and, therefore, she rearranges and freemoves on more occasions than the person she is designing for. Also, the designer is explicitly designing for another person and, consequently, she thinks about goals, reflects, and imagines throughout her stream in terms of the other person.

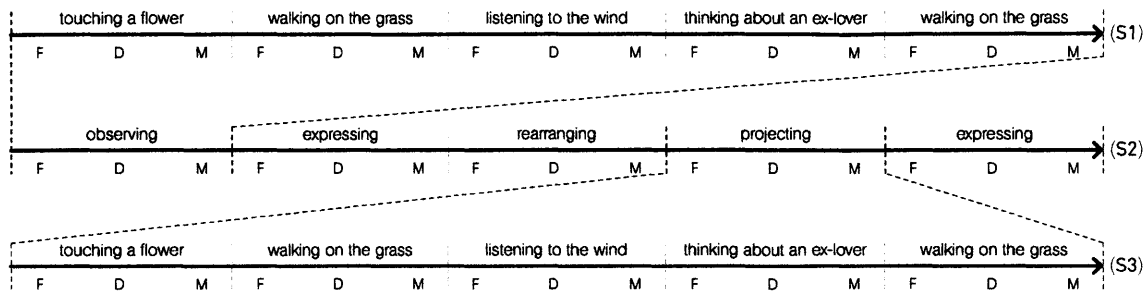
As a designer, I can also observe, think about, and express the Stream of Experience of the person I am designing for. I can go to the field to observe what my user or client is doing (moving, sensing, thinking), and take notes, photographs, and record video. I can even interview another person and ask him about his stream of experience. I can also stay in my design studio and project the stream of experience of another person using my mind's senses. For example, I can see (with my mind's eyes) another person freemoving with the materials I am rearranging. In both cases, I can use the stream as a means to express what I observe or project by drawing or writing down the sequence of experiential moments, in terms of my Collective Principles and Mindful Vocabulary: another's doings, another's feelings, and another's materials.

In Figure 6.7 you can see three Streams of Collective Design: another person's observed stream (S1), my own stream as a designer (S2), and another person's projected stream (S3). However, these three streams are actually part of a unique stream: my own sequence of experiential moments as a designer, where observing, projecting, and expressing are part of my own individual experience (S2). In other words, the experience of another person

appears through my own experience. This unique stream does not mean I cannot, as a designer, observe or project the experience of another person. Quite to the contrary, this unique stream is allowing me to actually observe and project, and then express, talk, and reflect on the experience of others in design.

You may argue that the designer and the person she is designing for do not always encounter each other in the same space for delivering, freemoving, and observing one another. However, as part of a culture or network of conversations, the designer and the person she is designing for are still altering the courses of each other's streams without delivering and observing each other directly. What happened when Steve Jobs showed the iPhone for the first time? He was moving around a stage, freemoving with the rearrangement of materials (named iPhone) while millions of people were observing what he was doing and saying (in the theater or through the television or internet). Steve Jobs and the people he was designing for were actually coordinating their experiences by freemoving, observing, and naming the materials. In this case, however, the encounter was unidirectional, and Steve Jobs missed the opportunity to learn from his users. This learning process occurred nonetheless because design is an open-ended process of transformation. The iPhone did not appear from nowhere, this rearrangement of materials is part of a history of experiential transformations involving different ways of living with and communicating through materials: the telegraph, the phone, the computer, the personal computer, the cellphone, the internet, the iPod, the touchscreen, the iPhone.

In a culture, multiple streams are running in parallel, altering one another's courses in a chain: one stream affects another stream, which affects another, which affects another. The designer may deliver her materials to one person, who may freemove and show to another person what to feel and do with these materials. The Apple design team may design the new iPhone 10, and then may deliver these materials to me. I buy an iPhone for my mother and show her what to do and feel with the materials. And while moving I say: "Look mom, *this* is called an iPhone, you can press here and talk to me like you do with your regular phone, but you can also press here and also write me emails like you do with your computer." What is happening here? I am



delivering the materials, freemoving with them, while my mother observes, learns, and transforms. While this is happening a lot of people are buying iPhones for their mothers and coordinating their experiences as well.

Then, the Apple user-experience team comes to town and observes what *mothers* are doing with their iPhones. These researchers then tell the Apple design team what they have observed: “Mothers write their daily activities on their iPhones, we suggest designing a Diary App.” Even though the designer from the Apple design team did not actually encounter a mother to deliver the materials, through the network of conversations or parallel streams, delivering, freemoving, observing one another, and learning from one another was still happening.

| Figure 6.7 |
Observing and Projecting Another's Stream

7. Transformational Game

In this chapter, I introduce an exercise in which a minimum of two participants—a user and a designer—play by producing and exchanging expressions of experience and materials: the user draws an experience he wants to live, and the designer responds by rearranging materials. I call this the Transformational Game. This exercise is part of the Third Foundation of Transformational Design, wherein I put my second model into actual practice and integrate the exercises from the previous two Foundations into a collaborative design process.

This exercise is partially inspired by the Toolmakers Paradigm, a fictional story wherein people isolated in different worlds exchange sets of instructions for making things, without being able to see one another, visit each other's worlds, or exchange samples of the things they construct (Reddy 1993, 292). While the story describes how people communicate by actually having to spend some *energy* talking to one another, my game explores how participants design together by having to spend some *energy* observing and learning from one another.

You will learn about this game through reading words but also through observing images of people doing things: drawing on their canvases, cutting cardboard, delivering their materials, and moving with them in front of one another. First you will encounter the setup of the game, including its phases and rules, so that you can practice the exercise directly or conduct the exercise with other people. The phases of the game are *Learning*, *Expressing*, *Designing*, and *Demonstrating*. Next, you will encounter the evidence that resulted from two exercises: one in which participants played in a Bi-directional Sequence and one in which they played in a Circular Sequence, both of which I developed as different flows of exchange between users and designers. Finally, you will encounter the findings of the game: for both

users and designers there is a mismatch between what they want or intend to experience and what they actually end up experiencing.

The evidence consists of my own observations, after documenting the exercises by writing notes, taking photographs, and recording audio and video. The findings consist of my own reflection on the evidence in the light of having directly observed people participating in the exercise.

While in the previous exercises I was exploring my vocabulary and first model separately, in this third exercise I began putting everything together. Through this last exercise, I wanted to see how certain concepts of my vocabulary and certain design moves are taken up and used by the participants, and whether they are useful for them as a means to design for one another. That is, I wanted to see whether people can express their experiences to one another; whether they can use another's expression to rearrange materials; and whether they can observe one another moving with the materials to begin reflecting on one another's transformations. For this exploration I also developed a laboratory—a spatial configuration for playing the game.

7.1. How to Play

In this section, I explain how to play the Transformational Game, which is a playful, iterative, and collaborative process where players apply my Transformational Model. The model is a symmetric diagram that includes the individual and collaborative design moves. In the game, a minimum of two players—a user and a designer—follow the model's moves in an iterative process in which both players *win* by designing together and learning from one another.

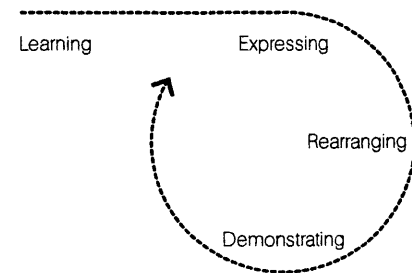
The role of the user and the role of the designer can be played either by one individual or by a team. My model describes the design process involving a couple, one designer and one user. Consequently, the advantage of having the roles played by individuals is that it is easier for the person running the exercise to observe closely the model in action. On the other hand, the advantage of having the roles played by teams is that the person running the exercise can observe and listen to how participants engage and talk to

one another, which can be used as complementary evidence. Still, when players work in teams, they are engaging in their own personal streams, feeling themselves expressing or rearranging.

I organize the game into four phases: *Learning*, *Expressing*, *Rearranging*, and *Demonstrating*. In the first phase, participants are introduced to the general concepts and the specific format of the game. In the second phase, participants begin the game by playing as users: they express an experience they would like to live it, fill out their canvases, and deliver them to their corresponding designers. In the third phase, participants become designers: they put materials together to bring forth an experience according to the canvases the users have given them. In the fourth phase, designers deliver the final rearrangement of materials, and both designers and users freemove with them, and observe one another.

While the first phase sets up the game, the other phases constitute the actual game. Participants learn the general concepts and specific format of the game only once at the beginning and then iterate between cycles, or *game rounds*. Each round is comprised of three phases, namely *Expressing*, *Rearranging*, and *Demonstrating*. Every new round becomes a response to the previous round (Fig. 7.1). That is, the *Expressing* Phase (from the new round) becomes a response to the *Demonstrating* Phase (from the previous Round). The game is open-ended and can be played in any number of rounds with a minimum of one complete round.

In the *Learning* Phase, participants are introduced to my Transformational Model (Fig. 7.2), which includes explaining my Mindful Vocabulary according to my Collective Principles (another's feelings, doings, and materials). The model, vocabulary, and principles can be explained by drawing the diagram on a whiteboard, with the design moves of both players, the designer and the user. And then describing these moves in terms of the Primary Categories: I feel myself rearranging materials, freemoving with them, and then delivering them to another person and observing. In this exercise, participants are also introduced briefly to the Ancillary Moves (Thinking, Expressing, and Naming).



| Figure 7.1 |
Phases of the Game

Phases of the Game

1. *Learning*

Players are introduced to my Transformational Model and are informed about the format of the game

2. *Expressing*

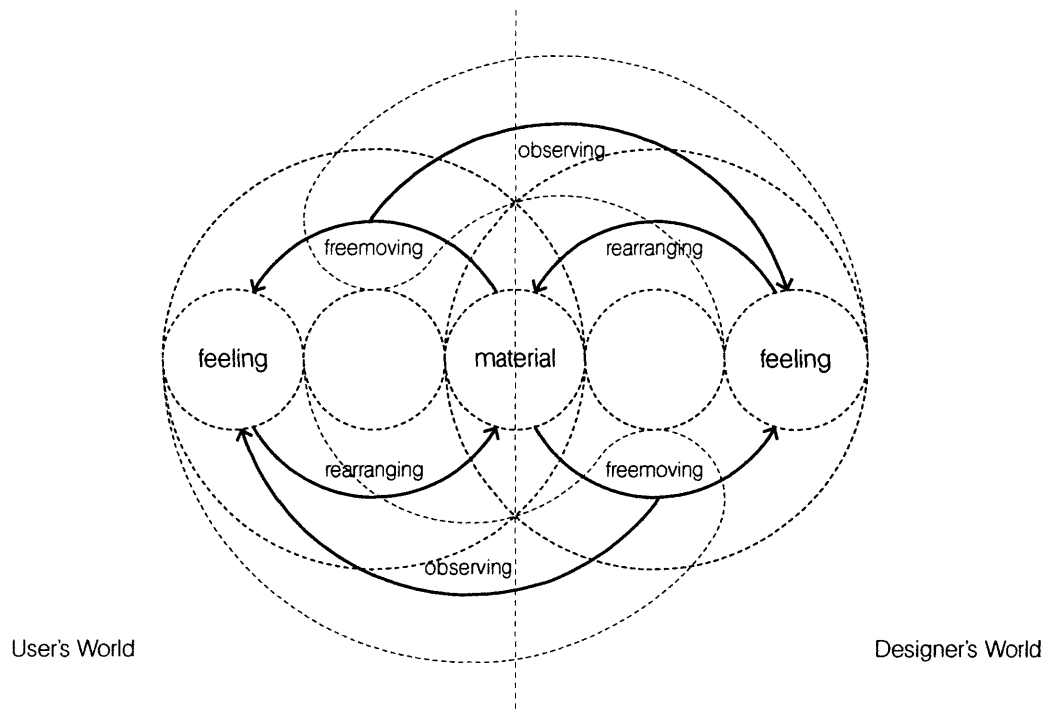
Users express an experience using the canvas, and then deliver the canvas to their corresponding designers

3. *Rearranging*

Designers respond to the canvases given to them by putting materials together and freemoving with them

4. *Demonstrating*

Designers deliver the final rearrangement of materials, and both designers and users freemove with them, and observe one another



| Figure 7.2 |
Transformational Model

The game does not require participants to have practice in mindful awareness or in design. Consequently, regarding mindfulness, in this phase it is necessary to explain how to become present and direct our attention to the senses, movements, and sensations. Regarding design, in this phase it is necessary to clarify that the model is just a model and that design is learned by practice.

After being introduced to my model, participants are informed about the format of the game: the sequence, teams, working place, type of canvas and materials. The game sequence refers to the order of and relationship between users and designers. There are two types of sequences, circular and bidirectional; for example, between four players or four teams of players A, B, C, and D (Fig. 7.3).

The sequence is circular when players organize in a circle and become users for the players positioned behind them and designers for the players positioned in front of them. For example, when A is user for B and designer for D (player before A in a circle). The sequence is bidirectional when two players (or team of players) become users and designers for one other. For example, when A is user for B and B is user for A (in the Expressing Phase),

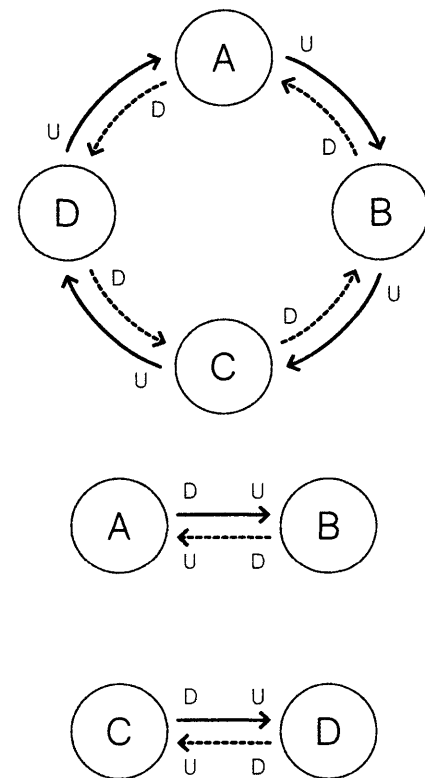
and then when A is designer for B and B is designer for A (in the Rearranging Phase).

Defining the sequence requires separating the participants into individual players or team of players and labeling them (A, B, C, and D, for instance). Moreover, the type of sequence defines the layout of the working place, since players cannot work next to their corresponding users or designers. For example, for a bidirectional sequence A has to be separated from B, and for a circular sequence A has to be separated from B and D.

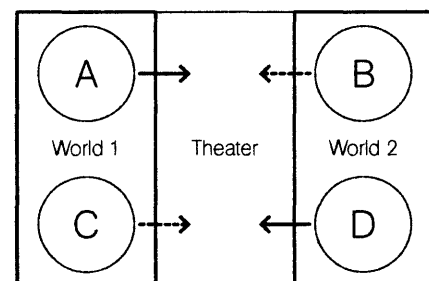
The Transformational Lab is a spatial configuration I developed to separate the players according to the game sequence (Fig. 7.4). This configuration includes two *Worlds* and one *Theater*. The Worlds are two separated spaces, World 1 and World 2, with tables and materials (for expressing and rearranging) where users and designers work separately without talking or observing one another. The Theater consists of a clear, empty space where users and designers come together to deliver their expressions and designs in silence. These three spaces can be organized using mobile panels, screens, or whiteboards. By rearranging the divisions, the same space can become the two Worlds or the Theater as needed.

The canvas is a means for players to graphically express their experience to one another in terms of my vocabulary—doings, feelings, and materials. In the game, participants either express using the Guided Canvas or the Free Canvas.

The Guided Canvas is an open-ended strip with empty frames, with an emotional graph above the strip and a body mapping below the strip. In this version of the Guided Canvas, I do not include the category chart at the bottom (Fig. 7.5). The Free Canvas is a piece of paper or tracing paper with no template, which allows participants to draw their doings and materials, and color their feelings as they want. I include this last version so that players can express freely without a template, and play the game even if they do not have the Guided Canvas (Fig. 7.6).

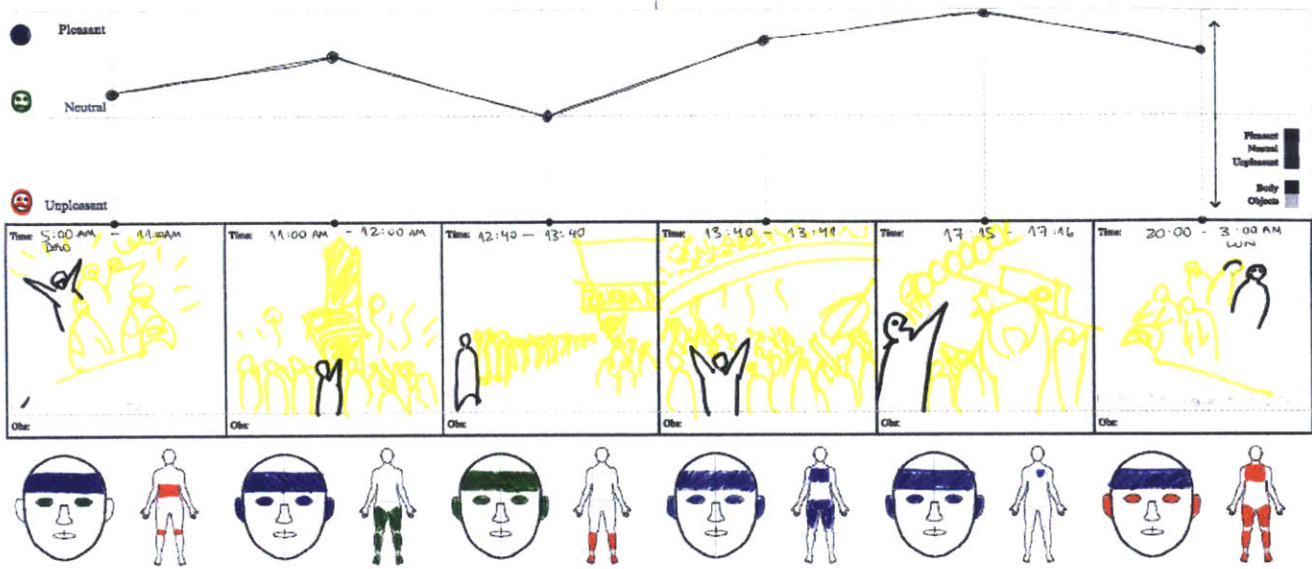


| Figure 7.3 |
Circular Sequence (top)
Bidirectional Sequence (bottom)

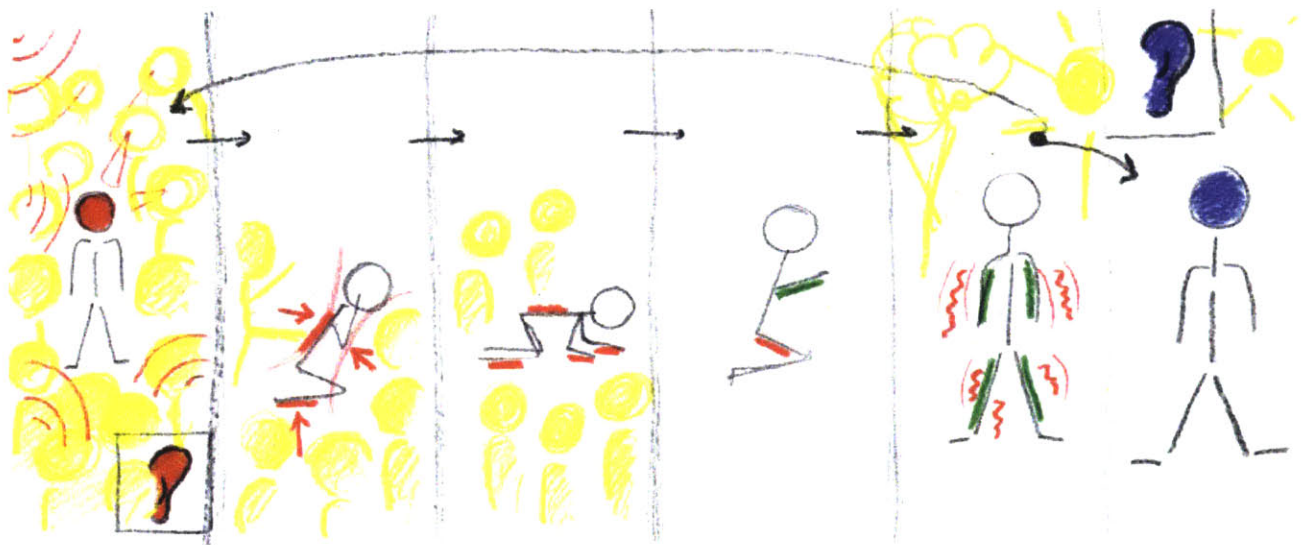


| Figure 7.4 |
Transformational Lab (World 1, Theater, World 2)

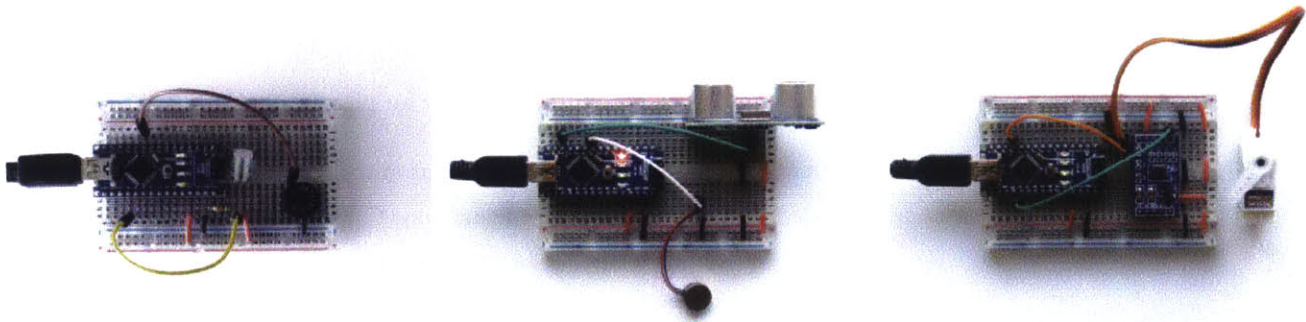
Transformational Design



| Figure 7.5 |
Example of Guided Canvas



| Figure 7.6 |
Example of Free Canvas



| Figure 7.7 |
The Screen-based Toolkit

The game materials are of two kinds, interactive materials and recycled materials. For the exercise, I develop a set of interactive materials, which I call the Screen-based Toolkit (Fig. 7.7). These materials include a microcontroller (Arduino Nano on a breadboard), three sensors (pressure, distance, and acceleration) and three effectors (buzzer, vibration motor, and servomotor). These materials can only be programmed visually by interfacing with the screen of the computer and writing text (code) in English. The recycled materials are everyday supplies that players encounter in their worlds (cardboard boxes, bottles, cans, newspaper, and fabric). The game is played with recycled materials as a way to avoid producing waste as a result of the activity (by reusing waste already produced).

The game begins with the Expressing Phase, where participants in the studio (World 1 and 2) play as users: They express an experience by talking about an experience they would like to have and filling out their canvases. While producing a canvas participants play as users, and when receiving a canvas from another player they play as designers (in the Rearranging Phase). Although participants know their corresponding designers will be responding to their canvases, they are asked to draw their canvases freely, expressing any experience they would like to live. In other words, they are told not to think about an experience according to what their designers may or may not be able to propose.

The Guided and Free canvases both share the same rules, which I call Rules for Expressing. These rules assign the order and color for expressing the feelings, doings, and materials within an experiential moment. Participants

begin drawing their doings in black, as bodily postures. Then, they continue drawing the materials in yellow, as background or support for the doings. Finally, they color the feelings on top of the bodily postures, using red for unpleasant, green for neutral, and blue for pleasant sensations.

In the Rearranging Phase, participants in the studio (World 1 and 2) play as designers: they receive the Experience Canvas from their users and respond by putting materials together and trying things out by freemoving (moving their bodies) with them. The materials they rearrange are interactive materials (the Screen-based Toolkit) along with recycled materials (cardboards, bottles, paper, cans, aluminum foil, and tape). The game is played with recycled materials to reuse a waste already produced, which avoids producing more waste during the exercise.

Although participants design by responding to their users' canvases, they are told to design freely and to use these canvases only for *intention* and *reflection* (my model's *thinking* moves). In other words, they first think about design *intentions* and then, putting these intentions aside, they engage in a spontaneous design process by bringing about unexpected experiences. Finally, they *reflect* by comparing their original intentions with what they actually experienced.

In this phase, participants follow the Rules for Rearranging, which promote a mindful design process based on rearranging and freemoving without using visual representations (drawings or digital models). They play without visual representations so that they can explore the materials directly with their bodies, without having to draw them first. I suggest explaining to participants that designing is like cooking without a recipe, where the chef mixes and tastes the ingredients (she has available) again and again, until she likes what she tastes or runs out of time for dinner.

Finally, in the Demonstrating Phase, participants gather together in the theater and without talking they play as users and designers in turns: first, designers deliver their rearrangements of materials to their users, second, users freemove with them while designers observe, and then designers freemove while users observe. Throughout this process of improvisation and observation, users and designers are allowed to examine the canvas.



Rules for Expressing

(For User)

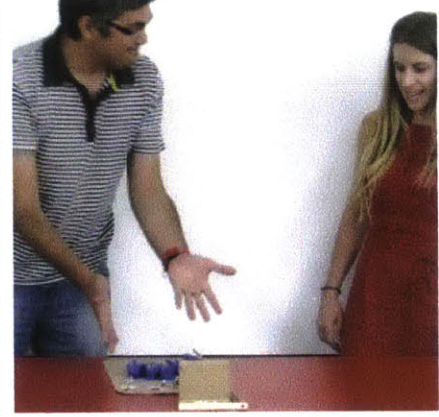
1. Project an experience you want to live
2. Draw your own doings as bodily postures (use black)
3. Draw the materials that are part of that experience (use yellow)
4. Color the feelings (sensory and emotional) on top of the doings (use red for unpleasant, green for neutral, and blue for pleasant)
5. Note that your drawing should express the most significant moments
6. Deliver your canvas to your designer in silence



Rules for Rearranging

(For Designer)

1. Observe your user's canvas to think about design intentions (before rearranging)
2. Rearrange materials freely according to what you can do and feel with them
3. Try things out by freemoving with the materials you have rearranged (and reprogramed) and pay attention to what you do and feel (be mindful)
4. Reflect on the spontaneous experiences you are bringing forth in reference to your user's canvas and initial design intentions
5. Note that visual representations of the designs (drawings or digital models) are not allowed
6. Note that you should not draw tags or signs on your materials (words, arrows, symbols) to indicate what to do and feel with them



Rules for Demonstrating

(For User and Designer)

1. (Designer) Deliver your rearranged materials in silence without telling the user what they are (labels)
2. (User) Freemove with the rearranged materials by doing and feeling something with them
3. (Designer) Observe what the user is doing
4. (User) Reflect whether you like the rearrangement or not
5. (Designer) Freemove with the rearranged materials by doing and feeling something with them
6. (User) Observe what the designer is doing
7. (User) Reflect whether you like the rearrangement or not
8. (User) Begin next round (Expressing Phase) by modifying your original canvas (when you want modifications) or by filling out a new one (when you want a new design)

In this phase, participants follow the Rules for Demonstrating, which define the doings and turns for both users and designers. Players demonstrate in silence, without giving each other explanations or labels for the materials. The purpose of the silence is to encourage each participant to try things out freely, without being prescribed by instructions or labels evoking experiences they know. The Demonstrating Phase completes one round of the game, becoming the driver for the next round, where in the Expressing Phase users modify their canvas or fill out a new one according to what they experienced and observed in the Demonstrating Phase.

7.2. Playing the Game

In this section, I present the evidence that resulted from two exercises: one where participants play in a Bidirectional Sequence filling out the Guided Canvas, and one where they play in a Circular Sequence filling out the Free Canvas. For both, Circular and Bidirectional sequences, I present evidence of two rounds played by two teams that are directly exchanging canvases and materials with one another (as users and designers).

In these two exercises, participants played in teams for technical and practical reasons. There was a limited number of toolkits, and I was the only one conducting, supervising, and documenting the exercise. Still, the advantage of playing in teams was that it offered me the opportunity to observe and listen to how participants engaged and talked to one another, which may be used as complementary evidence for further models.

The evidence consists of what *I observe* players doing from my own perspective, from a third-person position. I document the process by taking notes, photographs, and recording audio and video. For each example, I also include the context by describing the background and age of participants, the location where the game is taking place, and the type of hosting institution.

As I was developing Transformational Design, I was invited to conduct three-day workshops, one with professionals in a Business School and one with students in an Architecture School. I had already conducted the

previous two exercises of my foundations, and I was ready to explore the third exercise of my practice. Also, the time frame and type of participants specified by the invitations seemed appropriate for so doing. Consequently, I decided to use these workshops to begin completing the third foundation of my practice, trying out everything together –the vocabulary, models, principles, canvases, and interactive materials.

Circular Sequence

In the first exercise, participants play the game in a Circular Sequence. These participants are professionals in their mid-twenties and thirties, studying in the Masters of Innovation Program at the Catholic University of Chile¹. In this case, 23 participants play two rounds in 8 teams: A, B, C, D, E, F, G, and H (7 teams of 3 players and 1 team of 2 players). They play by expressing with the Guided Canvas and by rearranging the Screen-based Toolkit.

This game is played over the course of three days. On the first day, I teach participants my model, how to connect and reprogram the Screen-based Toolkit, and how the game is played (format). On the second and third days, participants play the actual game, completing one round per day. For each round, the Expressing Phase in completed is one hour, the Rearranging Phase in three hours, and the Demonstrating Phase in one hour.

In this section, I present evidence for one game (two rounds) played by teams C and D. In team C, participants are Caro, Borja, and Max, who play as users. In team D, participants are Consuelo, Francisco, and Ben, who play as designers. Participants in team C fill out the Guided Canvas to express an experience they want to live.

Exercise 5: Circular Sequence

Materials: Guided Canvas and the Screen-based Toolkit

Participants: 23 Graduate Students from Engineering, Business, and Administration

Institution: Master of Innovation (Catholic University of Chile)

Location: Santiago, Chile

Date: January 14 to 18, 2014

¹ This exercise was conducted with 23 participants as part of a workshop I taught in 2014 at the Master of Innovation of the Catholic University of Chile, in Santiago. This Master is an interdisciplinary graduate program held by the School of Administration or Business School. I was invited to teach design and electronics by Cristobal Garcia, a Chilean sociologist, professor at the Master of Innovation, and holding a Master of Science in Comparative Media Studies from MIT.

Then, participants in team D respond to that canvas by rearranging materials. I observed both teams throughout the game, took photographs, and recorded video and audio.

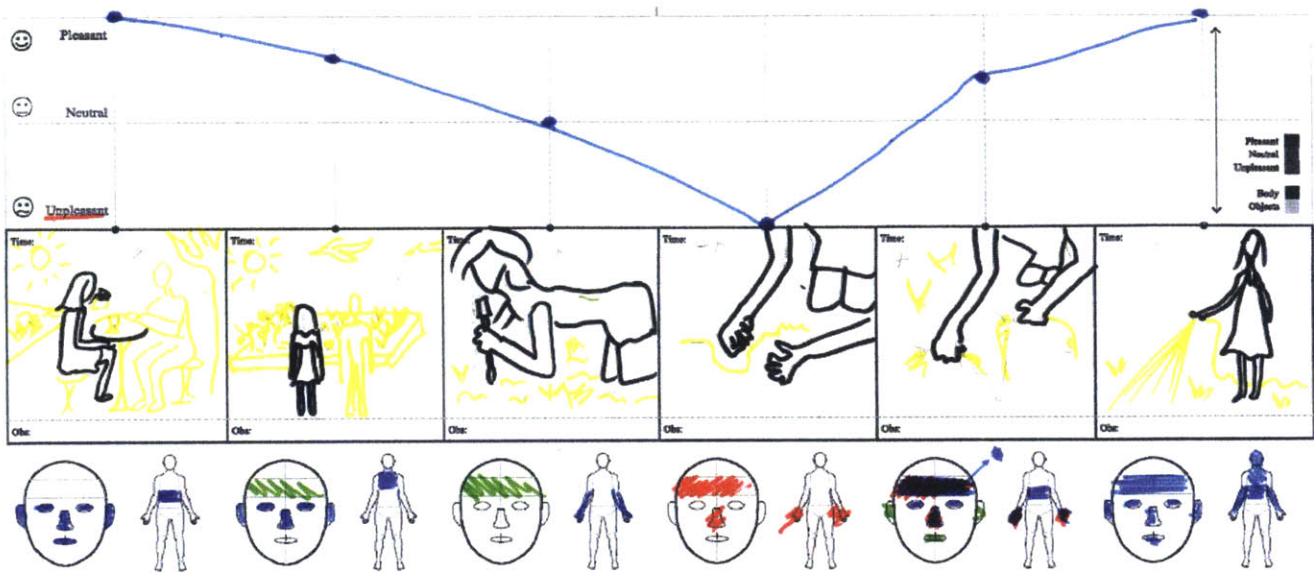
In the following section, I present the photographs and descriptions of what I observed. Then, I include a short description of the game played by participants from other teams to demonstrate that the evidence is consistent among participants.

Circular Sequence : First Round

In the Expressing Phase (First Round) the users in team C begin the game. Caro, Borja, and Max (the users) are in World 1, expressing an experience by filling out a Guided Canvas (Fig. 7.8). They are sitting on their desk and for a few moments they talk about the type of experience they would like to live.

They agree about wanting to feel calm and they talk about past experiences where they have felt calm. They decide to express a gardening experience, where they feel the touching of the ground, the smelling of the garden, and the tasting of the water. Caro is drawing the doings and materials, and coloring the feelings, while Borja and Max are observing and talking about what moments to express. Meanwhile, players in team D (the designers) are in World 2 and cannot see or hear what Caro, Borja, and Max are doing and talking about.

As you can see in Figure 7.9, Caro, Borja, and Max express a stream with six experiential moments. In the first two moments, they draw the whole body in black, and the space and another person in yellow. In the next three moments, they draw parts of the body in black, in a close and direct relationship to the materials, ground, and plants in yellow. In the last moment, they draw the whole body again in black and the objects and ground in yellow. They do not color the sensory or emotional sensations in the strip with the empty frames; instead, they color the body mapping below the strip. They also fill out the emotional graph at the top of the strip. The bodies on the mapping correlate to the points on the emotional graph.

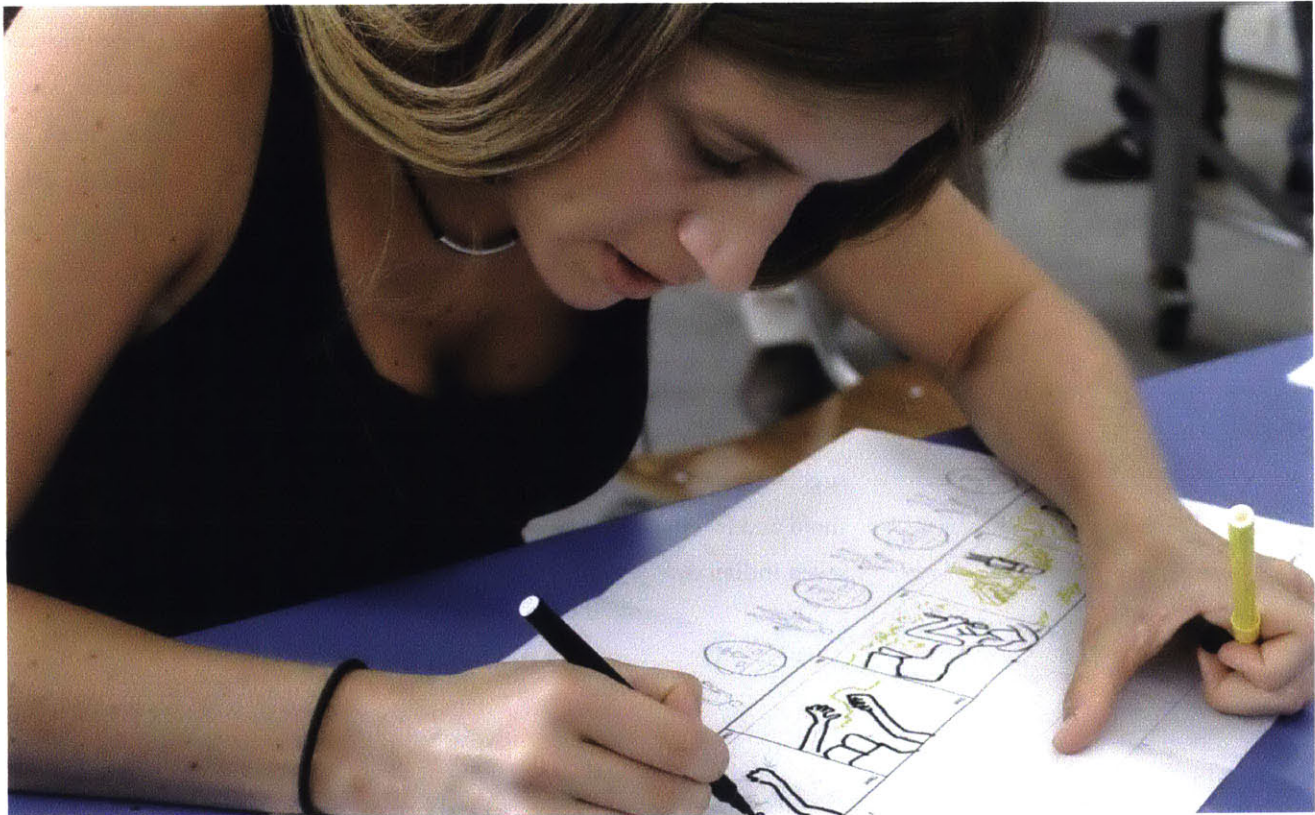


| Figure 7.9 |

Users' canvas (First Round)

| Figure 7.8 |

Users filling out the canvas (First Round)





| Figure 7.10 |

Users delivering their canvas to the designers
(First Round)



| Figure 7.11 |

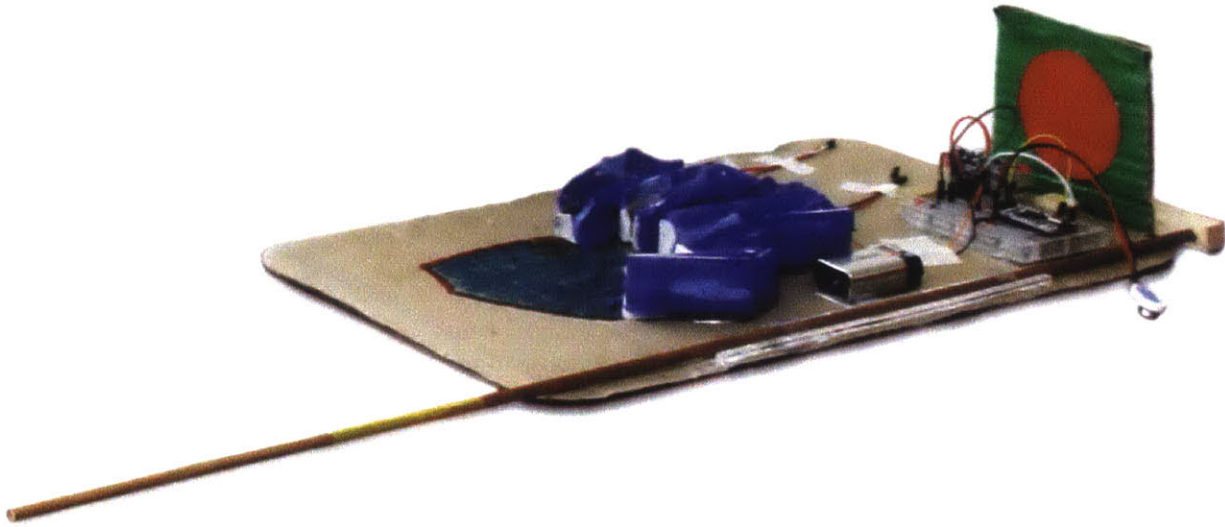
Designers reflecting on their users' canvas
(First Round)

After drawing and coloring their Canvas, Caro, Borja, and Max (the users) come to the Theater and deliver their canvas to Consuelo, Francisco, and Ben (the designers). In this example, participants play in a Circular Sequence and, therefore, Consuelo, Francisco, and Ben do not deliver their canvas to Caro, Borja, and Max, and have to wait for the next team in the sequence (Fig. 7.10).

Then, in the Rearranging Phase (First Round), it is the turn of the designers in team D. Consuelo, Francisco, and Ben (the designers) are in World 2 rearranging recycled and interactive materials. However, before rearranging they are sitting on their desk observing and talking about the canvas expressed by their users. (Fig. 7.11). They talk in terms of the different experiential moments, and the time and materials they have available. Meanwhile, players in team C (the users) are in World 1 and cannot see or hear what Consuelo, Francisco, and Ben (the designers) are doing and talking about.

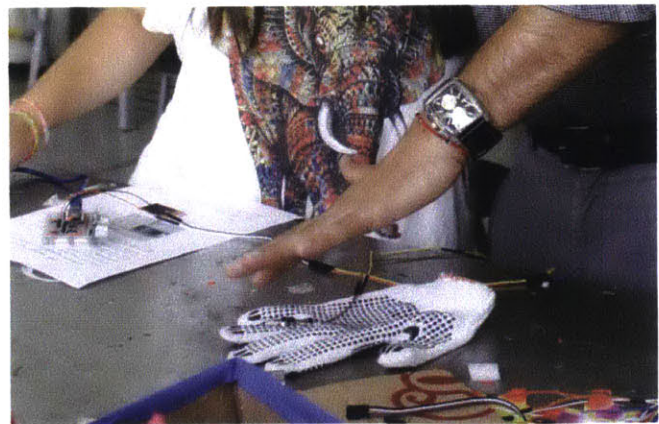
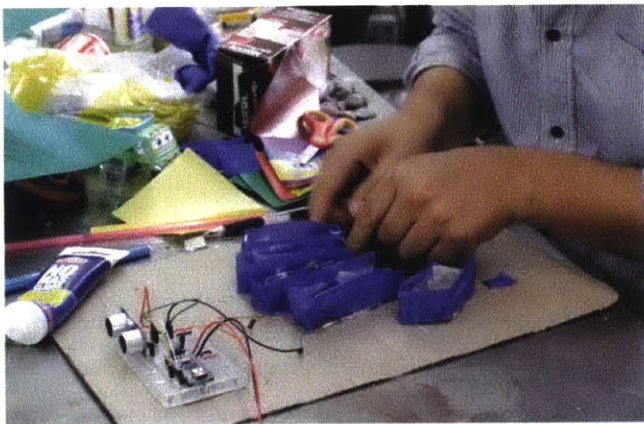
Consuelo, Francisco, and Ben respond by focusing on a couple of moments, on kneeling, getting close to the ground, and then touching and feeling pleasant and unpleasant sensations. They use a distance sensor, some vibration motors, a wooden stick, cardboard, paper, masking tape, gravel and sand. They connect the distance sensor and the vibration motors and reprogram their relationship using the personal computer. They place a piece of cardboard on the tip of the wooden stick and by moving the stick they change the distance to the sensor and, consequently, the frequency and intensity of the vibration motors. They also rearrange paper and masking tape around their hands to create a blue mold where they place the motors, and fill with gravel and sand (Fig. 7.12 and 7.13).

Even though they follow all the Rules for Rearranging, the hand shape suggests what to do and feel with the materials (place the hand inside the mold and feel the vibration of the sand), which is transgressing rule number seven indirectly.



| Figure 7.12 |

Final Rearranged Materials (First Round)



| Figure 7.13 |

Designers rearranging (left) the materials
Designers freemoving with them (right)
(First Round)



| Figure 7.14 |

Users freemoving with the rearranged materials (First Round)

Finally, In the Demonstrating Phase (First Round), users and designers meet in the Theater to observe one another freemoving with the rearranged materials. Consuelo, Francisco, and Ben (the designers) place the rearranged materials on a table and leave in silence without explaining what to do and feel with them.

Then, Caro, Borja, and Max (the users) come to the Theater, encounter these materials on the table and examine them without talking. They smile and they look to their designers for clues. They know about what they want (their canvas) but they move their bodies freely without making reference to their canvas (Fig. 7.14). Caro is the first to freemove. She observes the blue mold that is shaped as a left hand, and she reacts by placing her left hand down. Borja comes, picks up the stick attached to the base and rotates it. Caro feels the vibration of the sand and gravel on her left hand, and says, “It feels nice...” Then she picks up the stick herself and imitates Borja rotating the stick. Finally, Borja and Max freemove with the materials as well, imitating Caro’s movements.

While users do what they do, Consuelo, Francisco, and Ben (the designers) observe, smile, and cover their mouths with their hands. Participants from other teams also observe and smile (they do not laugh or clap). I am observing both users and designers and recording video. Even though users are not exactly doing what they have expressed in their canvas, this fact seems not to worry them. They actually respond directly to the materials without reexamining their canvas. Also, they smile and express enthusiasm



and openness in exploring and experiencing something different, evidencing that what they are actually expecting in the present is not determined by what they expressed wanting before.

Then, after the users freemove with the materials, Ben (one of the designers) appears in the Theater (Fig. 7.15). Without spending any time to examine the materials, Ben places his left hand inside the blue mold and then rushes to pick up the stick and clarify what to do with it. He moves the stick back and forth slowly and looks up to the camera and other participants in the crowd to demonstrate the main difference between his movements and the users'. In other words, he does this as a way to say: "Do you see? This is what is to be done and felt with our rearranged materials."

As Ben demonstrates the materials, Caro, Borja, Max (the users), and the rest of participants (from other teams) observe in silence and smile. Even though they seem to realize the difference between the users' and designers' movements they do not express surprise or excitement (they do not clap or laugh). Participants from other teams do not know what is actually happening because they do not feel the vibration of the sand and gravel.

Before leaving the Theater, Ben opens his arms to invite Caro to try the materials again, now according to his demonstration. The users, Caro, Borja, and Max, come back to the Theater, and one by one each imitates Ben's movements.

| Figure 7.15 |

Designers freemoving with the rearranged materials

Circular Sequence : Second Round

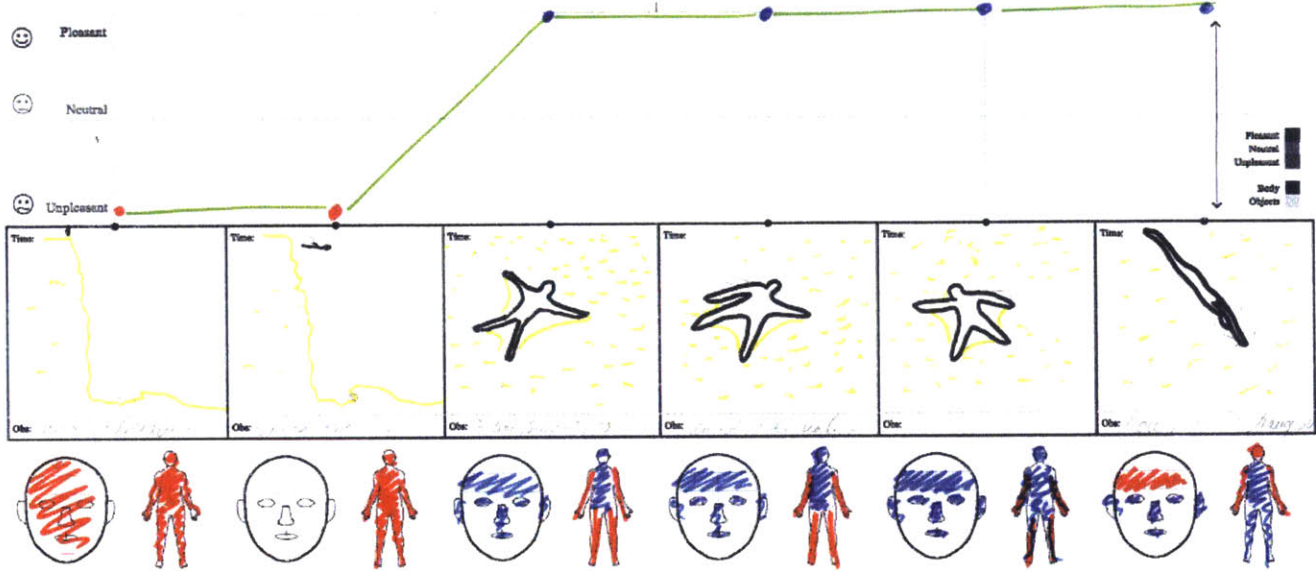
In the Expressing Phase (Second Round), Caro, Borja, and Max (the users) come back to World 1 and reflect about the designers' response. They decide to work outside, sitting in the stairs of the building. They observe their original canvas, asking themselves whether they want to ask for modifications or for a completely new design. They choose the latter, filling out a new canvas from scratch (Fig. 7.16).

Borja and Matt are standing and moving around Caro who is drawing the doings, materials and coloring the feelings. Consuelo, Francisco, and Ben (the designers) are inside the building and cannot see or hear what Caro, Borja, and Max are doing and talking about.

As you can see in Figure 7.17, Caro, Borja, and Max express a new experience, different from the one they expressed in the first round. They draw the experiential moments for the stream of jumping off a cliff: the feeling of adrenaline before jumping, the excitement and control throughout falling, and the final joy and tranquility when diving into the water. They draw the body in black and the space (cliff and water) and the clothes in yellow.

They do not color the sensory or emotional sensations in the strip with the empty frames; instead they color the body mapping below this strip. They do not include green color for neutral sensations, expressing only extreme and contrasting feelings between unpleasant and pleasant for both sensory and emotional sensations.

After drawing and coloring their canvas, Caro, Borja, and Max (the users) come to the Theater and deliver their canvas to Consuelo, Francisco, and Ben (the designers). In this example, participants play in a Circular Sequence and, therefore, Consuelo, Francisco, and Ben do not deliver their canvas to Caro, Borja, and Max, and have to wait for the next team in the sequence.



| Figure 7.17 |

Users' canvas (Second Round)



| Figure 7.16 |

Users filling out the canvas (left)
 Users delivering their canvas (right)
 (Second Round)

Then, in the Rearranging Phase (Second Round), it is the turn of the designers again. Consuelo, Francisco, and Ben (the designers) are in World 2 rearranging recycled and interactive materials. However, before rearranging they are sitting on their desk observing and talking about their users' canvas (Fig. 7.18).



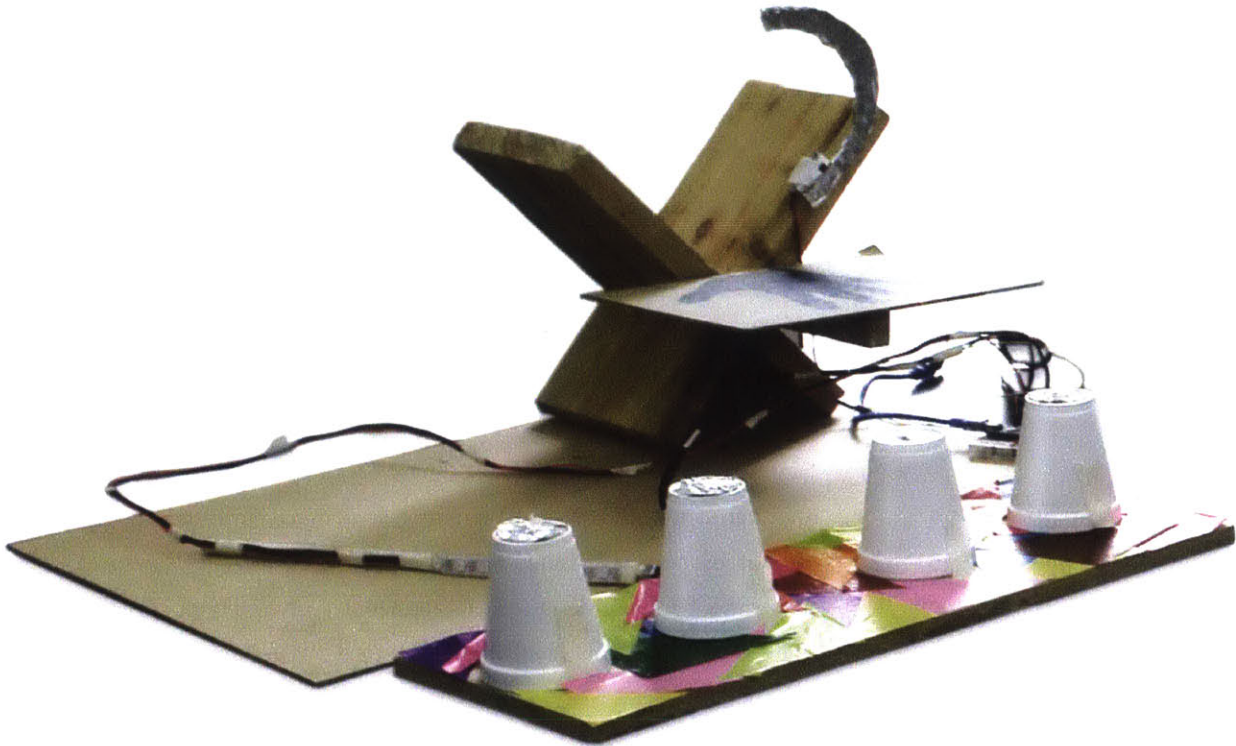
| Figure 7.18 |

Designers reflecting on their users' canvas
(Second Round)

Consuelo, Francisco, and Ben (the designers) seem frustrated because they seem to realize that bringing forth the experience of jumping off a cliff would be very difficult. However, they also realize that they could try to conserve the flow of emotional sensations, although the doings and materials would have to be changed. Caro, Borja, and Max (the users) are in World 1 and cannot see or hear what Consuelo, Francisco, and Ben (the designers) are doing and talking about.

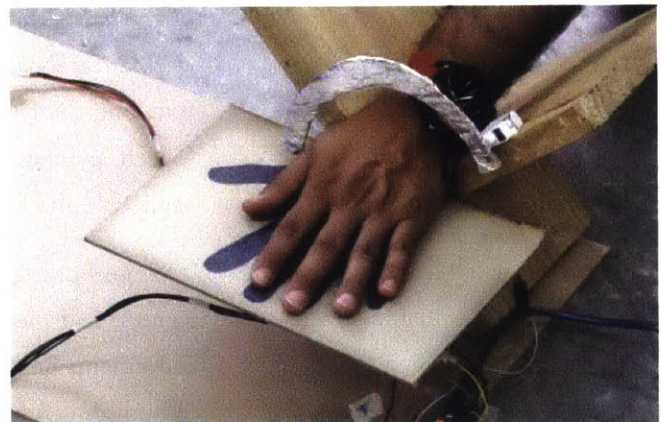
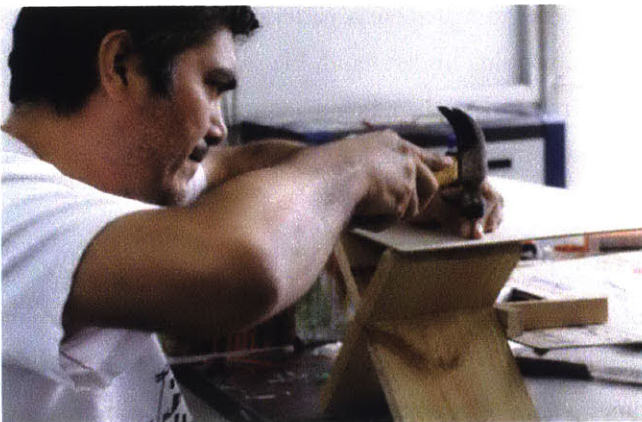
Consuelo, Francisco, and Ben discuss how to rearrange materials to bring forth extreme and contrasting emotional sensations: from uncertainty to control, from control to excitement, from excitement to calm. They use four switch sensors (not included in my toolkit), LED lights (in a strip), a servomotor, aluminum foil, pieces of wood, cardboard, and nails. They connect the switch sensors to the servomotor and LEDs and reprogram their relationship using the personal computer. They put together two pieces of wood to support a horizontal wooden plane on which they draw a hand.

They cut a clasp out of cardboard, connect it to the servomotor, and place these materials between the two supporting wooden pieces. For the switch sensors, they use a wooden stick with the tip covered in aluminum foil and four recycled plastic cups also covered in aluminum foil. They place the LED strip along the edge of the wooden stick (Fig. 7.19 and 7.20). While they rearrange and reprogram the materials they freemove by trying things out with their bodies: placing their left hand on the plane, picking up the stick, and touching the top of the cups with the sticks. They reprogram the LEDs and the servomotor according to the order by which they touch the cups with the stick.



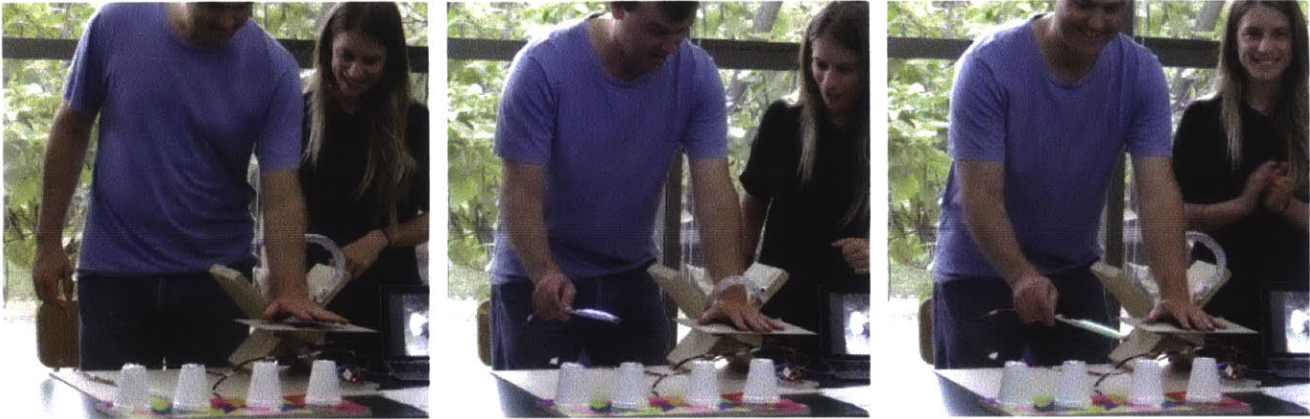
| Figure 7.19 |

Final Rearranged Materials (Second Round)



| Figure 7.20 |

Designers rearranging (left) the materials
Designers freemoving with them (right)
(Second Round)



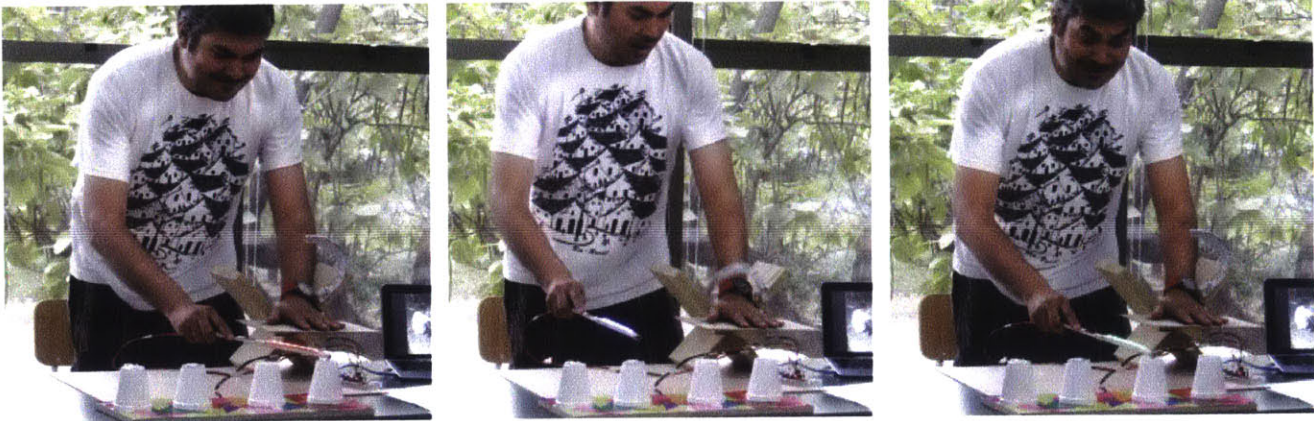
| Figure 7.21 |

Users freemoving with the rearranged materials (Second Round)

Finally, in the Demonstrating Phase (Second Round), all teams gather together in the Theater and present their designs. Although in this phase I did not ask players to follow the Rules for Demonstrating, Consuelo, Francisco, and Ben (the designers) spontaneously invite Caro, Borja, and Max (the users) to freemove with their rearranged materials. The users come to the Theater, encounter these materials on the table, examine them without talking, and freemove with them (Figure 7.21).

Borja begins freemoving by placing his left hand on the wooden plane, and by picking up the stick with his right hand. He then observes the four cups and touches them with the stick. He pays attention to how the colors of the lights change and tries to figure out a pattern. Suddenly, the semi-circular cardboard closes, trapping his left hand. He realizes he has to keep touching the cups with the stick and finding a sequence that would free his left hand again. Finally, after some random tries he is able to open the semicircle and free his hand.

While Borja does what he does, Consuelo, Francisco, and Ben (the designers) and the rest of the participants (from other teams) observe Borja's movements and laugh and clap from a distance. Some of them exclaim: "Ohhhhh... Awesome!" I am also observing a recording video. Even though users are not doing what they have expressed in their canvas, they show their enthusiasm about the designers' response by clapping, laughing, and congratulating the designers.



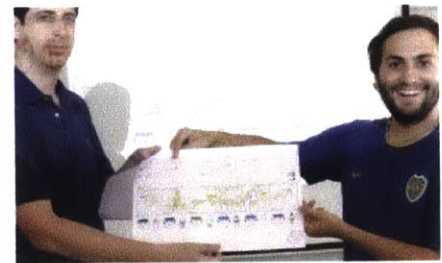
| Figure 7.22 |

Designers freemoving with the rearranged materials
(Second Round)

Then, after the users freemove with the materials, Ben (one of the designers) appears on the Theater, and without spending any moments to examine the materials, he also places his left hand on the wooden plan and begins touching the cups with the stick (Fig. 7.22). He shows the sequence of moves that closes and opens the semicircle, and he seems to be able to control the colors of the stick. He utilizes facial expressions to reenact the emotional sensations depicted on the canvas, including surprise, excitement, control, and calm.

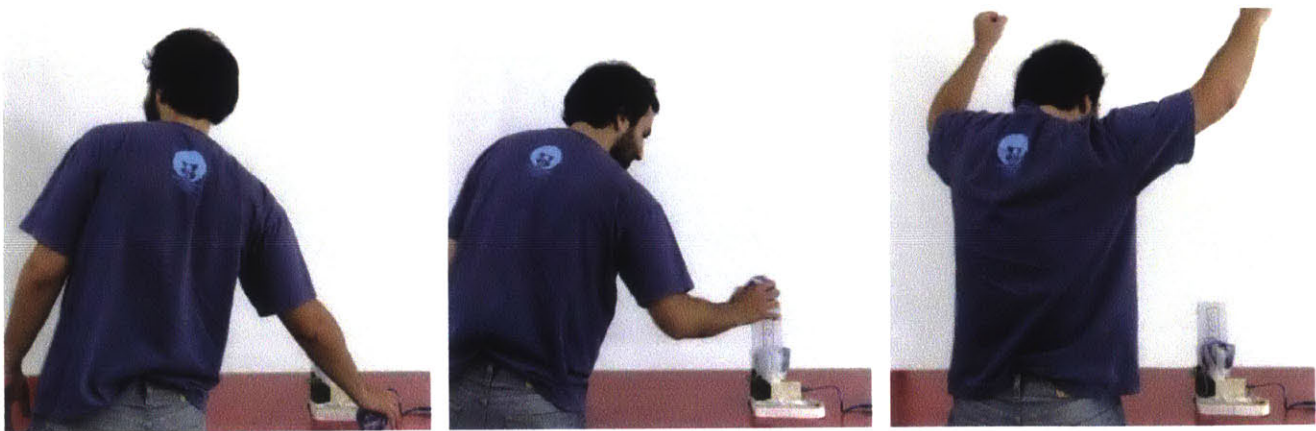
As Ben demonstrates the materials, Caro, Borja, Max (the users), and the rest of participants (from other teams) observe in silence. I am also observing and recording video. Users do not seem surprised about what they are observing. They were surprised already when freemoving directly and now they can only corroborate the designer's movement is similar to theirs. However, they still smile and pay attention in order to understand the sequence of moves for opening and closing the semicircle. By the end of Ben's demonstration users and the rest of the participants clap and congratulate the designers.

While Caro, Borja, Max (team C), and Consuelo, Francisco, and Ben (team D) are playing the game, participants in other teams are also engaging in a similar process (Fig. 7.23). In team E, Eduardo and Gabriel are playing as users, and in team F, Javier and Ricardo are playing as designers. In the Expressing Phase, Eduardo and Gabriel (the users) express the experience of a soccer game: going to the stadium, observing a soccer match, and



| Figure 7.23 |

Users delivering their canvas to the designers (top)
Designers rearranging materials (bottom)



| Figure 7.24 |
Users freemoving with the rearranged materials

celebrating a goal. And, in the Designing Phase, Javier and Ricardo (the designers) respond by rearranging materials as a ball and a basket. They do not follow the rearranging rule number six (Note that you should not draw tags or signs on your materials), and they tag their materials with the word *goal* and with a flag of Uruguay (which was drawn on the canvas by the users).

Then, in the Demonstrating Phase, Eduardo (one of the users) approaches the rearranged materials and without taking any moments to observe them, picks up the ball directly, throw it to the basket, and celebrates the goal (Fig. 7.24). Then, Gabriel approaches the materials and does the same. After the users moved with the materials is the designers' turn. However, although designers know the rules of the game, they refuse to freemove with their materials. Roberto (one of the designers) says, "Well... it is obvious, there is not much to explain."

Bidirectional Sequence

In this second exercise, participants play the game in a Bidirectional Sequence. These participants are undergraduate and graduate students in their mid-twenties, studying Architecture at Pennsylvania State University². In

² I conducted this game as a workshop in September 2013 at the School of Architecture of Pennsylvania State University. I was invited to teach design and electronics by Daniel Cardoso Llach, Assistant Professor at the Stuckeman School of Architecture holding a Master of Science and a PhD in Design & Computation from MIT.

this case, 13 participants play two rounds in 6 teams: A, B, C, D, E, F (5 teams of 2 participants and 1 team of 3 participants). They play by expressing with the Free Canvas and by rearranging the Screen-based Toolkit.

This game is played over the course of three days. On the first day, I teach participants my model, how to connect and reprogram the Screen-based Toolkit, and how the game is played (format). On the second and third days, participants play the actual game, completing one round per day. For each round, the Expressing Phase in completed is one hour, the Rearranging Phase in three hours, and the Demonstrating Phase in one hour.

In this section, I present evidence for one game (two rounds) played by teams A and B. In team A, participants are Justin and Nathalie, who play as users. In team B, participants are Matt and Dan, who play as designers. Participants in team A fill out the Free Canvas to express an experience they want to live. Then, participants in team B respond to that canvas by rearranging materials. I observed both teams throughout the game, and took photographs, and recorded video and audio. I present the photographs and descriptions of what I observed. Then, I include a short description of the game played by participants from other teams to demonstrate that the evidence is consistent among participants.

Bidirectional Sequence : First Round

In the Expressing Phase (First Round), the users in team A begin the game. Justin and Nathalie (the users) are in World 1, expressing an experience by drawing the Free Canvas (Fig. 7.25). They are sitting in their desk with a white piece of paper in front of them.

They read a printed version of the Rules for Expressing while discussing about what experience to express and how to draw it. They know about the Mindful Vocabulary and they talk in terms of the doings, feelings, and materials. Meanwhile, players in team B (the designers) are in World 2 and cannot see what Justin and Nathalie are doing, nor ear what they are talking about.

Exercise 6: Bidirectional Sequence

Materials: Free Canvas and the Screen-based Toolkit

Participants: 13 Architecture undergraduate Students

Institution: Stuckeman School of Architecture
(Pennsylvania State University)

Location: State College, Pennsylvania

Date: September 26 to 29, 2013



| Figure 7.26 |

Users' canvas (First Round)



| Figure 7.25 |

Users filling out the canvas (left)

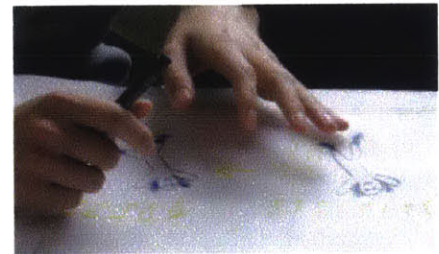
Users delivering their canvas to the designers (right)
(First Round)

As you can see in Figure 7.26, Justin and Nathalie draw three experiential moments from left to right. They follow the Expressing Rules by drawing the bodily postures in black, and the space and another person around these postures in yellow. They also color the sensory sensations in green (neutral) and blue (pleasant) in ears and feet. They do not color the emotional sensations in the body, and find a way to express them by drawing smiley faces (not specified in the Rules for Expressing). They also draw yellow arrows between the three moments and write musical notation to express sound. Their canvas evokes (to me) an experience involving feeling the music and the dancing with the materials.

After drawing and coloring their canvas, Justin and Nathalie (the users) come to the Theater and deliver their canvas to Matt and Dan (the designers). In this example, participants play in a Bidirectional Sequence and, consequently, Justin and Nathalie also receive a canvas from Matt and Justin.

Then, in the Rearranging Phase (First Round), is the turn of the designers in team B. Matt and Dan (the designers) are in World 2 rearranging recycled and interactive materials. Before rearranging, however, they are sitting in their desk observing their users' canvas (Fig. 7.27). They know about the Mindful- Vocabulary and the Expressing Rules so they try to make sense of the drawings by observing them and talking in terms of the doings, feelings, and materials. Justin and Nathalie (the users) are in World 1 and cannot see what Matt and Dan are doing, nor hear what they are talking about.

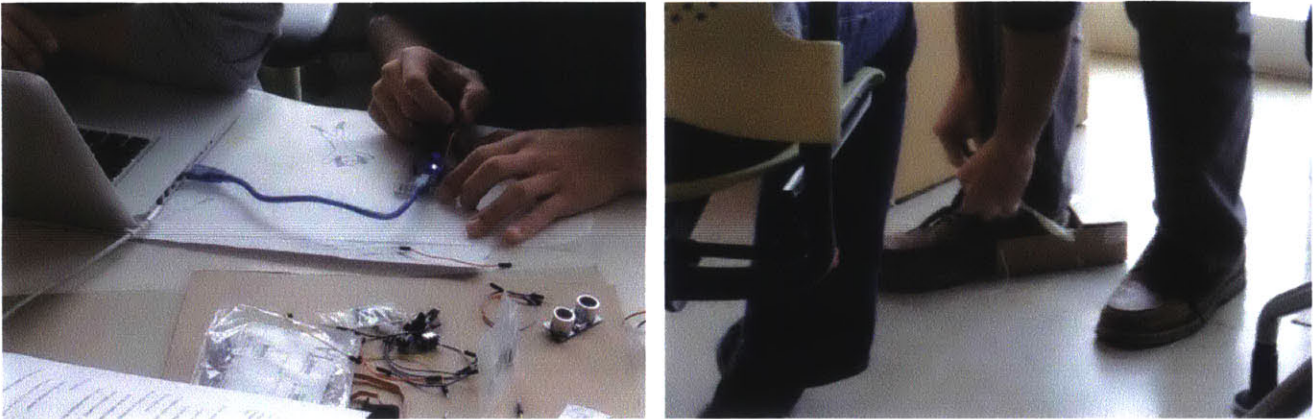
Matt and Dan respond to their users' canvas by rearranging the Screen-based Toolkit along with recycled materials. They use a pressure sensor, a buzzer effector, cardboard, masking tape, and a cord. They connect the pressure sensor and the buzzer, reprogram their relationship using the personal computer, and try things out by pressing the sensor and listening to the sound. They also pick up some cardboard, cut it into pieces, and put together these cardboard pieces with the interactive materials using masking tape (Fig. 7.28 and 7.29). They then freemove by wearing and walking with their rearranged materials. They follow most Rules for Rearranging except number five, which states that visual representations are not allowed. Before rearranging their materials they draw a perspective view of their materials on the back of the canvas.



| Figure 7.27 |

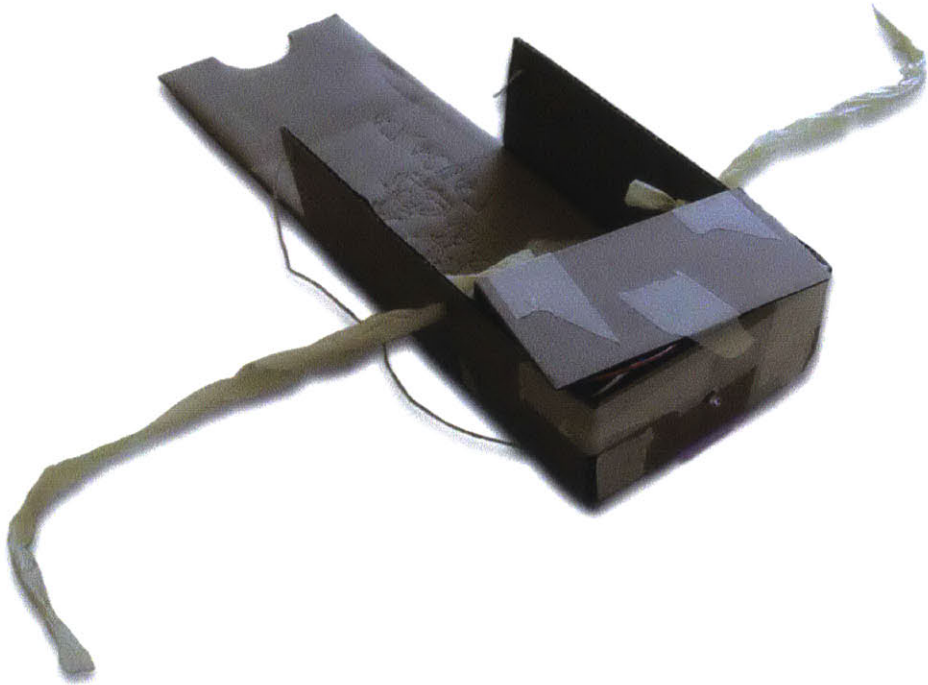
Designers reflecting on their users' canvas
(First Round)

Transformational Design



| Figure 7.28 |
Designers rearranging (left) the materials
Designers freemoving with them (right)
(First Round)

| Figure 7.29 |
Final Rearranged Materials (First Round)





| Figure 7.30 |

Users freemoving with the materials (First Round)

Finally, in the Demonstrating Phase (First Round), Matt and Dan (the designers) place the rearranged materials on the Theater and leave in silence without explaining anything about their design. Then, Justin and Nathalie (the users) come to the stage, encounter these materials in the floor and examine them without talking (Fig. 7.30). They seem confused. They know what they wanted (their canvas) but now they do not know what to do and feel with these materials. Their canvas evokes the experience of feeling the music and the dancing with these materials. So they know these materials should produce some sort of sound, and when pressing them they realize that they do: they produce a pleasant tone (beep) while pressing the materials. They also realize the materials have some straps or laces and they believe these materials could be wearable. Nathalie holds the materials on Justin's arm and tries to lace them. Justin freemoves with the materials by moving the arm wearing the materials, and with the other arm pressing the materials and producing sounds (beeps).

While users do what they do, Matt and Dan (the designers) and the rest of the participants (from other teams) observe the users' movements and laugh and clap from a distance without saying a word. I am also observing and recording video. Designers are surprised but in a positive way. Even though the users are doing something different from what the designers wanted and expected, this fact does not seem to worry them. On the contrary, they are laughing and clapping.

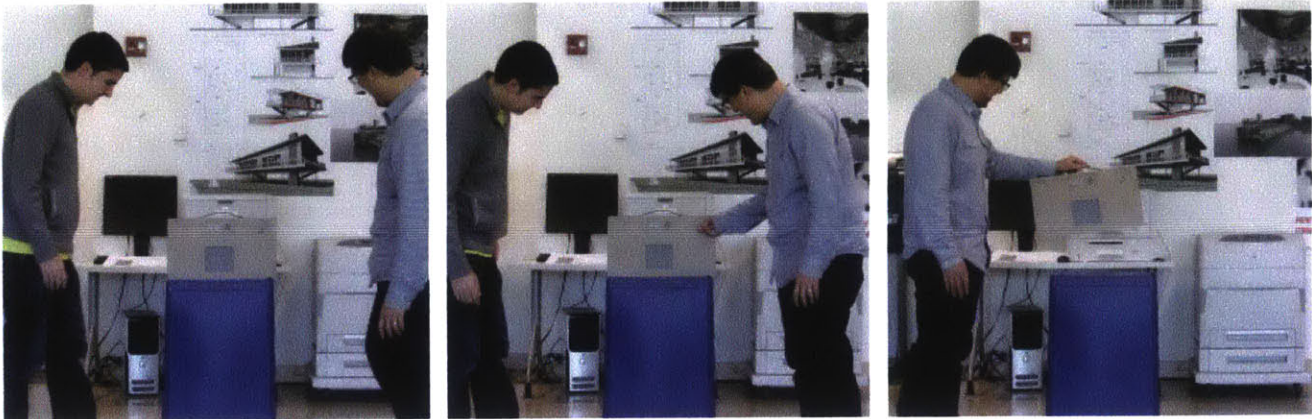


| Figure 7.31 |

Designers freemoving with the materials
(First Round)

They are also containing their excitement, and cannot wait to come back to the stage and show what to do and feel with the materials. Then, after the users freemove with the materials, Matt (one of the designers) runs to the front-stage. He cannot wait to show to his users and to the rest of the participants (from other teams) his team's design intentions by doing and feeling something with the materials (Fig. 36). Without spending any moments to examine the materials, he places them under his right foot and laces them. He then steps on them producing a sound (beep). As Matt freemoves, the users and the rest of the participants say, "Aaahhhhhh..." expressing a kind of *understanding* of what to do and feel with the materials. Then, Matt turns around to show the light in the back on his feet while he walks. With every step, Matt produces a sound, and reacts to this sound by smiling and laughing. After a couple of moments, he stops and begins dancing. He moves his body imitating the drawing on the canvas: he is trying to demonstrate that by jumping and stepping on his materials the sound can be converted into music to dance with.

As Matt demonstrates the materials, Justin and Nathalie (the users) and the rest of the participants (from other teams) observe the designer's experience and laugh and clap from a distance without saying a word. I am also observing and recording video. Users are also surprised by what they are observing. They did not expect to do what the designers intended them to do.



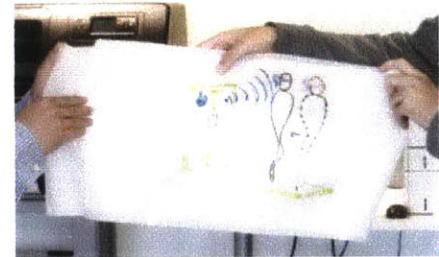
| Figure 7.33 |

Users freemoving with the rearranged materials

However, this fact does not seem to bother them. On the contrary, they are also laughing and clapping. After the designer finishes showing what to do and feel with the materials they jump to the stage again and now imitate him.

As Justin and Natalie (team A), and Matt and Dan (team B) are playing the first round of the game, participants in other teams are also engaging in a similar process (Fig. 7.32). In team E, Eli and Seoug are playing as users, and in team F, Hannah and Travis are playing as designers. In the Expressing Phase, Eli and Seoug (the users) express listening to a sound and moving towards the source. And, in the Designing Phase, Hannah and Travis (the designers) respond by rearranging materials as a box with a handle, speaker, and knobs. They do not follow the rearranging rule number 7, and they tag their materials with the words *volume, on* and *off*.

Then, in the Demonstrating Phase, Eli and Seoug (the users) approach the rearranged materials and, after observing them for a couple of moments, Seoug turns the knob and then holds the box from the handle (Fig. 7.33). After the users moved with the materials is the designers' turn. Hannah and Travis (the designers) approach the rearranged materials, Travis holds the knob from the handle and Hanna turns the knob (Fig. 7.34).



| Figure 7.32 |

Users delivering their canvas to the designers (top)
Designers rearranging materials (bottom)

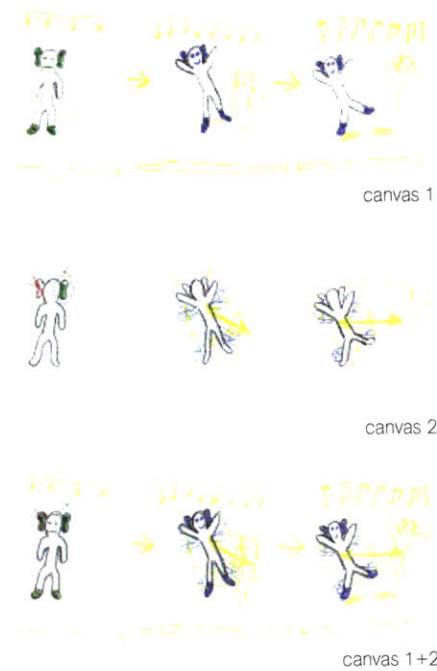


| Figure 7.34 |

Designers freemoving with the rearranged materials

Bidirectional Sequence : Second Round

In the Expressing Phase (Second Round), Justin and Nathalie (the users) come back to World 1 and reflect about the designers' response. They sit again in their desk and observe their first round's canvas and the designers' rearranged materials, asking themselves whether they want to ask for modifications or for a completely new design. They choose to ask for modification, which implies retracing the doings, feelings, and materials on top of their previous canvas (Fig. 7.36). Matt and Justin (the designers) are in World 2 and cannot see what Justin and Nathalie are doing, nor hear what they are talking about.



| Figure 7.35 |

New canvas (2) on top of previous one (1)

As you can see in Figure 7.37, Justin and Nathalie express the changes by redrawing the doings, feelings, and materials on top of their previous canvas. In the first moment, they draw a red X over the right ear and a green cloud with a check over the left ear. In the second moment, they draw multiple body postures on top of the original one, and a yellow arrow pointing towards the other person. I ask them about this moment and they tell me they wanted the music to be produced with the whole body and not only from walking and stepping on the materials. Finally, in the last moment, they draw a longer yellow arrow pointing towards the other person and also marks around the other person's body. Their retraced canvas evokes (to me) the fact that the experience of feeling the music and the dancing is not a solitary experience but occurs in relation to another person.



| Figure 7.36 |

Users filling out the canvas (left)
Users delivering their canvases to the designers (right)
(Second Round)



| Figure 7.37 |

Users' canvas (Second Round)

After drawing and coloring their canvas, Justin and Nathalie (the users) come to the Theater and deliver their canvas to Matt and Dan (the designers). In this example, participants play in a Bidirectional Sequence and, consequently, Justin and Nathalie also receive a canvas from Matt and Dan.

Then, in the Rearranging Phase (Second Round), is the turn of the designers in team B. Matt and Dan (the designers) are in World 2 rearranging recycled and interactive materials. Before rearranging, however, they are sitting in their desk observing their new users' canvas (Fig. 7.38). Matt and Dan (the designers) try to make sense of the new canvas in the light of what they have observed in the Demonstrating Phase. The canvas evokes now a dancing experience involving the whole body and the presence of another person. Also, in the Demonstrating Phase, the users wore the rearranged materials on their arms and not on their feet. Justin and Nathalie (the users) are in World 1 and cannot see what Matt and Dan are doing, nor hear what they are talking about.

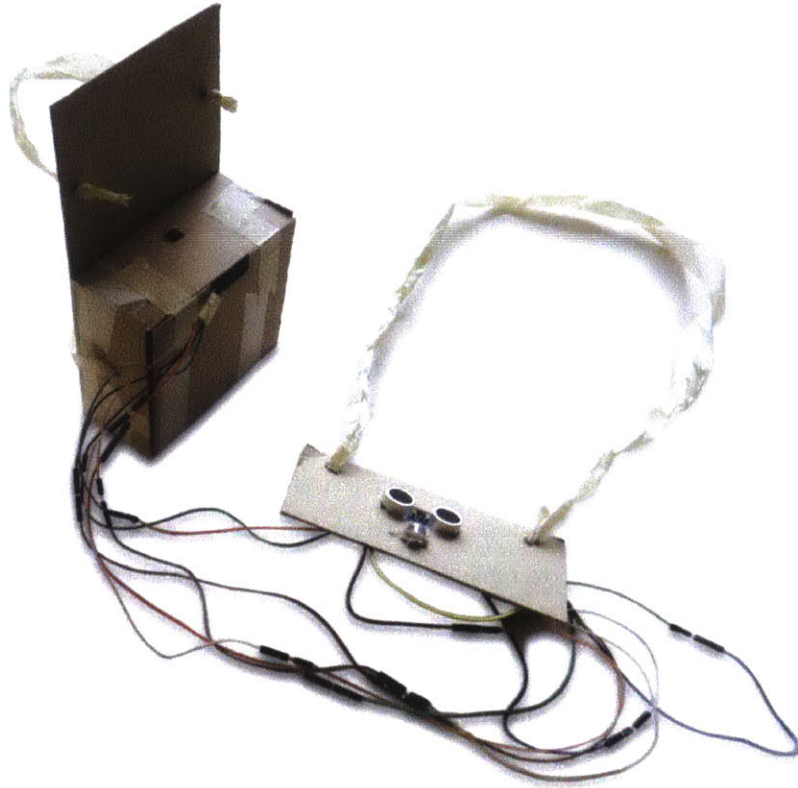


| Figure 7.38 |

Designers reflecting on their users' canvas (right) (Second Round)

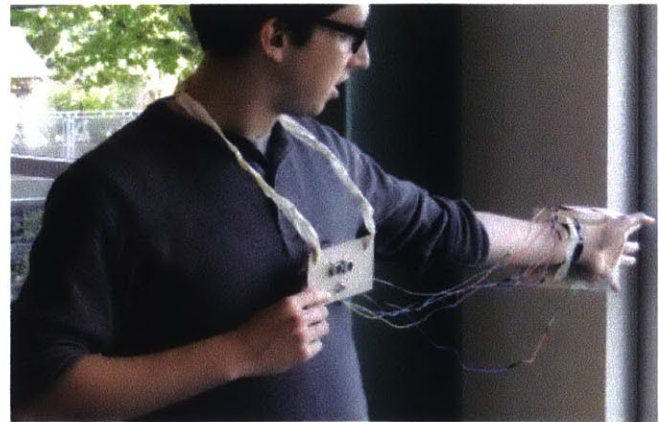
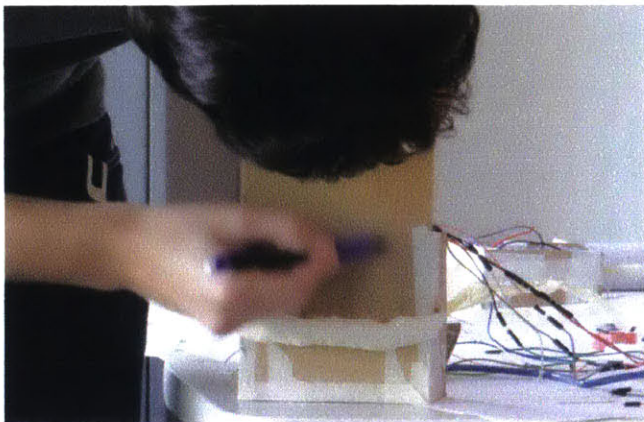
In this second round, Matt and Dan respond by rearranging the original materials and incorporating others. They use an acceleration sensor (accelerometer), a distance sensor, a buzzer, cardboard and masking tape. They connect the distance sensor, the accelerometer, and the buzzer, and reprogram their relationship using the personal computer. They cut a cardboard piece and place the distance sensor in the center, along with some folded masking tape on the corners to create a loop. They put together other cardboard pieces in almost the same way they did in the first round. They then place the accelerometer and the buzzer inside them (Fig. 7.39 and 7.40). While they rearrange the materials, they freemove by wearing and moving with them. This time, Matt and Dan move together. Dan wears the materials in his neck and left arm, but he only produces the sound when Matt is at a certain distance to him.

Finally, in the Demonstrating Phase (Second Round), all pairs of players (users and designers) gather together around a table and place their canvases and rearranged materials. In this final phase, I do not ask players to follow the Rules for Demonstrating. My intention is to see how participants explain their canvases and materials to one another in an unregulated way. Matt and Dan (the designers) place the rearranged materials on the table,



| Figure 7.39 |

Final Rearranged Materials (Second Round)



| Figure 7.40 |

Designers rearranging (left) the materials
Designers freemoving with them (right)
(Second Round)



| Figure 7.41 |

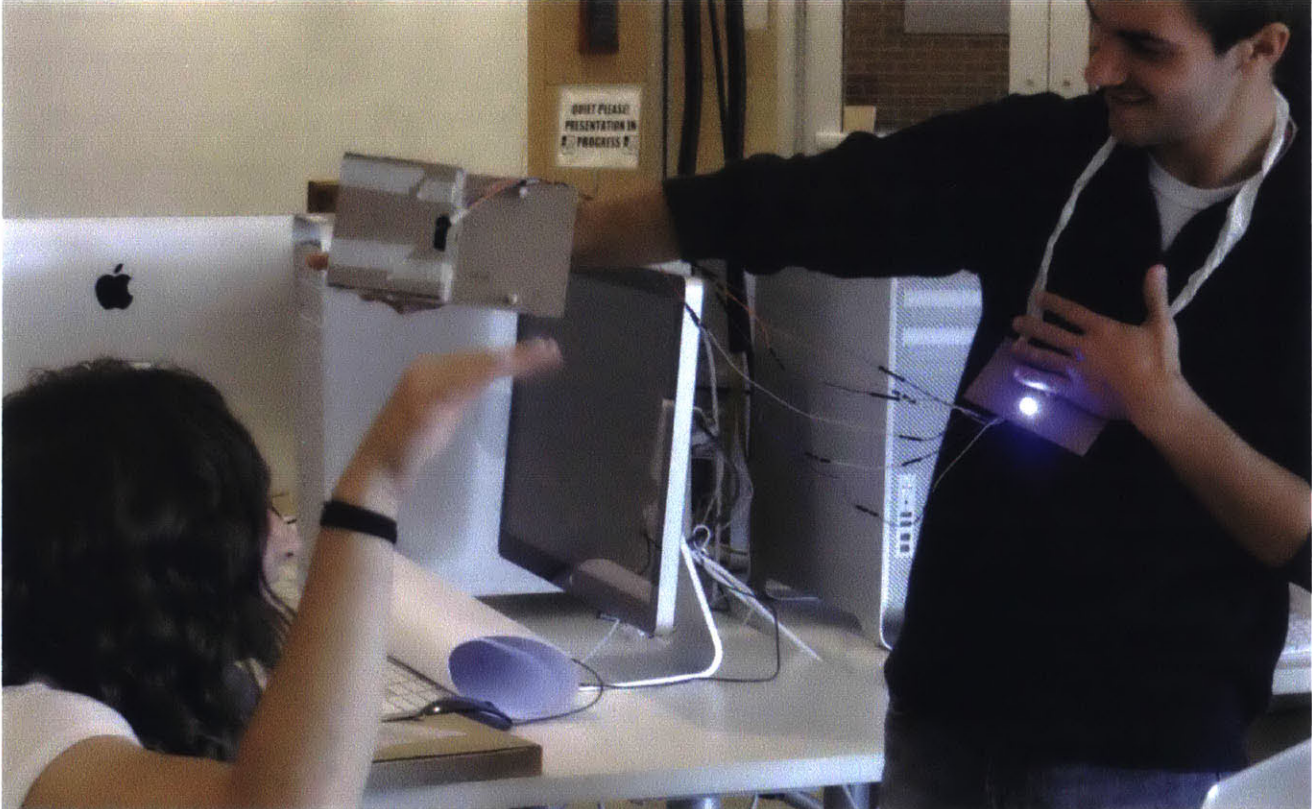
Users freemoving with the materials
(Second Round)

and then Nathalie wears them and freemoves with them (Fig. 7.41). Matt and Dan try to explain what to do and feel using words, but then Matt asks Nathalie for the materials, and demonstrates directly by moving with them (Fig. 7.42). Nathalie observes and then imitates Matt (without the materials). She also explains their second canvas in terms of the modifications they made to their first version. She uses words but while talking she also moves her body to explain her canvas to Matt. Through these conversations (where both use words and move their bodies) Nathalie and Matt coordinate their movements and come to understand and learn from one another.

| Figure 7.42 |

Designers freemoving with the materials
(Second Round)

While Matt, Dan, Nathalie, and Justin are demonstrating the materials to one another, the rest of the participants (from other teams) are engaging in a similar process around their own tables. I am moving around from table to table and observing, listening and taking photographs. This time, players smile and show engagement and enthusiasm, but they do not laugh nor clap. They are no longer constrained by having to demonstrate silently; they can interrupt one another freely and explain using words.



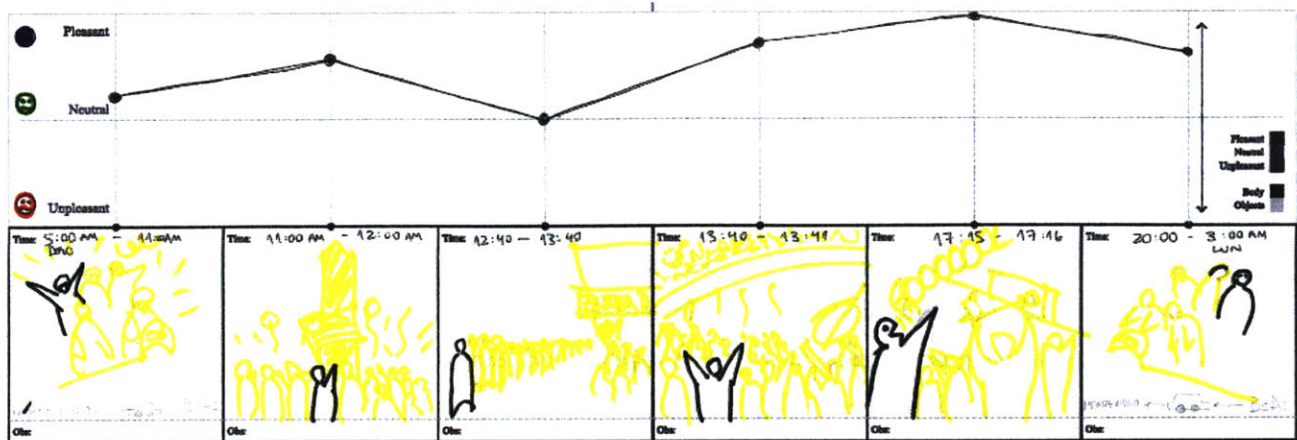
7.3. The Mismatches

In this section, I present my findings, which result from reflecting on the evidence in the light of having directly observed the participants playing the game. In the game, I find that for both users and designers there is a difference between what they want or intend to experience and what they actually end up experiencing. And I find that these differences are actually useful for design by allowing participants to transform together and learn from one another. I call these differences the *Mismatches*.

These Mismatches allow me to reflect on my third hypothesis: *With my Transformational Model, designers are able to observe how design transforms their own and others' experiences*. In the game, the mismatch makes the transformation explicit for both users and designers: they observe themselves and one another and can reflect and talk about each other's experiences. Therefore, my model (enacted through playing the game) is useful for designers (and users) as a means with which to observe their own and others' transformations.

First, I present the User's Mismatch, which refers to the difference between his desires (expressed in his canvas) and his actual movements with the rearranged materials; for example, when Caro, Borja, and Max (the users) expressed a *gardening experience* and they got the *hand-massager* from Consuelo, Francisco, and Ben (the designers).

Then, I present the Designer's Mismatch, which refers to the difference between her design intentions (expressed through her movements) and the users' actual movements with the rearranged materials; for example, when Matt and Dan (the designers) intended the users to wear the materials on their feet, they instead observed Justin and Nathalie (the users) wearing them on their arms. Finally, I describe these mismatches as explicit transformations that users and designers can use to reflect on their design processes and products.



| Figure 7.43 |

Users' canvas

User's Mismatch

First, I reflect on the user's experience, which includes the Expressing and Demonstrating phases. In the game, I observed a mismatch between the experience users asked for, and that which they ended up experiencing with the designers' rearranged materials. Users did not care when they did not get what they wanted. On the contrary, they expressed enthusiasm and satisfaction for the designers' rearranged materials when there was a difference between what they wanted and what they got. Similarly, designers did not care when they did not deliver exactly what the users were expecting. On the contrary, they expressed pride and satisfaction when they offered the users something new, something different from what they were asking for.

In order to support these findings, I present two examples from the game played in a Circular Sequence. In the first, I claim that there is a User's Match. In the second, I claim that there is a User's Mismatch. However, I invite you, the reader, to observe the evidence and decide for yourself whether there is a match or a mismatch. The canvas expresses an experience that the users want to live. Consequently, I claim that there is a *match* when the canvas is similar to what users do with the materials they get from the designers, and a *mismatch* when the canvas is different. By observing Figures 7.43 and 7.44 you can compare the users' canvas with what the users actually did with the rearranged materials. These are the results of the game played by Eduardo and Gabriel in team E (users) and Javier and Ricardo in team F (designers).



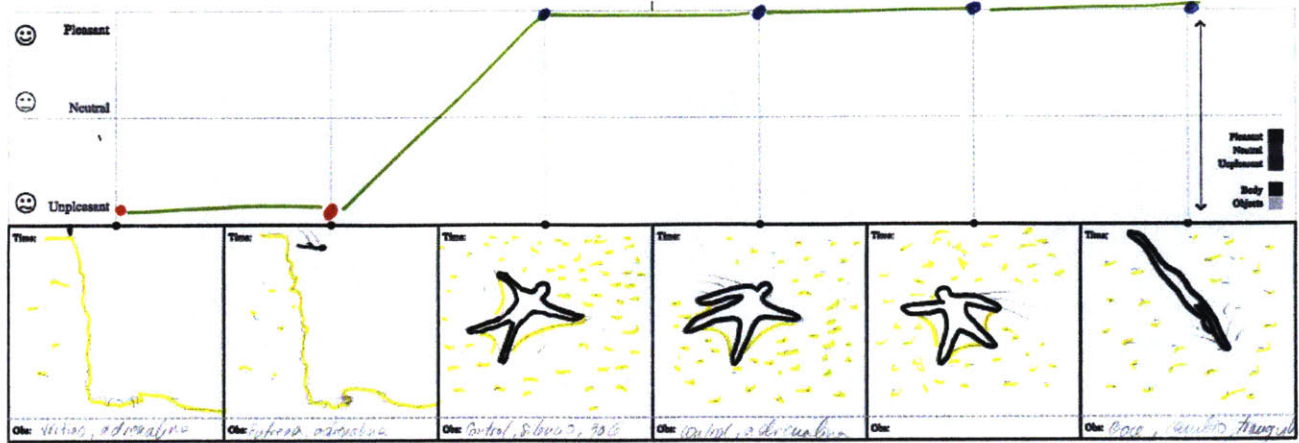
| Figure 7.44 |

Users' movements with the rearranged materials

Please, take a moment to observe and ask yourself whether the canvas (Fig. 7.43) and the movements (Fig. 7.44) are similar or different. Are they?

I argue that, in this example, the canvas and the movements are more similar than different and that this *similarity* suggests that users received what they asked for. In other words, there is a *users' match*. Do you agree? In the canvas, you can observe a stream of experience including going to the stadium, observing a soccer match, and celebrating a goal. And in the photographs of the user's movements, you can see how Eduardo picked up a ball, scored a goal, and celebrated the goal. The users reenacted some of the experiential moments expressed in their canvas, such as the goal and the celebration of the goal: the design matched the users' desires. Consequently, you may argue that users were satisfied because they got what they asked for, and that the designers were satisfied because they were able to rearrange the materials according to what the users wanted. However, by observing the reactions of participants, I found that this was precisely the opposite.

The users did not seem intrigued, surprised, or excited about the designers' rearranged materials. They both recognized the materials right away because they knew what to do and feel with them: the rearranged materials were *recognizable*. And, therefore, there was not much space for their participation in the creative process. That is, they could not explore, freemove, try things out in new ways. While users moved with the materials, they observed, smiled, and clapped at their designers in a condescending way, expressing that they understood their design very easily.



| Figure 7.45 |
Users' canvas

Players from other teams observed in silence without laughing or clapping. Moreover, the designers expressed embarrassment and declined to demonstrate their materials, saying, “Well... it is obvious, there is not much to explain.”

In Figures 7.45 and 7.46, you can observe a second example, and compare the users’ canvas with what the users actually did with the rearranged materials. These are the results of the game played in a Circular Sequence by Caro, Borja, and Max in team C (users) and Consuelo, Francisco, and Ben in team D (designers). Please, take a moment again to observe and ask yourself whether the canvas (Fig. 7.45) and the movements (Fig. 7.46) are similar or different. Are they?

I argue that, in this example, the canvas and the movements are more different than similar and that this *dissimilarity* suggests that users did not receive what they asked for. In other words, there is a *users’ mismatch*. Do you agree? In the canvas, you can observe a stream of experience including jumping off a cliff, sky diving (flying), and diving into the water. And in the photographs of the user’s movements, you can see how Borja placed his hand on the wooden plane, picked up the stick, and touched the cups with it. The users did not reenact the experiential moments expressed in their canvas, but rather freemoved by exploring new movements they were not expecting: the design did not clearly match up with the users’ desired experience. You may argue that users were not satisfied because they did not get what they asked for, and that the designers were not satisfied because they



were not able to rearrange the materials according to what the users wanted. However, by observing the reactions of participants, I found that this was precisely the opposite.

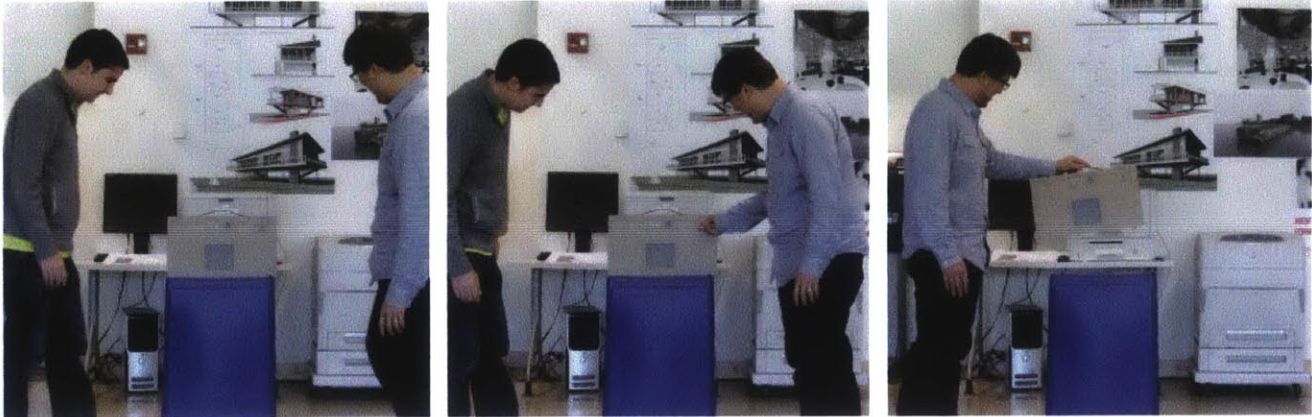
The users expressed surprise, joy, and enthusiasm by smiling, laughing, clapping, and congratulating the designers. In other words, they were satisfied with the design, although it not obviously correspond to what they had asked for. I argue that they were excited to explore something unexpected, and that they were enthusiastic about becoming participants in the creative process by freemoving and by learning something new—that is, by *transforming*. While users moved with the materials, players from other teams laughed, clapped, and exclaimed, “Ohhhhh... Awesome!” Finally, the designers expressed pride by jumping into the stage right away in order to demonstrate their materials again, even though their movements were almost the same as the ones the users had made.

Designer’s Mismatch

Second, I reflect on the designer’s experience, which includes the Designing and Demonstrating phases. In the game, I observed a mismatch between the experience the designers intended the users to have and that which the users ended up experiencing. Designers did not particularly care when they were unable to prescribe the users’ experience. On the contrary, they seemed to enjoy and feel proud of not having done so. They smiled,

| Figure 7.46 |

Users’ movements with the rearranged materials



| Figure 7.47 |

Users' movement with the rearranged materials

clapped, and could not wait for their turn to demonstrate their intentions to the users. Similarly, users did not care when they did not recognize the rearranged materials and did not know how to move with them. On the contrary, they seemed intrigued and eager to explore the materials in new ways by freemoving with them.

In order to support these findings, I present two examples from the game played in a Bidirectional Sequence. In the first, I claim that there is a Designer's Match. In the second, I claim that there is a Designer's Mismatch. However, I invite you, the reader, to observe the evidence and decide for yourself whether there is a match or a mismatch. Designers are expressing their design intentions when showing their users how to move with the rearranged materials. Consequently, I claim that there is a *match* when, in the Demonstrating Phase, the designers' movements are similar to the users' movements, and a *mismatch* when these movements are different. By observing Figures 7.47 and 7.48 you can compare the users' movements with the designers'. These are the results of the game played by Eli and Seoug in team E (users) and Hannah and Travis in team F (designers).

Please, take a moment to observe and ask yourself whether the users' movements (Fig. 7.47) and the designers' movements (Fig. 7.48) are similar or different. Are they?

I argue that, in this example, the users' movements and the designers' movements are more similar than different and that this *similarity* suggests that the users did what the designers intended them to do.



In other words, there is a *designers' match*. Do you agree? In the photographs of the users' movements you can see how Eli and Seoug approached the rearranged materials, and how Seoug touched the knob, heard the sound, and then held the materials. Likewise, in the photographs of the designers' movements you can see how Travis and Hannah approached the materials, how Hannah touched the knob and heard the sound, and how Travis held the materials.

The users and the designers did something very similar: the users' movement matched the designers' intentions. Consequently, you may argue that designers were satisfied for having specified the users' movements, and that the users were excited about knowing what to do with the materials. However, by observing the reactions of participants, I found that this was precisely the opposite.

The designers did not seem excited or fulfilled when observing the users' movements and reactions. The users did not express excitement but rather seemed uninterested when moving with the materials. They recognized the materials right away because they knew what to do with them. Consequently, as the designers observed the users, the designers reacted by blushing and smiling nervously. Finally, when demonstrating the materials themselves, the designers expressed discomfort. I conclude that they felt their freemoving was not necessary because they were simply repeating some of the users' movements.

| Figure 7.48 |

Designers' movements with the rearranged materials



| Figure 7.49 |

Users' movement with the rearranged materials

In short, there was nothing new or different for them to show. While users and designers demonstrated how to move with the materials, players from other teams observed and whispered.

In Figures 7.49 and 7.50, you can observe a second example, and compare the users' movements with the designers'. These are the results of the game played in a Bidirectional Sequence by Justin and Nathalie in team A (users) and Matt and Dan in team B (designers).

Please, take a moment to observe and ask yourself whether the users' movements (Fig. 7.49) and the designers' movements (Fig. 7.50) are similar or different. Are they?

I argue that, in this example, the users' movements and the designers' movements are more different than similar and that this *dissimilarity* suggests that the users did not do what the designers intended them to do. In other words, there is a *designers' mismatch*. Do you agree? In the photographs of the users' movements you can see how Justin and Nathalie approached the materials, held them without knowing what to do with them, and then placed them around Justin's arm. In contrast, in the photographs of the designers' movements you can see how Dan, right away, placed the materials in his foot, walked around to show the sounds and the lights, and then danced with the materials.

The users and the designers did something very different: the user's movement mismatched the designers' intentions. Consequently, you may argue



that designers were frustrated for not having specified the users' movements, and that the users were embarrassed for not knowing what to do with the materials. However, by observing the reactions of participants, I found that this was precisely the opposite.

The designers expressed surprise, joy and pride when observing the users' movements and reactions, and the users expressed curiosity, interest, and excitement when freemoving with the materials. Although the users did not recognize the materials, I argue that they were excited because they felt part of the creative process by exploring new movements themselves. And, as the designers observed the users, they reacted positively by laughing and clapping. They were also holding back, and could not wait to jump into the stage and move with the materials.

Finally, when demonstrating the materials themselves, the designers expressed pride. Even though they were exposing the mismatch by showing different movements, this fact seemed not to worry or embarrass them but rather delighted them. I conclude that they felt their freemoving was necessary because they were showing something new; in a way, they were teaching their users how to move with their materials. While users and designers demonstrated the rearranged materials, players from other teams laughed and clapped with enthusiasm.

| Figure 7.50 |

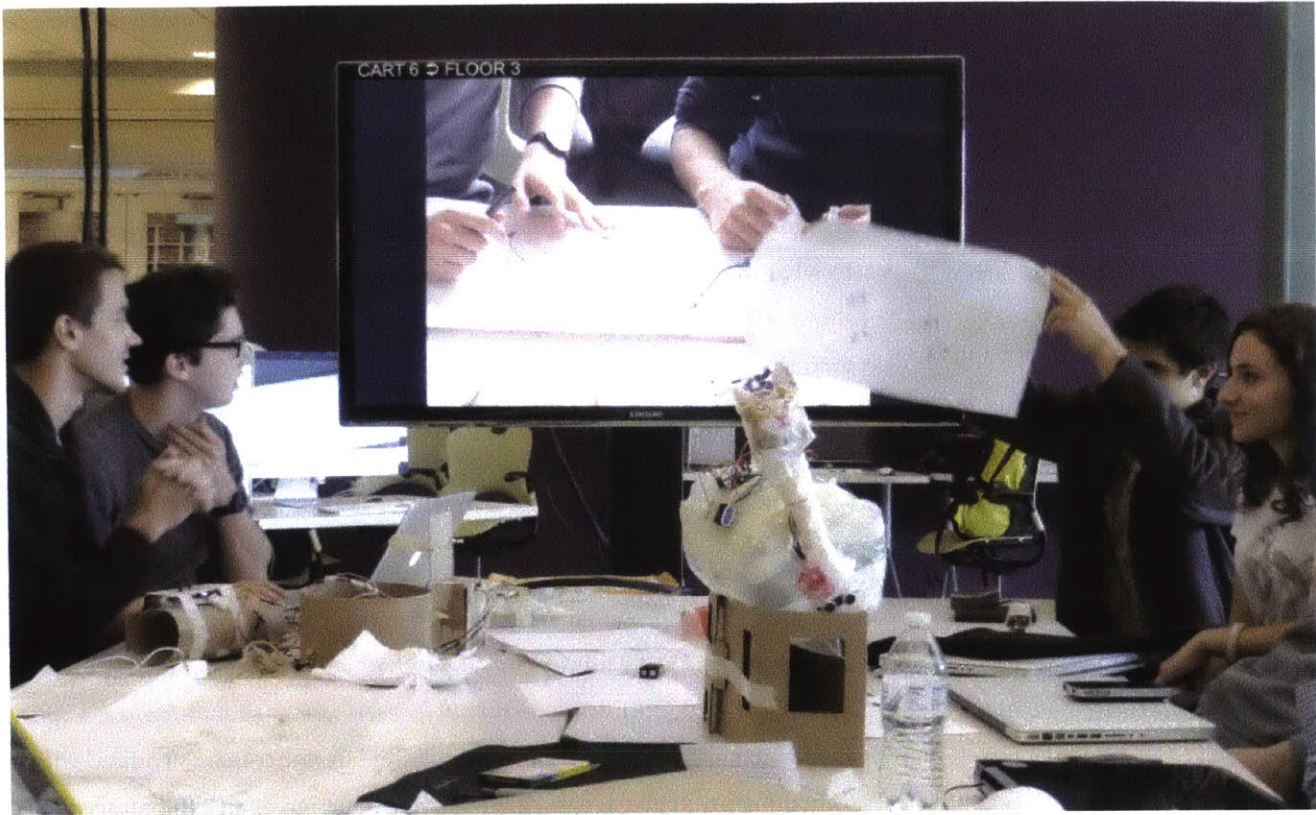
Designers' movements with the rearranged materials

Mismatch as Explicit Transformation

By playing the game, I explore whether my model is a useful means for players to observe their own and others' transformations. I argue that the mismatch makes the players' transformations evident. That is, the observable differences between what players want and what they actually get, and their positive emotional reactions to these differences demonstrate that they are experiencing something new and learning from one another: *they are transforming with every mismatch*. Consequently, I find that, by observing, talking, and reflecting about the mismatches, my model is useful for designers and users as a means to observe their own and others' transformations in design (Fig. 7.51). I also find that these differences can be used as measure of success of a design process. Participants care more about participating, observing one another, been surprised, and finding differences than they care about the actual rearranged materials or even the *experience*—what they do and feel with the rearranged materials.

For users and designers, the User's Mismatch makes the transformation of users explicit because both can realize the differences between what users expressed in their canvas and what they ended up experiencing – as, for example, when Caro, Borja, and Max (users) expressed the experience of jumping off a cliff on their canvas, and then experienced something different with the materials rearranged by Consuelo, Francisco, and Ben. I argue that, by their positive reactions to this mismatch, Caro, Borja, and Max (users) and Consuelo, Francisco, and Ben (designers) were transforming themselves and their experiences by participating actively in the creative process and learning something new.

By way of this first mismatch, users are transforming because they do not receive what they want and expect, but rather learn something new from their designers: users are transformed. And by way of the same mismatch designers are also transforming because they do not observe what they know and expected but learn something new from their users: designers are transformed.



For both designers and users, the Designer's Mismatch makes the transformation of designers *observable* because both can realize the differences between what designers intended users to do with the rearranged materials and what users actually ended up doing – as, for example, when Dan and Matt (designers) placed the rearranged materials in their foot, and Nathalie and Justin (users) placed the rearranged materials around their arms. I argue that, by their positive reactions to this mismatch, Dan and Matt (designers) and Nathalie and Justin (users) were transforming themselves and their experiences a second time by participating actively in the creative process and learning something new again.

By way of this second mismatch, designers are transforming because they do not prescribe the users' experience with an experience they know, but rather observe their users moving in new ways and learn from them: designers are transformed a second time. By way of the same mismatch, users are also transforming because they do not recognize the materials and have

| Figure 7.51 |

Users and Designers talking about their Mismatches

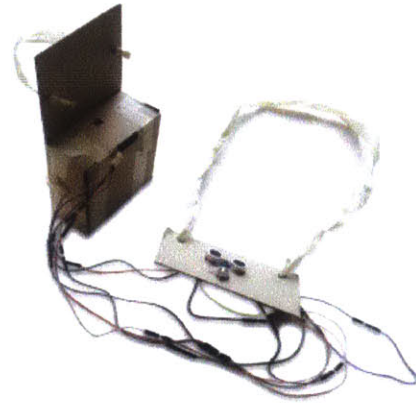
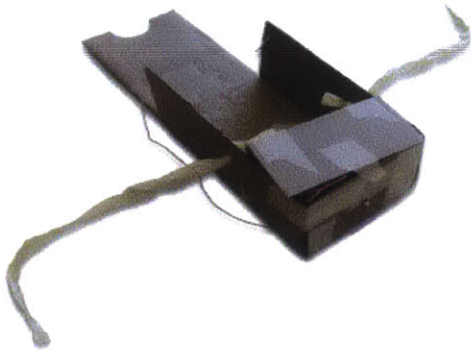
to bring forth something new by freemoving with them: users are transformed a second time.

The designer's mismatch fosters design as exploratory process because, in the next design iteration, the designer can use what is learned from the users. For example, Dan and Matt (designers) changed their design according to what they observed users were doing. In the first round, Dan and Matt showed their design intentions by wearing the materials on their foot. However, after observing how Nathalie and Justin (users) freemoved by wearing the materials on their arms, the designers *changed their minds*. In the second round, they responded by modifying the same rearranged materials (Fig. 7.51) by wearing them on their arms (Fig. 7.52).

Finally, I conclude that the mismatches are the *measure of success* of a design process, because users and designers expressed excitement and satisfaction when there was a mismatch. Why is that? I argue that the answer to this question is straightforward: *users and designers seek to be transformed*. Users are not actually seeking to fulfill their desires but rather to be surprised with something unexpected, participate actively in design as an exploratory process, and show others how to move with the materials.

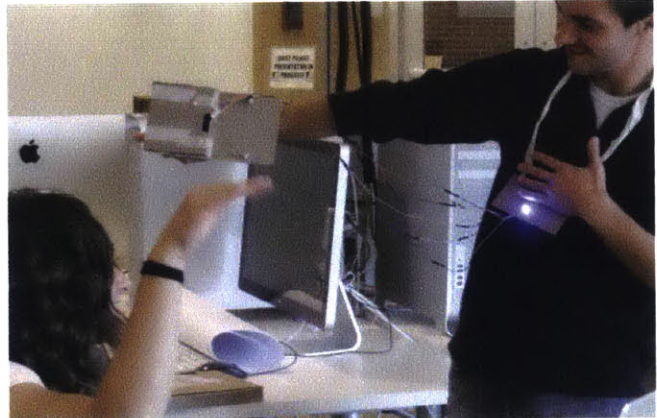
Designers are not actually seeking to prescribe their users' experiences but rather to surprise them with something unexpected, participate actively in the creative process, and find out new possibilities for their designs by observing the users' freemovements. In summary, both users and designers are seeking to transform themselves and transform one another.

Thus design is not about *matching* but about *mismatching*: design, as a creative and open ended process, is about transformation because designers and users are both active, creative agents and learn from one another by rearranging materials, delivering them, freemoving with them, and observing one another. A design is successful if it *transforms*, and we can observe, talk, and reflect on the transformations by way of the *mismatches*.



| Figure 7.51 |

Materials rearranged in the First Round (left)
Materials rearranged in the Second Round (right)



| Figure 7.52 |

Users freemoving in the First Round (left)
Designers freemoving in the Second (right)

CONCLUSIONS

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8. Designing a Practice

As I am writing these conclusions, I am reading my Introduction and the Foundations again. To my surprise, some of the words and phrases that I am reading seem foreign to me; they do not seem like something I would think, say, or write. I ask myself, “Who wrote this? This doesn’t seem like me...” After conducting the exercises and writing these texts, I am different; I have also been transformed. I have been transformed because Transformational Design is also a result of a creative process. I have described how designers put materials together for one another, how they try them out, and how they deliver them to one another. In my own work, I have done the same. I have put materials together (words, canvases, images, and interactive materials), I have tried them out myself, and I have delivered them to people. I have brought Transformational Design to people’s tables.

I am designing a design practice. Everything you have read is part of an iterative and open-ended process of exploration, in which I did not know what I was going to do before doing it. In other words, I did not know about the vocabulary and the models before writing about them, drawing their diagrams, talking about them with friends and professors, and trying out the exercises with people. And, whether you like it or not, as you read these very lines you are also becoming part of the loop.

Transformational Design is not completed; I have not finished. Completing this version of Transformational Design only means that it is time to reflect and get ready for the next iteration.

I begin by reflecting about what I have done. I describe my actual contributions as they respond to the problem that I have framed in the Introduction. Then, I continue by reflecting about what I have learned; I use the findings to prepare for the next iteration by refining the concepts and

exercises once more. I conclude by reflecting about what I might do next; I describe the loose-ends of my work as opportunities for further exploration.

8.1. Contributions in Practice

I remember when I explained the problem of Unreflective Transformations to my friend Edwina. I gave her the example of her computer, tablet, and smartphone, explaining how, with and through these technologies, she had changed her daily experience. People understand this problem because they have undergone the changes themselves. However, after a couple of moments, she looked at me and said, "...but Daniel, this problem seems too big; this is like trying to solve Global Warming with PhD research."

Edwina's comment affected me because, in a way, I knew she was right. However, I stayed with the problem of Unreflective Transformations because I wanted the contributions of my work to matter. That is, I wanted the problem to be important for our society in general, not only for designers and researchers in academia, but also for people on the streets, villagers in small towns, my friends in school, and my parents at home. All along, I have somehow felt that the load was too heavy, and yet the weight of what I was carrying was my motivation to keep going. Now, after skimming through the pages of my own writings again, I realize that I was not trying to solve this big problem all at once, but rather trying to provide designers with a means to address the problem for themselves, that is, a means to reflect as these transformations were taking place within their own creative processes.

If you take a couple of moments to go quickly over the text again, you will see many words, a couple of diagrams, but mostly people doing things: drawing in front of a river, cutting cardboard, connecting cables, or moving in front of others. My contributions take place in practice, within those intimate moments—in the studio, in the exercises as participants are putting materials together, trying them out, and observing one another. And from these moments, I have responded to the problem of Unreflective Transformations. Instead of trying to solve Global Warming all together, top down

through new policies and regulations, we can all begin on our own personal paths; from our own home, reducing our energy consumption and recycling our garbage. In a way, my practice responds with a similar strategy, from the bottom-up and through three steps that practitioners can follow within their actual design practice.

Becoming Aware

My first contribution is to provide a means for designers to become mindful of their own experiences as they are unfolding in the moment. I have called this means a *vocabulary*, a set of concepts structured as a diagram. However, these concepts are not definitions of experience, but rather evocations aimed at directing our awareness toward feeling what we are doing directly.

This vocabulary becomes a contribution in *practice*, that is, through people participating in an actual exercise. In the text, you can see people in front of rivers and mountains drawing the experiences they are living in the moment. Participants have gone out to the field, trying to become mindful of their experiences and to express them using a graphic template that I have put together for them, the *Experience Canvas*. This template is my first deliverable, because this canvas can also be used by other design practitioners and educators to learn and teach my vocabulary. As an observer, I have seen how most of these participants were able to fill out their canvases, show them to one another, and talk to one another in terms of my vocabulary. However, more than expressing their actual experiences, they have constructed a narrative about what they have done and felt. The vocabulary, through the canvas, does not allow participants to capture their real experience, but to see things in ways they would not have otherwise seen them.

You may be asking yourself, “But wait. How does this vocabulary contribute to the problem of Unreflective Transformations?” I would reply by saying that we cannot reflect on anything if we do not see it. That is, if we are not aware of something, we cannot reflect about it. How could it be otherwise? Transformations are the multiple changes we are undergoing in

our daily experiences. Consequently, if we are to reflect on these changes, the first step is to become aware of these experiences and how they are changing us. I am addressing the problem of Unreflective Transformations from the bottom up, and this is only the first step, the First Foundation of an alternative path.

Experiencing Something New

My second contribution is to provide a means for designers to bring forth new experiences, never felt or heard before, as they are trying out the materials they are putting together. I have called this means a *model*, a set of design moves or operations, structured as a diagram. For me, designers rearrange the materials they encounter in their worlds and move freely with them. In my model, designers do not design new experiences, but rather bring forth new experiences when they realize that they are experiencing something new with the materials they have rearranged. For example, as they are jumping on the materials, they may say, “I have never experienced this before... I have brought forth a new experience.”

This model becomes a contribution in practice, that is, through people participating in an actual exercise. In the text, you can see people in their studios, cutting cardboard, connecting cables, and trying things out. Participants rearranged pieces of cardboard, cans, bottles, along with distance sensors, buzzers, and motors. They put these materials together and tried things out freely, without trying to make a *thing* they already knew. Participants used two sets of electronic components that I put together for them, the *Screen-based Toolkit* and the *Spaghetti Toolkit*. These toolkits are my second deliverable, because these materials can also be used by other design practitioners and educators to teach and learn my model. As an observer, I saw how most of these participants were able to put together *things* that others were not able to recognize using known labels, because they did not know what to do and feel with the materials—the experience was new. Consequently, the participants had to make up labels in order to talk about what they had made.

You may be asking yourself again, “I understood the contributions of the vocabulary, but how does this model contribute to the problem of Unreflective Transformations?” I would reply by saying that we cannot transform if we are not experiencing something new. Transformations are the changes we undergo when we experience something new, when we touch, move, and think in new ways with the materials we encounter in our worlds. And, if we are to reflect on these changes, the second step is to change by bringing about new experiences. I am addressing the problem of Unreflective Transformations from the bottom up, and this is only the second step, the Second Foundation of an alternative path.

Transforming Together

My third contribution is to provide a means for designers to observe their own and others’ transformations, as they deliver the materials they have rearranged for others, and observe what they do with them. I have also called this means a model, a set of collaborative design moves, or operations, structured as a diagram. I maintain that both designers and the people they are designing for (the so-called users) are learning by bringing forth their own individual experiences and observing one another. For me, designers do not prescribe the experience of others, but rather participate with others in a mutually beneficial process of transformation. For example, as they are observing others moving with the materials they have rearranged, they may say, “This is new for me, I did not move with my materials in that way.”

This model also becomes a contribution in practice, that is, through people participating in an actual exercise. In the text, you can see people in their studios, drawing their canvases, cutting cardboard, delivering their materials, and moving with them in front of each other. Participants played the roles of users and designers for one another. As users, they drew the *Experience Canvas* to express an experience they would like to have. As designers, they responded to their users’ canvases by rearranging the Interactive Materials, along with pieces of cardboard, cans, and bottles. They worked in a spatial configuration that I set up for them, the *Transformational Lab*: two studios (worlds) where they worked separately, and one theater where

they delivered their canvases and materials and observed one another. This spatial configuration is my third deliverable, because the Transformational Lab can also be used by other design practitioners and educators to explore the exchanges and relations between designers and users. As an observer, I saw how most of these participants were not able to predict what others would do. Users did not know what designers would do with their canvases, and designers did not know what users would do with their materials. Thus both users and designers were able to experience something new and learn from one another.

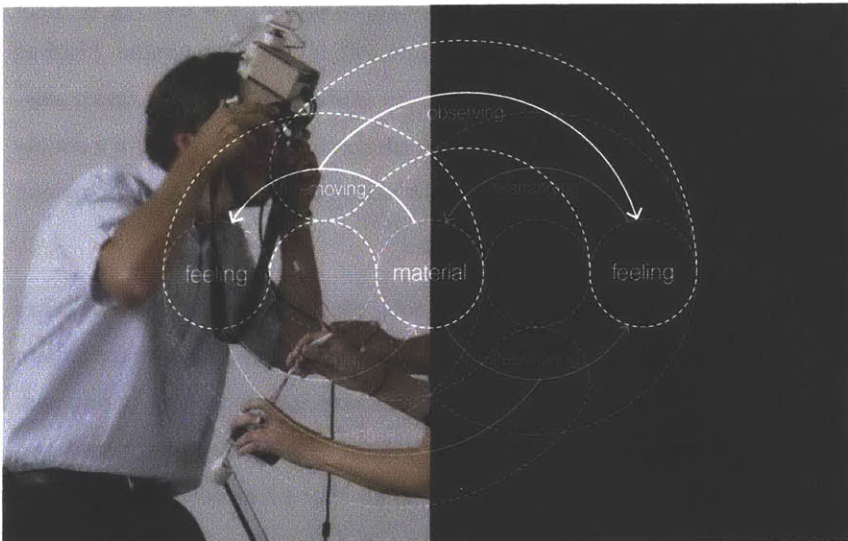
You may be asking yourself once more, “I understood the previous contributions, but how does this second model contribute to the problem of Unreflective Transformations?” I would reply by saying that we cannot reflect on these transformations if we cannot observe and talk about our own experiences and the experiences of others. Transformations are the changes we undergo directly and the changes we observe others undergoing. If we are to reflect on these changes, the third step is to have a means to observe and talk about them within the creative process. I am addressing the problem of Unreflective Transformations from the bottom up, and this is the third step, the third foundation of an alternative path. This Third Foundation builds on the previous two: in order to reflect about the changes we need to observe the changes; in order to change we need to experience something new; in order to experience something, we need to become aware of our experiences.

Even though these three contributions are all responding to the problem of Unreflective Transformations, having framed this problem is also a contribution. I have described a problem that matters, showing how some contemporary interactive technologies have altered our daily lives. I have contextualize this problem within contemporary design practices, where designers are putting technologies together. I have also demonstrated the obstacles that practitioners in these practices are confronting, explaining how these obstacles are not allowing them to reflect on the transformations they are bringing forth for themselves and for the people they are designing for.



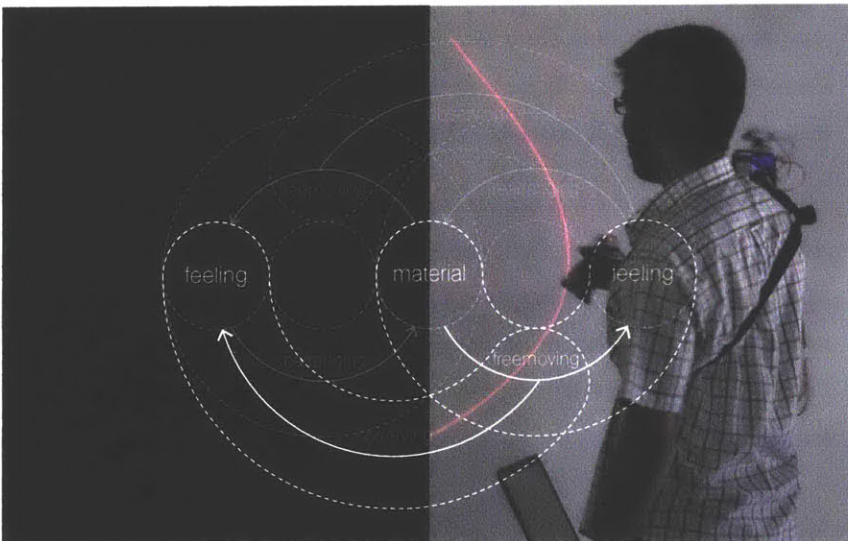
| Figure 8.1 |

(Model in Practice A)
Designer rearranging materials
Designer freemoving with materials



| Figure 8.2 |

(Model in Practice B)
User freemoving with materials
Designer observing



| Figure 8.3 |

(Model in Practice C)
Designer freemoving with materials
User observing

8.2. Refining a Practice

I am walking between two worlds, the two studios that I had separated using mobile whiteboards so that participants could draw their canvases without their designers observing what they were doing. I am the only one allowed to go through and observe both worlds. As I am walking, I am thinking about what Diego, one of the participants, had told me just a moment before, "...but Daniel somehow I need to *express* that I want to be happy." He had said that after I told him not to write words or draw smiley faces on his canvas. At that moment, I had not written about emotional sensations, and I had only thought about the canvas as a means to express sensory sensations. However, Diego was right, and as I was walking between the two worlds I realized that I had to modify my path once more. I had to redesign the canvas, redefine the rules for expressing, and write about *emotions* in my vocabulary. I was about to conduct another exercise in a couple of months, and I needed to modify the materials that I had, in preparation for the next trial.

This realization was a *finding* that took place in the same way as other realizations that I had and would have along my journey. I have seen them all along, throughout each of the fourteen exercises that I have conducted. For each exercise, I had rearranged materials, the canvases, electronics, and words in ink on paper. These are materials that I had never finished putting together, always incomplete, always in design, because, in every iteration, through delivering them to people and observing them, I had always learned something new. These very materials you are reading right now, this final version of Transformational Design, is also incomplete.

The findings are my last realizations, after trying things out in the last iteration. These findings include the *Constructs*, the *Unrecognizables*, and the *Mismatches*. And I am going to use them to refine my Foundations, once more. I am running out of time and I have to submit this dissertation, but I am not done and I still have a couple of moments to change what I have written.

Refining the First Foundation

The Constructs are the findings of my first exercise, where I say, “I find that when participants fill out my canvas, they do not express the experience they are actually living, but rather construct a retrospective and coherent narrative about what they had experienced” (p. 101). This finding took place after writing the vocabulary, conducting the exercise, and reflecting on the evidence. Consequently, I can only refine my First Foundation here, after the fact, by writing about the vocabulary and the first exercise of my practice once more.

For the *Mindful Vocabulary*, this finding implies differentiating between *experiencing* and *experience*. In the moment, I am feeling what I am doing with materials, right here right now: I am *experiencing*. However, when I am expressing or thinking about what I have experienced, this experience becomes a construction: *an experience*¹.

When I express *an experience*, feeling and doing also become a construction: *a feeling* and *a doing*. I construct a narrative of an experience by expressing or thinking about a sequence of feelings and doings. I can express (or think about) these feelings and doings as nouns, that is, words I write, read, speak, or listen with my mind’s ears (think). But I can also express them by drawing or acting them out, and think about them using all of my mind’s senses.

In my vocabulary, I describe the *Stream of Experience* as a sequence of experiential moments. However, I am refining this description here by differentiating between the stream that I feel passing by from moment to moment (*experiencing*), and the stream I construct after the fact (*an experience*). In my vocabulary I describe *experience*, *feeling*, *doing*, and *materials* as evocations to become mindful of what is *happening* in the moment, and then talk and think about it. My intention here is not to replace these

Experiencing

Feeling what I am doing with materials, in the moment

An Experience

What I think I am experiencing or have experienced

Feelings

What I think I am feeling or have felt

Doings

What I think I am doing or have done

¹ A similar distinction between *experience* and *experiencing* is described by the philosopher Eugene Gendlin in his book *Experiencing and the Creation of Meaning* (Gendlin 1997). He writes, “I use the word ‘experiencing’ to denote the concrete experience, because the phenomenon I refer to is the *raw*, present, ongoing, *functioning* (in us) of what is usually called experience” (Gendlin 1997, 11).

Transformational Design

Rules for Expressing (first variation)

1. Begin experiencing (by sensing and moving with the materials in your world)
2. As you are experiencing, direct your awareness towards feeling what you are doing in the moment

Rules for Expressing (second variation)

1. Begin experiencing (by sensing and moving with the materials in your world)
2. As you are experiencing, direct your awareness towards feeling what you are doing in the moment
3. After experiencing, take a couple of moments to think about what you have experienced, in terms of a sequence of experiential moments (feelings, doings, materials)
4. As you are thinking about doings, draw them as bodily postures (use black)
5. As you are thinking about materials, draw them as background for your bodily postures (use yellow)
6. As you are thinking about feelings, color them on top of your bodily postures (use red for unpleasant, green for neutral, and blue for pleasant)

Rules for Expressing (third variation)

1. Think about an experience you have lived or want to live (use all your mind's senses)
2. As you are thinking about doings, draw them as bodily postures (use black)
3. As you are thinking about materials, draw them as background for your bodily postures (use yellow)
4. As you are thinking about feelings, color them on top of your bodily postures (use red for unpleasant, green for neutral, and blue for pleasant)

concepts, but rather to expand my vocabulary with four new concepts that complement what I have already written.

For the *Expressing Exercise*, this finding requires that I clarify the purposes of the activity. I can use the exercise as a means to become mindful of my experience in the moment (experiencing), and as a means to express and think about a (constructed) experience I have lived or would want to live. And I can use these purposes to refine my exercise through three variations.

The first variation is using the exercise as a means to practice mindfulness, not as a means of expression. After conducting the exercise, I realized that participants had sharpened their awareness because they believed they had to express their experience afterwards. Thus, in this variation, participants are told they are going to express, when in actuality they are becoming more mindful without having to express anything at all. That is, this is a shift from expressing to becoming aware.

The second variation is to use the exercise as a means to express a (constructed) experience. In this case, the only difference from the original exercise is to be explicit about the fact that participants express a construction and not what they actually have experienced. That is, in this version, participants construct a coherent sequence of experiential moments after the fact, according to what they remember they have experienced. They construct this experience by expressing in response to what they are thinking, and by thinking in response to what they are expressing.

And the last variation is to use the exercise as a means to come up with a (constructed) experience that participants would want to have. In this version, participants do not have to live an actual experience, and instead they construct an experience using the faculty of their minds, by remembering and anticipating, using all of their mind's senses. They construct this experience by expressing in response to what they are thinking, and by thinking in response to what they are expressing.

This third version is similar to the Rules for Expression I used in the game, where users expressed an experience they wanted to have. In the game, I was trying things out along the way.

I decided to ask users to think about (project) and express an experience they would like to live, after intuiting that there was not much of a difference between expressing a lived experience and expressing a projected one: both were constructions.

Refining the Second Foundation

The Unrecognizables are the findings of the second exercise, where I say, “I find that participants begin recognizing their materials gradually, as they rearrange and freemove with them, using descriptive phrases (proto-names) or gestures (proto-movements) to express their designs in terms of the experiences they are bringing forth” (p. 165). This finding took place after writing the model, conducting the exercise, and reflecting on the evidence. Consequently, I can only refine my Second Foundation here, after the fact, by writing about the model and the second exercise of my practice once more.

For the Experiential Model, this finding requires including proto-naming and proto-moving as design moves, or operations. When proto-naming, I am making up a phrase as a way to talk and think about the materials, in terms of the experience I am having or want to have. That is, this phrase expresses what I am doing or want to do with the materials; for example, a “thing-that-imitates-our-hands-movement.” And when proto-moving, I am making up movements and gestures, *on the fly*, as a way to freemove before or while rearranging the actual materials. Both of these design moves are *shortcuts*, allowing me to try things out and recognize things gradually as I am putting things together.

Proto-naming drives *rearranging* because by recognizing *what* I am making, I know what materials to search for and how I need to modify them and assemble them. However, this recognition is transient as I can change my mind freely and proto-name again while or after rearranging the materials. In my original model, naming the materials takes place after freemoving with them, when I bring forth a new experience and cannot recognize the materials. However, I am refining my model here by showing how naming

Proto-naming

Making up a phrase to talk and think about the materials, in terms of an experience

Proto-moving

Making up movements before or while rearranging the materials

is gradual, as I can begin proto-naming the materials earlier, throughout the process and before I bring forth a new experience.

Proto-moving fosters iteration because I do not have to wait to put all materials together in order to try things out. In my original model, freemoving takes place after rearranging the materials. However, I am refining my model here by showing how freemoving is gradual, as I can begin proto-moving with my body earlier and throughout the process, with or without the materials.

Rules for Rearranging

1. Explore possible experiences by proto-moving with or without materials
2. As you are moving, proto-name the materials (to be rearranged)
3. Rearrange the materials you have at hand: recycled and interactive materials
4. As you are rearranging them, try things out by proto-moving in different ways, and pay attention to what you do and feel (be mindful)
5. As you are rearranging them, you can also talk and think about the materials by proto-naming them in different ways
6. Note that visual representations of the designs (drawings or digital models) are not allowed
7. Note that you should not draw labels or signs on your materials (words, arrows, symbols) to indicate what to do and feel with them

For the Rearranging Exercise, this finding requires including proto-naming and proto-moving within the Rules for Rearranging. And by doing so, allowing participants to build up their labels gradually, as well as encouraging them to try things out on the fly, without having to wait for the materials to be completely rearranged and fully working.

In the refined version, participants begin the exercise by proto-moving (without materials) and by proto-naming accordingly. They proto-move to explore different possibilities directly with their bodies. And they proto-name to know what materials to search for and how to assemble them. Then, the actual engagement with the materials begins. Participants rearrange by searching for materials, cutting them out, and putting them together. And as they do so, they try things out by proto-moving with these materials freely and by proto-naming them in different ways.

Refining the Third Foundation

The *Mismatches*, are the findings of the third exercise, where I state, “Participants care more about participating, observing one another, been surprised, and finding differences than they care about the actual rearranged materials or even the *experience*—what they do and feel with the rearranged materials” (p. 260). This finding took place after writing the model, conducting the exercise, and reflecting on the evidence. Consequently, I can only refine my Third Foundation here, after the fact, by writing about the model and the third exercise of my practice once more.

For my model, my third finding requires adding more moments where the person I am designing for and I, the designer, encounter and observe one another. In my original model, I deliver the materials after I rearrange them, so that the other person can freemove while I am observing. However, by considering freemoving as a gradual operation (proto-moving), we can encounter each other in many more occasions, before or while I rearrange the materials. I can ask the other person to proto-move while I observe, and then I can proto-move myself while the other person observes. We do not have to wait for the materials to be fully working and rearranged in order to meet and learn from one another. We can proto-move and pretend the materials are there, by using some prompts and our bodies as materials. For example, I can place my hand on top of my head (hat), or I can say “bip, bip, bip” acting out the response of the materials as I am moving towards them.

For the Transformational Game, this finding requires blurring the boundaries between the game’s phases, so that participants can encounter each other, observe and learn from one another in more occasion and more organically. In order to do so, I am allowing participants to call for an *encounter* freely, in different moments of the game. And I am including proto-moving for both, users and designers, as a faster and more flexible alternative for expression and delivery of materials.

Instead of phases, I organize this version of the game around moves and encounters. The moves are moments where the user and designer play separately without observing one another. The user’s moves are expressing a (constructed) experience. The designer’s moves are rearranging the materials in response to the user’s expressions. The encounters are moments where user and designer find themselves in the same place (theater) to observe one another in silence, without using words to explain their intentions. There are three type of encounters. In the first, the user suggests some directions to the designer. In the other two, the designer delivers a response to those directions.

This version of the game can be played in multiple ways. The only prescription is to begin the game with the User’s Moves and to have a minimum

User’s Moves

Express an experience by drawing (canvas) or by proto-moving without materials

Designer’s Moves

Observe your user’s expressions and think about design intentions

Explore possible experiences by proto-moving with or without materials

Rearrange materials mindfully, as you are proto-moving and proto-naming them

Encounter A

(User) Deliver your canvas or proto-move without materials

(Designer) Observe what the user is doing

Encounter B

(Designer) Proto-move with or without materials

(User) Observe what the designer is doing

Encounter C

(Designer) Deliver the rearranged materials

(User) Proto-move with the rearranged materials

(Designer) Observe what the user is doing

(Designer) Proto-move with the rearranged materials

(User) Observe what the designer is doing

Example of Play 1

User's Moves
Encounter A
Designer's Moves
Encounter C
User's Moves
Encounter A
...

Example of Play 2

User's Moves
Encounter A
Designer's Moves
Encounter B
User's Moves
Encounter A
Designer's Moves
Encounter C
...

of two Encounters, considering the first Encounter is delivering the user's expression (Encounter A). The users can call for an Encounter B anytime they want, as they may be interested in knowing how designers are doing. After observing designers' proto-moving, they are also free either to suggest more directions or not to. That is, they call for a User's Move and a corresponding Encounter A.

On the other hand, designers can also call for an Encounter B any time they want, as they may be interested in getting some directions from the users. However, the users decide whether to suggest more directions or not, after they observe designers' proto-moving. Finally, both users and designers can call for an Encounter C. However, users can only call for this encounter if an Encounter B has taken place before. If the designers are not ready with the materials, they can change the users' request to an Encounter B. Designers can call for an Encounter C whenever they are ready to deliver the materials, and they can do so even if an Encounter B has not taken place before.

I include two examples of how the game may unfold. As you can see, the first example shows that the game can also be played in its original form.

8.3. Further Threads

In the exercises, I explained my practice to participants by holding a cord with both of my hands. I told them that Transformational Design was taking place at the two ends of the cord. I told them that at the left end of the cord, they would learn about mindfulness, experience, and design; what people may describe as the *theoretical*. At the right end of the cord, they would learn about technology, programming and analog and digital electronics; what people may describe as the *technical*. However, I also said that these two ends, which seemed far away from one another, did not have to exist in opposition to one another, but that everything depended on how we held the cord. Standing in front of the participants, I took both ends with both of my hands and brought them together. That is, I formed a loop, a circle, as I said, "Do you see? Now they are together, the ends are only showing that the practice is open."

The ends of the cords are beginnings. They are made of little threads, loose-ends pointing in multiple directions. My practice is still growing, and there are many loose ends, concepts, operations, and principles that I have not written about, exercises I did not try, materials I did not use. Transformational Design is like the cord in a loop, with people reading, talking about and practicing mindfulness, experience, and design, as well as putting together technologies using analog and digital electronics. For me, there is no distinction between the theoretical and the technical. The two ends of the cords are only showing that Transformational Design is full of loose-ends, threads pointing in multiple directions, full of opportunities for further exploration.

I have found nine loose ends of my practice by receiving feedback from people and by reflecting on what I have done and written about. These loose-ends, however, are not *problems* but rather *opportunities*: they constitute threads for further growth, support, and spread of Transformational Design. Even though the threads are distinct, some of them are clustering together as they point in similar directions.

Growing a Practice

Even though I have written about experience and design in detail, the more I write the more I can keep going. The vocabulary and the models are not exhausted; they are only the foundations of my practice. And after reading them, you may think about many other concepts for the vocabulary and design moves for the model. The more I write, the more loose ends are created in the cord. I think this is a good thing because it is showing that the practice has a life of its own. The following are only three loose-ends, three threads pointing towards growing a practice: *Habits*, *Client*, and *Materials*. There may be many others, and after reading them you may think of even more.

A first thread is *Habits*. Even though I wrote about *dispositions* in my vocabulary, I did not elaborate on how these conditioned reactions become recurrent patterns or habits, or on how I can talk and think about my own

habits and the habits of others in design. My habits fix my experience; that is, they become patterns of my daily life. Consequently, they are essential to Transformational Design. I have realized that the transformations that matter the most are the ones that stay, by becoming part of our daily routines. For example, with the smartphone, I have changed the way I communicate with other people. I do not call them anymore, but write them short messages by pressing a screen (texts). In this context, experiencing something new and reflecting on that experience is only the first step. As I am bringing forth a new experience in design, I then need a means to talk and think about how this new experience may or may not become a habit, altering my daily life and the daily life of the people I am designing for.

Still, this thread constitutes an opportunity for developing both the Mindful Vocabulary and the Expressing Exercise.

The vocabulary may be expanded to include habits, personal traits (personality), and ways of living, as well as explaining how transformation relates to these concepts. And the exercise may be developed to incorporate other means to become mindful, express and reflect about our own habits and the habits of others in design. One example would be to incorporate habits in the Experience Canvas.

Another thread is the Client. Even though I have described collective design, I have focused on the design moves and relationships between two specific design agents: the designer and the person she is designing for (the so-called user). However, in some design activities, there is also a third agent: a person who asks the designer to rearrange materials for the user. This third design agent is called the *client*. For example, some executive at Samsung (client) may hire some practitioner at IDEO (designer) to put together a new smartphone for an elderly person (user).

For me, this thread constitutes an opportunity for developing both the Transformational Model and the Transformational Game. The model may be expanded to include the agency of the client. There will be two new diagrams: one illustrating the coordinated dance between client and designer, and one illustrating the one between client and user. The client's moves may include rearranging, freemoving, and observing but also delivering the

initial materials and specifying certain conditions, such as timing and type of user. The streams show multiple experiences running in parallel and, consequently, it is just a matter of adding the client's. And the game may be modified to include a third player, the client, who may begin playing by choosing the materials and the type of user, and may end the game whenever he wants.

A third thread is the type of Materials. Even though I have described the materials as part of my vocabulary, I did not elaborate the materials within my model, that is, I did not explain how designers can operate differently according to the type of materials they encounter in their worlds, objects and spaces, as well as beings (people). In the exercises, most participants felt themselves holding, standing on, or wearing the materials they rearranged, and only some of them felt themselves moving inside the materials or using them to communicate with other people. Furthermore, participants moved, touched, listened, and saw, but they neither tasted nor smelled the materials.

Still, this thread constitutes an opportunity for developing both the Experiential Model and the Transformational Game. The model may be expanded by describing how designers can rearrange, move with, and think about different scales and type of materials, in order to bring about experiences involving objects, spaces, and other people, as well as a combination of the three. These type of experiences could be described as *services*; for example, where there are spaces (an office, a bookstore, or an airport), objects (a computer, a book, or a plane), as well as people facilitating an activity (working, shopping, or flying).

And the game may be developed further by modifying the canvas, rules and materials. For the canvas, there could be multiple layers, one for every person participating within the experience the user wants to have. In this way, the user may be able to express the experiences of the different people he is observing and talking to within his own experience. There could thus be new ones, such as asking people to participate as *materials* of an experience. The designer could become like a *theater director*, creating a play on stage by asking people to move around, interacting with himself and

with others as they all engage with the materials she has rearranged. Along with the interactive and recycled materials, there could be larger architectural components as well as comestible materials (food). Using architectural components, such *bricks, wood, columns, scaffolding, platforms, and beams*, the designer could become like the Gothic constructor, rearranging the materials on site and trying them out directly. Using food, such as *eggs, milk, flour, salt, vegetables, and meat*, the designer could become a chef by putting these materials together as she smells and tastes them.

Supporting a Practice

Even though I have tried to demonstrate the importance of my practice, you may still have your doubts, and may be thinking about some loose ends as *weak-points*. I would argue that by knowing my weak-points, I am also knowing from where to begin training and making myself stronger. The following are another three loose-ends, three threads pointing towards supporting a practice: *Documentation, Quantitative Research, and Development and Implementation*. There may be many others, because as the practice grows and becomes heavier, it requires more support.

A fourth thread is Documentation. Even though throughout the exercises I took photographs and recorded video of participants, there were important moments that I missed. I was not always sure what was important to document and what was not: I took photographs and videos without a clear direction. Then, while writing, I realized that there were some important moments that I had missed; for example, images of the villagers in Navidad and Coya undergoing their actual experience, and images of the students at Pennsylvania State University reflecting on their users' canvas. Also, while documenting, I focused too much on the visual by thinking about the evidence in terms of images and video. I therefore failed to record conversations between participants as they designed, my response to their questions as I was guiding them, and their comments and feedback after the exercises. Fortunately, through the audio in the videos, I was able to listen to some of what participants were saying, and I was able to transcribe what I was listening and present these transcriptions as evidence.

Listening to the audio nurtured my reflection and my findings. For example, I realized the importance of the proto-names and proto-movements by listening to what participants were saying. While I cannot know what people are thinking, listening to what they are saying opens a gate for understanding what they may be thinking (using their minds' ears). Talking, in a way, is thinking out loud. While through the images I can observe how people are moving and sensing with their materials, through the audio I can listen to how people are *thinking out loud* about their materials and their experiences.

For me, this thread constitutes an opportunity to establish a protocol and externalizing documentation. The protocol is a set of written instruction that specify which moments to document and how. For every exercise and for every phase of the game there could be specific moments to document. For example, for the Rearranging Phase, there are three moment that should be documented: participants reflecting on their users' canvas, asking questions to the exercise facilitator, and talking to one another as they rearrange materials. This documentation could be externalized so that it does not interfere with the exercises. Additional trained assistants could capture images and audio by following the protocol. Moreover, the Transformational Lab could be equipped with cameras and microphones in place, in the ceiling or in tripods, programmed to track and record participants. Finally, at the end of the exercises there could be an interview session where participants respond to open questions about what they learned.

A fifth thread is Quantitative Research. Even though I have conducted a considerable number of exercises (14) with a large number of participants (144), I have only focused on the qualitative aspects, describing and reflecting about what I observed. I want to clarify that the large number of exercises and participants does not reflect the repetition of a standard exercise, but rather the iteration between different exercises, as part of my creative process of Transformational Design. Moreover, within the total of 14 exercises, I only wrote about 6 of them, and within these 6 exercises I only described the work of 24 participants in detail.

Still, this thread constitutes an opportunity for demonstrating my observations and findings by using numbers. For example, I could count the

number of Constructs, Unrecognizables, and Mismatches, and then make comparisons, graphs, and projections. However, this quantitative research should not replace the qualitative. The nuances and details of what people are doing are central to my practice, and cannot be reduced to numbers, standards, and points in a graph. The numbers, comparisons, graphs, and projections should be used to talk about and enrich the qualitative observations and findings of the practice.

A sixth thread is Development and Implementation. Even though participants were able to put together materials that worked, these materials were at best rough, their connections slack and the electronics inefficient and in some cases even dangerous. In the exercises, they put the materials together quickly because the emphasis was on iteration, rearranging and trying things out as many times as possible. For me, however, development and implementation in professional practice is not so different from what participants actually did. The designs are never fully developed and implemented, and there is always a chance to modify them and experience something new. Design is open-ended and developing and implementing is only about iterating more times, rearranging more sophisticated materials, and trying them out so they are less expensive, more efficient, and safe.

For me, this thread constitutes an opportunity for positioning my practice as a solid alternative for practitioners working in the more technical and commercial design phases. One direction could be to extend my exercise as to embrace the process until the product is launched into the market. The exercises could become longer (more iterations) and participants could use their materials, tools, and laboratories. They could rearrange sophisticated materials using their advanced tools, such as molding, casting, 3D printing, and milling. They could demonstrate their rearranged materials by observing people in their laboratories, and using other machines to test efficiency, economy, and safety. The exercise could still be open-ended because launching the product onto the market can also be considered as part of a demonstrating phase, where users experience the materials and designers observe and learn for the next iteration. Another direction could be to include the exercise (or phases of the exercise) within the ways practitioners are currently developing and implementing their technologies. They could take

a moment within their daily practice to *play the game*, in order to become aware and reflect about their agency within an open-ended and collective process of transformation.

Spreading a Practice

Even though I have tried to spread Transformational Design as much as possible through conducting exercises and talks, you may still wonder about the actual impact of my practice. This is just the beginning of a practice growing slowly from the bottom up, and the challenge is to incorporate more and more people without losing track of what the practice actually is about. For example, *presence* is key, because participants use their hands and bodies and learn from one another in person. The following are another three loose-ends, three threads pointing towards spreading a practice: *Mindful Meditation*, *Chosen Users*, and *Scalability*. These are the last threads of an open cord, but there may be many more ways to extend the impact of a new practice.

An seventh thread is Mindful Meditation. Even though I wrote about meditation in my vocabulary and tried mindful exercises with participants, becoming aware of experience is a difficult skill that requires training. Mindfulness is a skill that meditators learn throughout their lives, training every day, year after year. In the exercises, participants were only able to get a glimpse of what mindfulness means and the opportunities it may open up for design.

Still, this thread constitutes an opportunity for education and collaboration. One direction would be to train design practitioners as part of a program or course over longer periods of time; for example, Mindful Meditation could become a core subject in design schools, serving traditional design practitioners working with different materials, in art, architecture, and music as well as product and interaction design. A second direction would be to collaborate with trained meditators, people who could guide the mindful design practice of designers, as well as engage in design activities themselves.

A eighth thread is Chosen Users. Even though I included users as key agents within my practice, in the game the user was not an exemplary *persona* for a particular design product or problem. In other words, the user was neither chosen by the designer, nor by the client, nor by the user-researcher. The users were participants of the game, and they were all of similar age, backgrounds, and willingness to participate. Still, I want to clarify that they were all actual *users*. For me, we can all become users if somebody is designing for us. Consequently, in the game participants were actual users because designers were designing for them. Again, the only difference is that, in the game, the users were not chosen.

Still, this thread constitutes an opportunity for inviting other type of users, people who the designer may be interested in designing for. For example, the designer may be interested in designing for miners, business students, or visually-impaired people. One direction is to play the game outside the studio. In the Expressing Phase, the designer could go out to the field with the canvas and then either ask users to fill the canvas themselves, or do it himself by observing users and asking them questions about their doings, feelings, and materials. In the Demonstrating Phase, the designer may visit the users again and deliver the rearranged materials on site. Another direction is to invite users to the studio. The users can participate in all the phases of the game, and become designers for themselves. In this game, the person who is interested in designing for these people becomes a different type of designer: a coach, a facilitator or lead designer who is setting up the rules, guiding participants, and observing them. This role is similar to the one I had when conducting the exercises with participants.

A ninth thread is Scalability. Even though this practice is growing from the bottom up, I have not explained how to scale Transformational Design as to have a larger impact. Within my individual efforts, there were a limited number of exercises and number of participants that I was able to handle: two exercises a month and a maximum of 20 participants per exercise. Lectures, papers, books, and online courses would not help because this practice is learned by taking an active part in a process. In order to learn Transformational Design, participants have to taste the soup: they need a space, materials, and they need to be present, play with their hands and

bodies and observe one another in person. There is no other way. This loose end is crucial, because for Transformational Design to become an actual design practice, it has to be learned, practiced, and talked about by design practitioners and educators.

For me, this thread constitutes an opportunity for growth without having to change anything about the actual practice I have already proposed. The strategy could be to create a team of coaches, people who participate in the exercises and whom I could train to facilitate other exercises without me. If two new coaches were trained at every session, and these coaches went on to train others, the number of trained coaches would grow very quickly. However, key would be to nurture the community and, consequently, once these coaches and participants are trained there could be other platforms for them to meet in person and talk about their work, demonstrate their materials, and reflect together about their own and other's transformations.

As I am spreading the practice it is also time to start saying my good byes. This has been a long personal journey, building these foundations for others, so that they can begin appropriating and exercising a practice of their own. I hope you have enjoyed the journey too, and are willing to embark yourself and take command of a practice that is for you to use and modify as you will. There are no right or wrong ways to keep going: the important thing is to remember the mindful, exploratory, and transformational nature of the journey.

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