Teaching a User-Centred Approach to Exploring Product Personalities and Sensory Attributes

Lois Frankel, School of Industrial Design, Carleton University, Ottawa, Canada.

Abstract
While basic design principles tend to be visually oriented, a user-centred design perspective focuses on the product experience and hence is multi-sensory. Moreover, the sensory qualities of products can relate to perceived product personalities. This paper describes a pilot investigation in a design principles course. We used an existing product personality tool for evaluating perceptions associated with a number of small mechanical everyday products. Initially students explored links between visual qualities of products and meanings and emotional responses derived from them. Subsequently, they observed participants’ multi-sensory experiences with the same products with the objective of understanding the differences in perception between purely visual experiences and other sensory layers of human-object interactions. The paper concludes that tactile and auditory sensory design attributes contribute additional and sometimes different meanings, emotional responses, and interactions to everyday products, and possibly into whole product categories. Product design educators can benefit from expanding their introduction to form-giving from a strongly visually-oriented approach to a multi-layered approach for detailing sensory characteristics of products, especially auditory and tactile features.

Keywords
Multi-Sensory Experiences, Sensory Product Attributes, Product Personalities

This paper documents a pilot student investigation of the relationship between perceived product personalities and sensory qualities designed into products. Patrick Jordan (2002) notes that products are like “living objects with which people have relationships”. Other design researchers have observed that people relate to certain products as if they were human, for example, getting angry with them or being nice to them to get them to work properly (Reeves and Nass, 1996). Given this phenomenon, designers should be able to enhance the person-object relationship by intentionally incorporating sensory features into products that may be perceived as having particular personalities. This project explored existing product/user relationships to begin to understand how and when sensory features contribute to perceived product personalities and user experiences, within the context of teaching design principles. The objective of the study was to identify multi-sensory design considerations for determining user-centred design features for different stages in human-product interactions.

The paper begins with a brief discussion of design principles introduced to product design students, ranging from formal “rules” to user-centred considerations. It then discusses the two phases of the students’ assignment; the first phase explored visual factors that contribute to perceived product personalities and the second phase explored how meanings, emotional responses and interactions based on visual perceptions can be altered by additional sensory channels such as touch and sound.
Context

Product designers have traditionally determined the visual and three-dimensional attributes of products. In product design schools, there is an emphasis on form-giving, according to fundamental principles governing visual and tangible properties (Gilles, 1991; Pipes, 2009). Prescriptive design approaches, many originating with the Bauhaus, form the basis for foundation design studios. Students also learn about user-centred issues in separate ergonomics or human factors courses and user-centred design projects (Courage and Baxter, 2005). There is a separation between the “creative” skill set and the human-oriented approach. In the former case, a good designer applies the rules of compositional unity and balance to achieve or disrupt a model of harmony (Jordan, 2002). In the latter case, user studies provide feedback for refining and adjusting a product’s formal properties to meet user requirements (Kuniasvsky, 2003).

Alternatively it could be argued that the visual and formal features of a product are part of the same domain as user-centred product features such as affordances (Norman, 2004). From that perspective user-oriented design adds more than formal attributes to design detailing; it encompasses a broader range of subjective multi-sensory experiences. According to Hekkert and Schifferstein (2007) product experiences consist of three components:

The aesthetic response is characterized by feelings of (dis) pleasure that are based on the sensory perception of the object; the object looks beautiful, feels pleasurable, or sounds nice. In addition, people try to understand how a product must be operated or which actions it affords, and people attribute all kinds of expressive, semantic, symbolic or other connotative meanings to it. The interactions with a product can help a person to reach a goal or can obstruct him or her in attaining that goal, and thereby lead to various emotional responses.

In a user-centred design approach, “the user should be involved from the product’s inception” (Courage and Baxter, 2005). This means that an understanding of users’ requirements, ways of doing things, mental models, and contexts of use all come to play in the design of the products. It makes sense to incorporate the users’ sensory experiences into the process rather than collecting user/usability data and then turning to principles of form-giving that are somehow detached from the components of the user experience.

This study was conceived as a way for students to learn about the relationship between the multi-sensory features of existing everyday products and users’ subjective experiences. The intention was to engage undergraduate students in examining how multi-sensory aesthetic, operational, and interactive components add to purely visual and formal compositional principles in product design. With this approach, emerging designers can develop a broader perspective about user-centred design features, especially for products incorporating multisensory characteristics.

Seeing is Believing

This exploration took place as part of a new second year undergraduate industrial design course entitled Sensory Aspects of Design, replacing a studio focused on traditional form and colour principles. The exploratory study described below, took part in two phases. Given that there is a strong focus on the visual characteristics of product design in the design curriculum, Phase One began with an investigation into the messages product appearances communicate. This investigation built on Patrick Jordan’s (2002) “Product Personality Assessment Questionnaire”. The objective was to determine perceptions of small mechanical everyday products within eight specific product categories: corkscrews,
locks for lockers, handheld safety razors, multi-purpose Swiss army-type knives, handheld juicers, desk lamps, tape dispensers, and staplers. There were eight teams with five or six students and each team selected one product category. Within their chosen product category each team studied three products varying from “high design” through to “low design”. They were looking for links between visual qualities of products that users associate with meanings and emotional responses to the products in that category. Each team recruited a total of ten participants from the class to assess the “traits” of each of the three objects in the team’s product category. For example, the Lock Down Krew team selected three different locks, as shown in Figure 1.

Figures 1 & 2: The 3 locks and set up for participant evaluation (credits: Booth-Dawson, Mathew, Rakoff Bellman, Steindel, Zurowski)

Each participant evaluated the locks primarily through visual inspection, as shown in Figure 2, filling out semantic differential scales derived from Patrick Jordan’s “Product Personality Assessment Questionnaires” [5], as shown in Figure 3 and Figure 4 below:

Figure 3: Product Personality Assessment Questionnaires (credits: Booth-Dawson, Mathew, Rakoff Bellman, Steindel, Zurowski)

The teams then analysed the set of product assessments for each product to determine its perceived personality. They identified the personality dimensions unique to each product by focusing on the adjectives with the highest scores. Following that, the teams analysed the formal properties of each product to determine links between the product personality profiles and specific form and colour phenomena that may have contributed to the perceived meanings and/or emotional responses. This interpretive and experimental
process, without prescriptive rules for interpreting form and colour features, stimulated discussion and debate. In the case of team Tight-Squeeze, their hand-held juicer results were revealing. For example, they associated the participants’ perceptions of narcissistic and inflexible personality traits with the juicer’s downwards-thrusting ridged and pointed central body element and its sharply angled asymmetrical legs as seen in Figures 4 and 5:

![Figures 4 & 5: The Violent Juicy Salif (credits: Cross, Yonekawa, Natchetaia, Sudak, Zhu)](image)

In addition, each team was required to develop a 5-minute role-playing enactment to illustrate the aspects of the products’ qualities and/or features that might affect users’ perceptions. Strangely, in the case of the Juicy Salif above, the enactment ended in the death of a much simpler and sweeter juicer who could not stand up to the sharp, violent masculine personality of Juicy. Playfulness aside, all of the student teams reported significant qualitative realizations. For example, the Lock Down Krew reported:

1. Similar products were compared yet vastly different personalities arose amongst the same product category. This is not because of large differentiations (aside from colour) but because of the magnitude of the sum of fine details, such as radii, finish, transitions, and text. Most personality traits could be traced back to a supporting formal detail of the lock.

2. Our group was surprised to find that our predictions for the results of the testing were far from the actual results. We would not have been able to perceive these results without testing. It was reinforced that, despite what we think, we don’t know what others feel/think until we ask.

By the end of this phase, each product was assigned a personality profile based on the visual perceptions of its formal features. The teams gave each product a name, ranging from common names to movie star names, already associated with strong personality types. The students had no idea if these personalities would hold true when participants interacted with the products using other sensory channels. Would sweet Annie Edison, the mini stapler or masculine, Viktor Iznakov, the powerful stapler maintain their attraction when participants actually used them?
Interacting is Differentiating

In the second phase student teams focused on observing sensory and experiential interactions between people and the chosen team products. The objective of this phase was to analyze the multi-sensory experience of a product with respect to understanding if the original product personality would change with more interactive sensory involvement, based on the work of Fenko, Schifferstein, and Hekkert (2009). Their mission was to determine:

How do sensory features and attributes affect product choice and multi-sensory experience?
Do the previously determined product personalities persist?

Three participants tested each product. Each participant performed two tasks with each product, in some cases choosing each of the three products in order of preference. Team members observed, videotaped (with permission), and later analysed the interactions each participant had with the product while completing the specified tasks. In their analysis they looked at the number and kind of sensory interactions in relation to specific product features and stages of use. For example, in the case of the eStapler team the two simple tasks were to “choose a stapler and staple some paper”, which was repeated three times, and to “refill the staplers”. The results of these observations led to Classifications of Sensory Interactions, which some teams presented as storyboards of sensory interactions (see Figure 8) and interpretations of the findings (see Figure 9).

Overall, the teams found that the principal senses people engaged with while using the products were visual and tactile, and secondarily, auditory. In fact, the senses could be ordered as follows: “the first experience of interaction is through the distant sense of vision,
followed by the proximity sense of touch, and enhanced periodically during use by the distant auditory sense”. Most teams found discrepancies between their findings from phase one and phase two. Moreover, design elements appealed to different sensory modalities depending on stages of use. For example, the Lockdown Krew noted that, when first seen, colour and formal novelty initially attracted their Phase 1 participants to their lime green “Olivia” lock. However, the anticipated familiarity associated with the users’ tactile and auditory experiences made their “Gary” lock the favourite when participants engaged in sensory interactions with the locks in Phase 2, as noted in Figures 10 and 11:

![Lockdown Krew Locks](image)

Figures 10 & 11: Participants’ choices differed between Phases 1 & 2 (Barsalou, Chen, Nyakairu, Wilcox, Wilson)

Overall, the discrepancies alerted the students to the value of user-centered and multi-sensory design approaches to design decision-making. Their insights are discussed in the following section.

**Discussion**

Since this assignment was both introductory and experimental, it was not obvious whether the results would show any differences between participants’ visual perceptions of products and their perceptions after additional sensory interactions with them. However, for most of the teams, once participants interacted with the products, the perceived product personalities changed. The students began to recognize that user-centred design is closely tied to ease of use. The users are influenced by their interactions with multi-modal product features. As in human relations participants’ interactions became more intimate, focused, and complex when they were required to complete tasks. While good looks promise successful and engaging interactions, tactile and auditory product features act as important mediators in the activities.

For example, the desk lamp team realized that the visual aspects of the product personalities “held true”, but “during interaction, certain sensory aspects of the lamps started to contradict their personalities”. A friendly lamp displayed tactile unfriendliness during interaction due to poor button design and a sophisticated multi-element lamp displayed primitive tactile operational features for adjusting its height. They concluded, “The functionality and usability started to influence the personalities more than their visual qualities”, supporting the notion of considering multi-sensory aspects as user-centred design features.

The students began to consider visually oriented aesthetic product features as “the most determining factor in terms of shelf appeal”. They began to recognize that multi-sensory attributes that contribute to an engaging and successful operational experience are key factors for a good user-centred product. “In terms of it being a successful product,
functionality and usability is incredibly important—HONESTY". One team summarized the user-centred sensory contributions of sound and touch by saying, “These functional and usability factors need to incorporate secondary sensory aspects in order for it to become a satisfying experience”.

The students were also encouraged to consider the ordering of human-object interactions with respect to sensory features, based on the work of Fenko, Schifferstein, and Hekkert (2009). As a result several teams presented their findings in relation to stages of use, similar to a task analysis breakdown, as can be seen in the knife interactions in Figures 12 & 13 following, where the sensory interactions are mapped onto each step in the task. As the stages of use proceed, the dominant visual sense in stage one in Figure 12 gives way to tactile interactions, which dominate in the rest of the stages, albeit to a lesser degree (note grayed-out hand). These are further augmented by auditory feedback as the cycle progresses and in stage one in Figure 13, auditory engagement is more important than the visual experience.

Figures 12 & 13: Mapping sensory interactions to task stages (credits: Arkuszewski, Choi, Gilmour, Kurluk, Roberts)

By the end of phase two it became apparent that the overwhelming focus on the visual aspects of form and colour phenomena in form-giving activities could contribute to products that do not fully meet users needs, requirements, or optimal sensory experiences. Taking a multi-sensory approach to the design of product features could result in a richer multi-layered, and longer lasting product experience.

Nonetheless, this pilot study had several limitations. First, it was a simplified introduction to basic design research for undergraduate students beginning to develop their foundational industrial design knowledge. Second, it was the first assignment in a new course with the objective of converting a studio-based approach to form and colour principles into a reflective user-centred exploration of multi-sensory product features. Third, the students were given a great deal of leeway in setting up their testing contexts to allow for some creativity, which may have affected the test results. For example, some teams came to the conclusion that the discrepancy between phases one and two were due to the testing situation. For example, the Lockdown Krew were concerned that they had influenced their participants in phase two:

Our question in phase 1 targeted visual aesthetic preference from a consumer perspective. Personality is a factor that influences choice but it is mostly based on tastes. Our user scenario was (unintentionally) a high-pressure situation. We think the choice of lock was influenced by an “observer expectancy effect” [in which] our test subjects wanted to perform well and meet our expectations. The desire to perform well led our users to choose the lock with which they were most familiar.

With different product choices and a different time frame, in-situ observations may have been more appropriate. Since participants did not fill out a Product Personality
Assessment Questionnaire after the multi-sensory use scenarios, the discrepancies in final personalities were not statistically confirmed. Lastly, the basic design research observations in these two phases were oriented towards providing a reflective alternative to teaching students prescriptive design principles. Therefore a measure of success would be to determine the extent that students are more aware of how a wider range of user-centred multi-sensory features can be an integral part of the design development of everyday products.

Conclusion
This paper illustrates the potential usefulness of incorporating form and colour characteristics within the larger context of a user-centred approach to design detailing in foundation design studies. It reveals how students explored the dynamic nature of the sensory relationship between a product and a user over time, as different sensory experiences come to the fore in different stages of interaction. Product personalities are first perceived through a visual sensory modality. Once the user engages tactile and auditory senses in operational and interactive activities, his or her original visual perceptions may change, altering the perceived personality of a product. This awareness can sensitize student designers to the multi-layered aspect of sensory interactions with products, with more than one sensory experience occurring, creating a richer or a more complex (good or bad) experience for the users. Therefore, in this assignment, emerging student designers learn that user-centred design is not separate from the aesthetic formal and multi-sensory features of products. Well-designed multi-sensory and use-oriented attributes of products can contribute to users' perceptions and responses to those products.

Product personality is only one tool for measuring assumptions, reactions, reiterations, and contextual differences. In this case, it provides a lens that shows how sensory engagement changes with stages of use. Multi-layered sensory interactions are necessary considerations in the design of a product for long-term use. Product design educators can benefit from expanding their introduction to form-giving from a strongly visually oriented approach to a multi-layered approach to detailing multi-sensory characteristics of products, especially auditory and tactile features.

The assignment described here was inspired by the work being undertaken at Delft University of Technology in Multisensory Product Experience in Industrial Design Engineering by Hekkert and Schifferstein and the work of Sensory Anthropologists David Howes and Constance Classen at Concordia University. It sets the stage for future investigations into the transformation of prescriptive design principles as well as the study of the advantages and disadvantages of different sensory modalities in designing product interactions. The long term goal is to sensitize emerging designers to integrate multi-sensory design elements that enhance pleasure, meaning, and operational aspects as part of holistic, long term, evolving relationships between people and their everyday products.

References


Lois Frankel
Lois Frankel, Associate Professor in the School of Industrial Design at Carleton University, studies the user-centred design of computer-enabled products. Her past experience as a jewellery designer influenced her focus on wearable computing devices for health and wellbeing. Her work with smart products for the Elderly/Vision Impaired includes design research projects with the TAFETA (Technology Assisted Friendly Environments for the Third Age) group at the Elisabeth Bruyere Health Centre in Ottawa and the Canadian National Institute for the Blind.

Lois has been a Professor in the School of Industrial Design for twenty years and is a past Director of the School. She is currently a PhD student at Concordia University, with the generous support of a Doctoral Fellowship from SSHRC (the Social Sciences and Humanities Research Council). Her PhD research combines the disciplinary approaches of Sensory Anthropology Research and Generative Design Processes in design research for wearable technologies for mature adults. Her previous degrees include: Master of Environmental Design (Industrial Design) from the University of Calgary, Meisterschulerin from the Düsseldorf Art Academy, Germany, Bachelor of Fine Arts from the Nova Scotia College of Art and Design, and Diploma in Crafts and Design from Sheridan College, Ontario.