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TO LEARN TO FEEL: DEVELOPING TACTUAL AESTHETIC SENSITIVITY IN DESIGN EDUCATION

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ABSTRACT
Through touch we are in physical contact with the material world, to explore and manipulate that world. Touch is the basis for our understanding of the materiality of the world. In addition, touch is a communication channel for affection: it is through touch that we feel accepted or rejected.
Touch is therefore essential to our well-being. Design education should develop students' awareness and sensitivity for the tactual experience in human product interaction and the skills to design for touch. But touch is a tacit experience, difficult to access. To develop a course addressing the tactual experience we first need to get access to that experience. At Delft University of Technology, Department of Industrial Design, we developed a set of tools, methods and exercises, presented to the students in the course 'Tactility'.

Keywords: Tactual experience, aesthetic sensitivity, tactual design skills

1 INTRODUCTION

People experience the physical world they live in through all their senses: the visual, the, auditory, the tactual, the gustative and the olfactory sensations all contribute to an integrated experience of what is happening. Despite this integration in sensory experience, each sense seems to contribute in its own specific way, having a meaning and importance in its own. Looking at a cup of coffee differs from smelling it, or from holding it to warm our hands. Thus in design education, despite the integrated aspect of experience, each sense seems to deserve specific attention for its characteristics: its meaning and its principles in human experience.
Delft University of Technology offers different courses each addressing the development of a design student's awareness and sensitivity for a specific sense modality. This paper will elaborate on the course 'Tactility', created to develop a student's tactual aesthetic sensitivity.

2 MEANING OF TOUCH

Through touch we are in physical contact with the material world, to explore and manipulate that world. Touch is therefore the basis for our understanding of the materiality of the world (Merleau-Ponty, 1962). One learns about 'hardness' by bumping into hard edges of tables and about warmth by physically experiencing the warming effect of wrapping a blanket around one's shoulder. But above all, touch is a communication channel for affection: people caress to show their affection and slap to communicate the opposite. Touch is therefore the basis for our emotional well-being in this world (Fields, 2003). This affective aspect of touch is the core issue addressed in the course tactility.

3 BODY LANGUAGE OF OBJECTS

Despite the importance and richness of the world of touch, we find it difficult to communicate about our tactual experiences: touch is a tacit experience. We immediately feel the difference between a pleasant and an unpleasant pair of scissors, but we find it difficult to describe it: "it just cuts much better".
To develop a course addressing the tactual experience we first need to get access to that experience. We need to develop a conceptual framework to understand and explore touch in human product interaction, and tools and skills to work with this framework.

Overall, the tactual experience can be characterized with the notion of body language of objects (Sonneveld, 2007). In human product interaction, people move to touch objects. In these movements, objects are experienced as having a personality and intentions which they express through the way they touch us. The handshake is a good metaphor to understand this concept: when shaking hands, we experience the physical characteristics of the hand (warmth, moist, force, and so on), and through these characteristics, we encounter the other person: we experience personality traits (e.g. arrogance, enthusiasm), intentions (e.g. wanting to get to know us, wanting to get rid of us), and feelings (feeling at ease with that person, or rejected). In other words, people express themselves when shaking hands and these expressions are well understood. Likewise, in human-product interaction, people understand the affective meaning of the body language of objects.

4 TACTUAL EXPERIENCE GUIDE

The introduction to designers of the conceptual framework about the tactual experience should be presented embedded in practical, sensory experiences. This approach is based on the interplay between cognitive learning and perceptual learning: once people have a set of concepts to describe what they feel, they will be able to perceive more nuances, and thus describe their experiences more extensively. And vice versa, the more they have experienced physically, the more they will be able to give content to the specified concepts (Chollet, Valentin, & Abdi, 2004).
The Tactual Experience Guide is developed as a tool to get this practical, personal insight in the tactual experience. Students are introduced to the different domains of tactual experience by exploring their own experiences with the objects that surround them. Each domain of the tactual experience is explored using a mind map (figure 1). With this tool, students will acquire a language to understand the world of touch, and a structure to be able to build their own 'tactual database'.

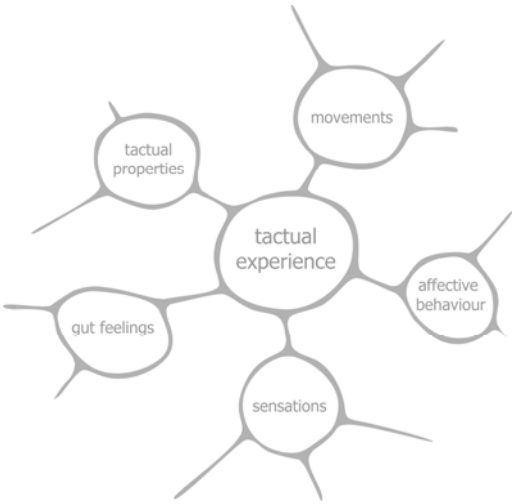

Figure 1. The five domains of the Tactual Experience Guide

5 THE COURSE TACTILITY

The course Tactility (ID5362) was presented as an elective for the master students at the Faculty of Industrial Design Engineering at the Delft University of Technology, from 2000 to 2009. In this period the elective, lasting eight weeks, was organized fourteen times, to fourteen different groups of students. A maximum of 20 students participated in each cycle. The course was scheduled for two hours per week, complemented with four hours of homework per week.
The course aims for the following educational goals:

- The development of students' design knowledge by offering insight in the concept of tactual aesthetics through personal experiences. This involves the development of the students' aesthetic sensitivity, personal preferences in tactual aesthetics, and their personal position on how to design for this domain;
- The development of students' design skills by offering design exercises in which they practice the translation from design knowledge to tangible design solutions. This involves framing the

problem domain, exploring design solutions, and communicating about these aspects in the different phases of the design process.

The assessment of the results are based on the following criteria:

- The quality of the exploratory process for the different exercises: the originality of the questions the students formulated as starting points for their design exercises and the broadness and depth of their search to get material answers to these questions;
- The quality of the translation of the findings of their exploratory search into new 'tactual' concepts: the capacity to formulate abstract conclusions based on their material exploratory results, and to generate innovative and unexpected material designs based on these abstractions;
- The completeness and conscientiousness of the different presentation forms;
- The overall effort invested in the course.

5.1 Exercises

Two types of exercises are developed for this course. First of all, the students are presented with awareness and sensitivity developing exercises, meant to introduce the different aspects of tactual experience through personal, hands-on experiences and to enable students to discover personal preferences.

Second, the students are presented with design exercises, to learn how to shift from awareness and observation to creation, and to learn how to incorporate tactual aesthetics in the practice of product design. During the exercise, the students learn how to relate experience to tactual properties. For that purpose the student is first confronted with a short exercise as a starter, followed by a more elaborate design exercise of 4 weeks.

5.1.1 Awareness exercise 1: Blindfolded tactual exploration

Goal of the first exercise is to introduce students to the world of touch without preliminary knowledge, as an open-minded encounter. The exercise is inspired by a study where blindfolded participants were confronted with unfamiliar material objects to explore their tactual properties. The results of that study showed that being blindfolded stimulates people to focus on the tactual senses and to discover the 'own-ness' of the tactual world by exploring the properties of objects and by imagining what could be done with the object (sonneveld, 2007).

Figure 2. Examples of objects presented to the students in the first awareness exercise

For this exercise, a collection of different man-made objects is assembled (figure 2), covering the different aspects of the tactual properties of objects. The products are presumed to be unknown to the

students, to stimulate them to tactually explore the objects for a longer period and in all their tactual properties.
For this first exercise, students are seated and blindfolded. They each receive one object to explore. After having explored the object in its different aspects, the students pass the object to each other one by one, until they receive the object they started with. Overall, a set of about 20 objects is explored in about 30 minutes. To stimulate the students to explore the different tactual properties of the objects, they are asked to explore the movements the object elicits, to explore what you can do with it, and to explore what the object does. During the explorations, the students are allowed to comment spontaneously on their experiences. After all objects have been explored, the blindfolds are taken off, and the students are allowed to explore the visual properties of the objects they have been touching. The exercise is concluded with a discussion on the different experiences during the exercise.
Students comment that blindfolded experiencing of objects is surprising and fascinating. Tactually experiencing without seeing seems to have an exciting aesthetic value in its own right. Especially the fact that the object presents itself immediately in a physical way without visual anticipation is thrilling and confrontational.
In addition, students discover that the tactual properties of the objects are related to the movements they make. Moreover, they become aware that some objects elicit many different movements and therefore are perceived in many different ways, whereas other objects do not. In addition, objects differ in the length of time they stimulate someone to move: some objects stimulate people to keep on moving, whereas other objects are put aside quite soon after receiving them. Nevertheless, there does not seem to be consensus on this aspect for each object.
Eventually, students are surprised by the fact that the aesthetic experience of these objects differs from person to person. The same object may feel pleasant for somebody, but disgusting for somebody else. Although we know this phenomenon from the visual domain (‘tastes differ’), it leads to surprise when students discover it is also the case for tactual aesthetics.

5.1.2 Awareness exercise 2: What is pleasant to touch?

Goal of the second exercise is to create awareness for the aesthetic aspects of the tactual properties of objects and to discover and develop personal preferences.
Students are asked to bring different objects to the class: 3 objects that are appreciated for their tactual qualities, and 3 objects that are not. In class, each student puts his objects on the table, mixing the pleasant and unpleasant objects. The students walk around the different tables to explore the different objects, to explore their properties and to evaluate their pleasantness or unpleasantness to touch. Next, the students are asked to present their collection one by one, motivating their choice, and to reflect on what they discovered about their personal preferences. The exercise concludes with a discussion on these findings.
Overall, it seems easier to find examples of objects that feel good than objects that do not. Students report that they feel ‘naïve’, starting to explore a new domain without having a frame of reference about what is generally considered as a correct result. This creates insecurity: *‘Am I doing it right?’*, *‘Can I bring this to class or will it be ridiculous?’*. This naïveté seems partly reflected in some of the objects that are brought to class: initially, soft cuddle toys and rough sand paper are over-represented in the collections. Throughout the course, students come with less obvious and more sophisticated examples.
The students are surprised that it is difficult to recognize in each other’s collections which objects are brought in because they feel good, and which are brought in for the opposite reason. The explanations of the students often reveal that movements are important: *‘It doesn’t feel good when you just hold it in your hand, but when you caress it in this direction it is really smooth’*.

5.1.3 Design exercise 1: Design of pleasant and unpleasant touch

For this first design exercise, the students are asked to transform a wooden stick (30 cm, Ø 2.5 cm) into an object that feels pleasant on one side and unpleasant on the other side. The students are allowed to use any material and any creative technique they like. Again, the results of the exercise are presented to the other students in class. First the transformed sticks are passed to each other one by one. Next, the students motivate their choices and give a short comment on the exercise. The exercise concludes with a discussion on the different findings. The students report that it is difficult to predict how a particular design solution will feel: the final outcome differs from the expectations. Stearine

wax is a good example of this phenomenon: students remember that it is nice to play with, but once they covered a broomstick with it, they were disappointed. The same thing holds for spikes: they are often applied initially because they are thought of as terrible to touch, but a broomstick with spikes in a particular pattern may actually feel good, *'You squeeze it, and you feel that it could hurt you, but it doesn't really hurt you because of the pattern. It is just the right amount of pleasant pain'*.

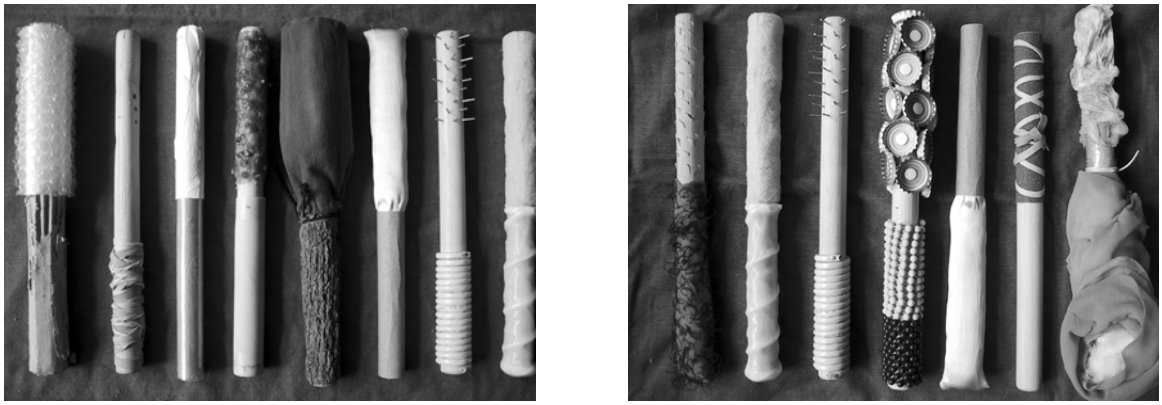

Figure 3. Examples of designs of products pleasant on the one side and unpleasant on the other side.

In making the objects, students discover that the aesthetic aspects of touch are not clear concepts. Physical pleasure may imply tenderness as well as erotic aspects, whereas physical unpleasantness may imply pain, disgust or creepiness. Moreover, the exercise underscores that these two domains do not have clearly defined borders: physical pleasantness and unpleasantness are mixed phenomena and may vary in time: *'In the beginning it really felt good, but after a while it became irritating'*.
Again, the solutions presented by the students have to be experienced through different movements. Some sticks are meant to be squeezed, others to be caressed, others to swing around with, and so on. The intended movements are not evident for all sticks, and instructions are needed to experience the interaction it its full right.

5.1.4 Design exercise 2: Design of a product with a personal touch

Goal of this last design exercise is to bring together the lessons learned from the previous exercises in one final product design exercise, within a specific design context. The students are asked to redesign a product in such a way that the interaction with the device becomes a pleasant tactual experience for themselves.
The exercise has three phases. In the first phase the students explore their tactual experiences with a personal, unpleasant product, using the Tactual Experience Guide. This exploration results in insight in the object's body language.
In the second phase, the students formulate the desired body language of the product through words and collages of visual images, again using the Tactual Experience Guide as a frame of reference. Third, the students redesign the new product in 'tactual' sketches and 3D models. To support this third stage of the design process, students are asked to 'design by touch'. To find new design solutions, students collect and explore other objects that present the desired behavior, to analyze their tactual properties as a source of inspiration for their design. Their results are presented twice to the group: once after the first phase and once after the final design is finished. In between the plenary sessions, the students are coached in pairs, each coaching session lasting 20 minutes.
The students discover that to design for tactual experience is to design through tactual experience. This becomes particularly explicit in the fact that most students do not make sketches during this design exercise, but directly design with 3D models and materials.
Examples of design projects are given below, in figure 4 to figure 6.

6 EVALUATION AND FUTURE DEVELOPMENTS

Students end their reports with an evaluation of the course 'Tactility'. The course is generally experienced as an eye-opener, although 'hand-opener' would be a more appropriate term in this case. Students acknowledge that they tacitly are aware of this tactual world, but that they need such a course to incorporate this awareness for touch in their design practice. In addition, the course supports the development of their tactual sensitivity (or as one of them wrote: *'I can't stop touching anymore!).*

The design exercises in the course Tactility make evident that students lack sketching techniques to design for touch. The present practice of drawing and rendering neglects the physical world. But to design for touch is to design through, using different modeling techniques. Future developments of tactual sketching techniques in design are needed: design needs to move from visualization to tactualisation.

Fig. 4 The juggling cones
The current juggling cones of this student were not cooperative in the learning phase, and did not 'participate' in the movement. They were indifferent to whether or not she was juggling with them. In addition, due to their shape and hard material, they hurt her when she caught them. The new cones are filled with water. When played with, the movement of the water slightly slows down the movement at just the right moment, giving the feeling that the juggling cones are considerate and enjoy to participate. The cones are wrapped with a soft rubber material filled with air, to allow for a gentle touch with a firm grip when being caught.

Fig. 5 The bunch of keys
Keys are chaotic, hysterical and try to escape whenever you try to catch one of them out of the whole bunch. In addition, keys hurt you when you carry them around in your pocket, trying to poke you in the leg. This design attempts to 'tame' the keys: they are aligned in a smoothly shaped holder. When you need one of them, you unfold it and turn it back into place after use.

Fig. 6 The CD box.
This student experiences a CD box as an object that does not want to be opened, and once it is, it does not want to let the CD go, it seems to struggle to keep it in. The student designed a CD box with the opposite behavior: opening the box is a pleasant and delicate movement, like a dance: one slides the two halves of the box over each other to open it. In this opening, the box offers the CD like a waiter offers you your plate.

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