TRANSITIONING FROM FORM AND COLOR TO SENSORY ASPECTS OF DESIGN

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1. INTRODUCTION

In North American undergraduate industrial design programs the curriculum frequently includes a foundation studio course introducing students to the fundamentals of form and color. This paper reports on a recent curriculum change from a traditional design studio to a lecture-based course that explores the sensory aspects of design for product designers. The sensory-focused work of Howes (1991, 2006), Rognoli (2010), and Schifferstein and Hekkert (2009) influenced this change. The latter assert that the definition of a product experience is "the awareness of the psychological effects elicited by the interaction with a product, including the degree to which all our senses are stimulated, the meanings and values we attach to the product, and the feelings and emotions that are elicited". This perspective calls for a modification to introductory design principles for industrial design students by expanding perception- and sensory-based guidelines for good design. This discussion begins with a look at the historical roots of design principles in the design curriculum.

2. BACKGROUND

Design and art educators acknowledge the influence of the Bauhaus, founded in 1919, on current foundation courses in their curricula (Greet Hannah, 2002; Jones, 1969; Lerner, 2005; Lerner, 2012; Phelan, 1981). Walter Gropius, the founder and first director of the Bauhaus, insisted on the importance of a 'scientific' approach to learning about the basic "elements of form and laws of design for putting them together" (Jones, 1969). These laws included "systematic compositional precepts such as proportional schemes- the Golden Section and so on- or else the ordering of colors into symmetrical combinations such as complementary hues" (Jones, 1969). Today in art and design programs students are still encouraged to apply the same rules about unity, emphasis and focal point, scale and proportion, balance, rhythm, line, shape/volume, pattern and texture, space, value, color, contrast, etc. (Lauer, 2007, Pipes, 2009). Johannes Itten the first teacher of the Bauhaus foundation course, the Vorkurs, was a proponent of learning the rules by applying them in student compositions (Lerner, 2005). According to design education researcher Fern Lerner (2005), Itten focused on problems of contrast and tension by "comparing polar opposites, like light/dark or soft/hard …in materials, textures, forms, colors, rhythms, and so on". Subsequent foundation instructors Laszlo Moholy-Nagy and Joseph Albers expanded upon his hands-on analytical method. The sum of their three points of view established the approach to foundation studies common today (Phelan, 1981; Lerner 2012).

Critics of the Bauhaus method say that it provides "a dead and deadening routine" (Jones, 1969). For example, there are only so many opportunities to rearrange visually oriented compositions, given a limited set of shapes and forms to explore. While the Bauhaus educators were focused on visual-spatial studies, they "often used only the term 'visual language" when referring to their studies in the Vorkurs (Jones, 1969; Lerner, 2012). The Bauhaus foundation instructors were influenced by the emerging field of Gestalt psychology, which explored the role of visual perception in defining and understanding a formal composition or gestalt. The term "gestalt" is defined as "a unified physical, psychological, or symbolic configuration having properties that cannot be derived from its parts" (Morris, 1970). For example, Gestalt psychology proposed that, "certain gestalts are enhanced by our innate tendencies to constellate, or to see as 'belonging together' elements that look alike (called 'similarity grouping'), are close together

('proximity grouping') or have structural economy ('good continuation')" (Behrens, 1998). These concepts are grouped among the design principles of unity, which are presented as good rules of composition today.

Since these and other "laws of design' were originally linked to a Gestalt psychology interpretation of human perception of visual stimuli the approach was, in effect, user-centered. The prescriptive rules for organizing compositions and color-relationships that are currently still in use emerged in order to engage people's capabilities of visual perception. At the time these radical principles were connected to a breaking away from traditional forms of art and design; they provided guidelines for two- and three-dimensional compositions based on abstraction of shape, form, and color. According to Phelan, "the reason for arranging forms or shapes was taken out of the religious, metaphysical or moral sphere and placed squarely in the perceptual one (1981). Today, abstract compositions are commonplace and much more is known about people's sensory modalities of experience and perception that extend beyond the visual-spatial. The next section discusses a greater range of sensory experiences that people bring to their interactions with formal objects.

3. SENSES AND PERCEPTION

The field of anthropology of the senses proposes that an individual gains culturally specific knowledge about his or her world through all of the bodily senses– his or her "sensorium of experience" (Howes and Classen, 1991; Paterson 2007). The sensory anthropology literature also argues against the idea of isolating sensory experiences in favor of the inter-play of the senses: sometimes augmenting and sometimes opposing or contradicting each other (Howes and Classen, 1991; Paterson, 2007). Since a person interacts with a product as a combination of sensory engagements, it may not be sensible to single out the visual aspects of a design or the auditory, tactile and other aspects when designing. According to Howes (2006), "the dynamics of intersensory relationships are what make the sensory models employed by societies and individuals vital, interactive and versatile". A person's sensorium ranges from five to nine or even twenty-one types of sensory perception (Geurts, 2002). For the purpose of this discussion, the senses of vision and spatial awareness are extended only to include hearing, touch, smell, and taste in relation to cultural context.

According to Hekkert and Schifferstein (2009), sensory experiences are only part of the overall interaction people have with products. They assert "the psychology of perception, cognitive psychology and psychology of emotion" are necessary to understanding "people's subjective reports of their experiences with products". They ask:

> How do people use their senses in experiencing products? How do people understand how to use a product? Why are people attracted to some products and not to others? On what grounds do people perceive a product as smart, stupid, or splendid? Which memories, associations, and emotions does a product evoke? Why do people develop a bond with a product? (2009)

These are the kinds of questions that lead to acknowledging that the concept of aesthetics "is not limited to the visual domain" according to Hekkert and Leder (2009). They elaborate on the concept of a multi-sensory product aesthetic: "Just as people like to see patterns that allow them to detect relationships, people like to detect organization in sounds, and feel structure in a surface". In view of this recent interpretation of aesthetics, it seemed appropriate to apply it to the only course in the curriculum that focused on the study of aesthetics.

4. COURSE REDESIGN

The studio course entitled Form and Color Fundamentals was part of the industrial design curriculum for at least thirty-five years, with progressive modifications to the content and projects to complement core industrial design studios. Students worked mostly as individuals, solving two- and three-dimensional visual problems, along the lines of those described in the book, *Elements of Design: Rowena Reed*

Kostellow and The Structure of Visual Relationships (Greet Hannah, 2002). Over time it became apparent that students were not applying the principles they were exploring in their abstract and playful compositions to their product design projects in other studio courses. For example, even after applying Itten's color relationships to projects in Form and Color, there was little indication in their other studio courses that the students understood the subtleties of color perception to enhance the product experience. For example, in a subsequent studio many of the students painted their appearance models with identical color schemes, unrelated to function or context of use! Though the cost of the paint was more affordable when divided among a number of students, the choice did not demonstrate learning.

A new course was developed to incorporate advances in disciplinary theory and build upon the human centered interdisciplinary approaches in the field of industrial design. It incorporates much of the old course content with a new orientation: studying the multi-sensory qualities derived from and designed into products to optimize sensory and cultural experiences. The course outline explained that it would examine the visual, tactile, auditory, and other related design elements and principles that contribute to multi-sensory characteristics of the product experience, adding meaning and emotional value. Two of the main learning objectives for the course follow:

- Differentiate between the sensory qualities that contribute to people's interactions with products.
- Conduct multi-sensory observations of interactions between people and products in contexts of use.

These were incorporated into the two major course assignments and supported by regular readings and quizzes. One assignment was a team analysis of the sensory factors that may contribute to meanings, emotional responses, and interactions derived from products. The second was an individual assignment in which each student would contribute to an ongoing class blog journal from the perspective of a single meaningful product in his or her daily life. These are described in more detail in the next section.

5. EVALUATING SENSORY FACTORS: USER ANALYSIS WITHIN A PRODUCT CATEGORY

The team project had two phases. The first phase required each team to choose a product from a group of predetermined small mechanical product categories such as corkscrews, handheld safety razors, and staplers, among others. Within their category, each team studied three products varying from "high design" to "low design". In phase one, the teams were to conduct a study, using Patrick Jordan's (2002) Product Personality Assessment Questionnaire". They asked ten classmates to evaluate the visual features of the product against the list of opposing adjectives. The team analyzed their responses to identify the product personalities and the visual features that may have contributed to the test participants' perceptions. They also were asked to enact a five-minute product role-play to illustrate the way specific visual features of the product might affect the users. The most dramatic enactment was that in which the violent, masculine, and sharp Juicy Salif was used as a murder weapon!

Figures 1 & 2: Phase 1 Juicy Salif Analysis by C. Sudak, E. Cross, R. Yonekawa, M. Zhu. & L. Natchetaia

In phase two the students observed how people physically interacted with the same three products to come to understand the relationship between the users and the sensory features of each product.

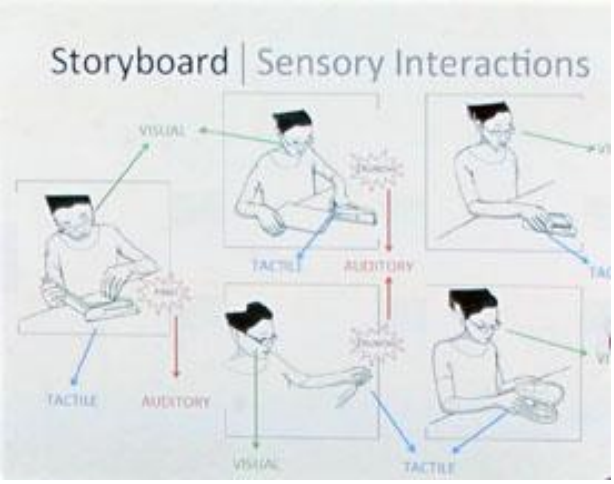


Figure 3: Phase 2 Stapler Interaction Interpretation by M. Chen, R. Barsalou, P. Nyakairu, C. Wilcox, J. Wilson

In general the teams were surprised to find that the visual senses were mostly important in the first stages of product use, followed by tactile interactions for functional applications, and enhanced by periodic auditory stimuli. They discovered that people tended to favor different products when choosing with all their senses, rather than by sight alone.

6. EVALUATING SENSORY FACTORS: SENSORY BIOGRAPHY JOURNALS

In this project each student was asked to give a meaningful product in his or her life (excluding his or her cell phone) a voice. They were instructed to draw from the topics in the class lecture and readings from that week for the journal posts. Some weeks, the products were asked to describe specific aspects of their lives and relationships with their humans. Other weeks, the products were free to reflect on particular aspects of the weekly themes such as design and emotion, visual appearances, product semantics, tactile experiences, auditory design, taste, smell, and multi-modal sensory frameworks.

The students chose a wide range of products as follows:

- Personal: cologne bottle, backpacks, hair brush, glasses, hair straightening iron, nail clippers, laptop bag, ornamental pillow, purse, watches, wallets
- Recreation: bicycles, cameras, car, flute, guitar, headphones, motocross bike, turntable, skateboard, violin
- Home & home office: bedside lamp, chair, computer mouse, pens, power bar
- Kitchen: apple peeler, Bodum one cup coffee maker, cup, lunch box, thermos

Students posted narratives, comic-strip scenarios, photos, diagrams, sketches, and videos illustrating the interactions between their product and themselves. For example, the scenario below was a study of the sensory interactions while playing the flute. On the blog, the flute explains how Beccy responds to

auditory feedback, noting that, “she often closes her eyes in order to focus on the sound, cutting out vision entirely” as seen in Figure 4.

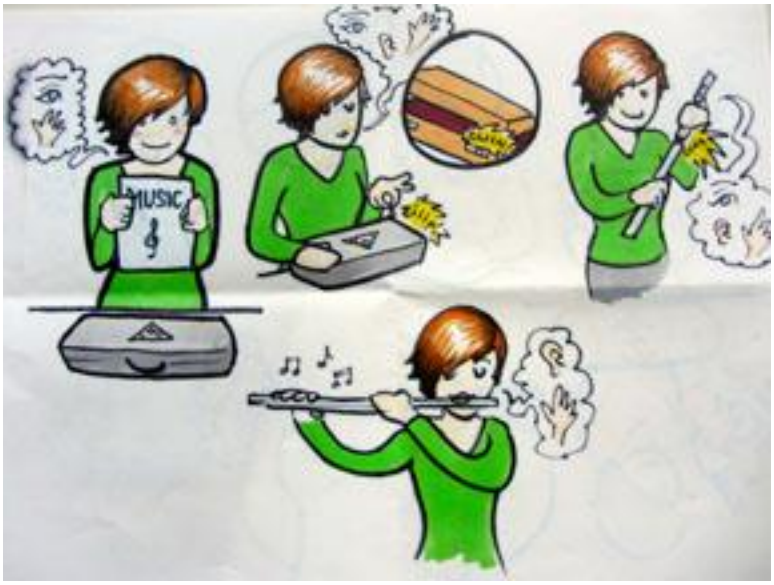


Figure 4: Sense icons depict the order of sensory experiences by B.Murphy

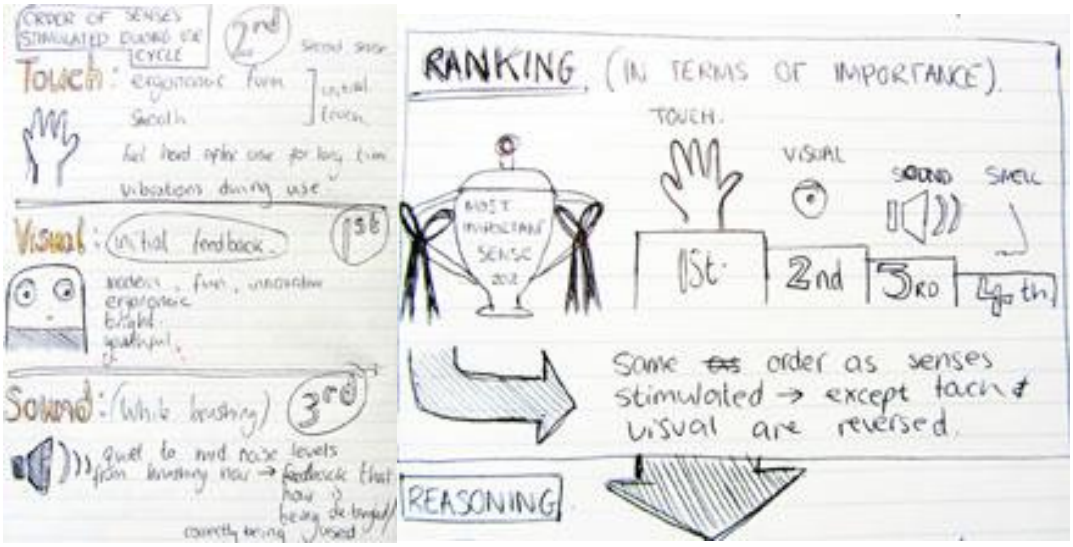
Some of the students used their paper journals to decide what they would discuss on the weekly blog as follows:

Figure 5: Contents of Backpack by E. Kurluk

Overall, the products reported on their features in rather objective terms. Nonetheless, the students seemed to be paying close attention to the relationship between multi-sensory details of everyday products and user experiences. For example, the only car on the blog went into some length describing his tactile features, “When Cliff turns my steering wheel, pulls my parking brake, or adjusts my dials he is using **active touch** to interact with me. I touch Cliff back in the form of **passive touch**, resulting in

sensations. I do this with my seats, creating **pressure** on Cliff's back and rear, especially when my adjustable lumbar support is manipulated. I also use my heated seats and climate controls (AC/heat) to passively touch by way of **cold and warmth**".

Since the course proceeded from individual sensory features to evaluating the layers of sensory modalities people experience when interacting with products, that set the order for the sensory biography journal entries. In the end, the students began to identify sensory ordering and layering among person-product interactions, as well as the importance of including a range of sensory modalities into the "gestalt" of the product experience.



Figures 6 & 7: Sensory order & ranking of interacting with a hairbrush by S. Garner

This was followed by the understanding that just because the visual sense is the first one stimulated in the product experience, it may not be the most important sense to consider in designing product features as seen in the subsequent ranking of the hairbrush in Figure 7. On her blog the student's hairbrush says, "Touch is the most important sensory experience when it comes to my design, as Sylvie's hair becomes detangled via my bristle touching and coming into contact with her hair. As I am a hand-held object, I am constantly being held during use".

7. DISCUSSION

The analysis and user-focused content in this course supports other product design studio courses. It begins to address the general concern about how the "laws of design" can be acquired through working on abstract foundation exercises that are subsequently applied to product design concepts. The primary objective for making this transition from a foundation studio model to a theory based analysis model was to introduce more current and expansive knowledge about sensory and perception-oriented features relevant to the design of products. In addition, it made sense to realign the valuable design principles passed down from the Bauhaus with their human focused origins in psychology and the newer field of sensory anthropology. With its human oriented focus, the course belongs in the continuum of human factors subject matter in the curriculum.

A limitation of any change is how people react to it. The students clearly preferred the previous studio approach, which was more fun and less academic. In addition, the first half of the semester focused on formal details that contribute to visual experiences of products, many of which include or build upon the foundation principles of two- and three-dimensional form derived from the Bauhaus. As a result, course content that was once presented in a lecture- and apply- format over a whole semester is now condensed

into half a semester. On top of that the course learning objectives include understanding even more sensory knowledge about design details. Their product design studio professor reported that he could see a difference in their design thinking about studio projects in the following semester. He remarked on instances of higher sensitivity in choosing materials for their water bottle design project. Not only were students thinking about the safety aspects of the material, but also how it would affect the taste of the water in the bottle. That is one small indication that this course is moving in the "right" direction.

Future considerations for this course format could include more in-class experiments comparing sensory and perceptive modalities, such as exploring the difference between passive and active touch with a range of materials or interviewing classmates about their everyday experiences with the same product. As this new course has only been taught once it will evolve in subsequent years.

8. CONCLUSION

This paper discusses the reasons for making a transition from a foundation design studio and describes the changes. Where the studio approach was based on traditional exercises for exploring formal compositions, the new approach is focused on analytical assignments with a human-centered focus on extending the students' knowledge about sensory and perceptual aspects of design. The course conveys similar information, in part, especially about design features that stimulate visual experiences. However, the learning mode is no longer an individually- oriented hands-on and limited model-based set of activities. In this new format, students are expected to develop skills in evaluating and applying knowledge about other people's multi-sensory interactions with design features in products. This course complements the product design studios and provides the opportunity to learn about human-oriented reasons underlying the principles of design.

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