Designing Blind: An approach towards universal design

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Introduction
A key measure of success for consumer products that are designed for broad markets is how well principles of universal design have been addressed. NCSU-CUD defines universal design as “The design of products and environments to be usable by all people, to the greatest extent possible, without the need for adaptation or specialized design.” However, despite initial goals, many products fail to truly address a universal user. While more products are becoming inclusive of consumers with physical or hearing disabilities, fewer address the needs of consumers with visual disabilities.

Industrial design students of a first semester junior studio were challenged to conceive or redesign a consumer housewares product that addresses the needs of blind consumers while being universal in its function and appeal. They had an opportunity to focus in the area of kitchen, laundry, bath, home entertainment or environmental controls (thermostats, alarm keypads, etc.). The Director of Access Technology for the National Federation of the Blind (NFB), the largest organization of the blind in the United States, who is blind, was invited to talk with students and establish a foundation to understand the value of universal design. This paper highlights the experience of designing for the blind that engaged students in a deeper level of empathy and heightened their sensitivities towards universal design.

Partnering to Bring Universal Design into the Classroom
The ongoing advocacy of universal design principles has produced useful references for design education that include print and digital materials. Additionally, students can gain hands on experiences through activities such as geriatric sensitivity training – a series of brief exercises that constricts the physical movement and visual capability of participants (students) thereby immersing them into a temporarily world that simulates these challenges. However, while such activities provide students with a better awareness of the challenges that persons with compromised abilities face in performing routine activities, they may not achieve the level of empathy that becomes embedded within a maturing design process. The notion of creating a valued empathetic experience around issues of universal design was the motivation for this project experience.

The project was inspired by a talk given during the 2005 IDSA Mideast District Conference. Among the several presentations that celebrated the successes of design, there was one sobering voice that reminded, and in some cases enlightened, the audience that within the stories of success were significant missed opportunities. The speaker challenged the audience to view a few product examples through a wider lens and thereby reconsider the products’ success. This wider lens included users who are blind. Further focus was made possible because the speaker, Anne Taylor, the Director of Access Technology for the National Federation of the Blind, happens to be blind. NFB is the largest advocacy organization in the United States. In the fall of 2007, Ms. Taylor accepted an invitation by the author to give a talk on Universal Design at the School of Design at Carnegie Mellon. This talk and the subsequent discussions kicked off the “Designing Blind” project with the junior industrial design studio.

In an earlier phone conversation with the author to establish the parameters of the project, Ms. Taylor was asked, as a blind person, what activities would she like to perform that she currently was restricted from doing? The goal of the question was to stimulate exploratory discussion about product opportunity areas. The author was surprised when without hesitation she replied, “I want to drive.” Ms. Taylor, who has worked with Carnegie Mellon before, is acutely aware of the ongoing technology developments that will one day afford blind people the opportunity to drive a
vehicle. But the answer reflected the beginning of several examples where the class would be educated about the broad and rich experiences that blind people desire; experiences that are no different than ones that sighted people are afforded. NFB states:

“The real problem of blindness is not the loss of eyesight. The real problem is the misunderstanding and lack of information, which exist. If a blind person has proper training and opportunity, blindness is only a physical nuisance.” www.nfb.org

Having quickly established that driving for the blind was beyond the possibility of the course, housewares emerged naturally as an opportunity area. Housewares was also an area that students were somewhat familiar with and one that was easily accessible for research. Ms. Taylor helped identify the specific categories of focus through her description of personal desires within the home. “When I watch television…” was part of a response she provided that offered important insight into the interactions blind users have with their products and environments. After the author probed more deeply with curiosity of blind people watching television, Ms. Taylor went on to explain that people who are blind watch television just like anyone else, but not without difficulty. Televisions, DVDs and similar devices with touch screens and on-screen menus are examples of products that are inaccessible to the blind. Later, and during Ms. Taylor’s visit to the School of Design, she shared several additional examples with students about how people who are blind are excluded from mainstream activities and interactions because of the lack of consideration in product design. She shared that with proper attention to the needs of the blind as an inclusive part of the design process, this market segment can access many of the same benefits and experience as sighted consumers, without significant costs to the product. The reality, however, is that the blind are currently excluded from many mainstream product offerings resulting in targeted but small production products that are cost prohibitive to the average blind consumer. Ms. Taylor demonstrated a few mainstream products that had been designed specifically for a blind market. These products included a PDA with Braille input and a refreshable Braille display. The products that she carried with her approached a cost of $10,000 versus the few hundred an average consumer might pay for similar products. Additionally, two key reasons were identified as to why designers and businesses should care about designing products to be universal and inclusive of the needs of the blind: 1) Good design that is universal can be a smart and lucrative business decision; and 2) In the end we are designing for the needs of a growing population, a population that will include us. The following are some statistics provided by the National Federation for the Blind.

- Almost 3 million people will have age related macular degeneration by 2010. Even more will suffer glaucoma.
- The number of people with diabetic retinopathy will almost double to more than 7 million.
- Thirty million people will have cataracts – a 50% jump from today.
- Seventeen percent of persons age 45 and older report some form of vision impairment, representing 16.5 million persons. By the year 2010, when all baby boomers are age 45 and older, this number will increase to 20 million.
- Nine percent of people age 45 and older report severe vision impairment, representing 8.7 million persons. By the year 2010, when all baby boomers are age 45 and older, this number will increase to 10.7 million.
- About 7.3 million, or 21% of persons age 65 and over, report some form of vision impairment. As baby boomers age, this number will reach 8.3 million in the year 2010, 11.3 million in 2020, and in 2030, 14.8 million persons age 65 and older will report some form of vision loss.

The examples and statistics raised the level of interest immediately within the class. Students actively engaged in questions and discussion on possible product opportunities. One exchange dealt with whether the blind desired a device that would identify people as they walked through a crowd. Ms. Taylor, who has a wonderful sense of humor, responded, “Would you? How annoying would that be?” However, she went on to say that if there were a product that could point out specific people in a crowd, people that she was in search of, that would be useful. The questions
and exchanges helped students to enter into the project and also realize that there were many stereotypes to overcome before a real focus on issues and potential solutions could take place.

**Blind product analysis: Creating an empathetic designer**

The project represented an area of design that many had not considered and served as an opportunity for a unique and meaningful learning experience. However, it was necessary to help students become empathetic to the challenges that a blind person experiences when interacting with products. An exercise that helped in this regard, and which served to better situate students within a moment of a blind person’s world, was the blind product analysis. Blind product analysis pairs students in a structured exercise; one student is blindfolded and tasked with providing a detailed analysis of the given products. This student describes in detail the tactile interaction, features, function, aesthetics and human factors while the other observes and takes notes. Each student reviews two to three products before switching roles and working with a new set of products. The author selected the range of products, none of which had been seen by the students. Products were selected based upon size (handheld was easiest to manipulate); familiarity of form (i.e., a desktop telephone); simple interactions such as a portable cassette player or containers with lids; texture and material qualities such as a rubberized flashlight. In a few cases products with multiple components had those components separated to challenge familiarity; one example is the receiver of a phone that was removed and analyzed as a separate component. During the activity, each evaluator was required to articulate their initial perceptions of the product and go on to describe what the product communicated in terms of overall form, features, details, function, quality of interaction and material. In one group, a student followed the contours of the receiver cradle of a modern desk phone. When he arrived at an abrupt change in form he blurted out “this sucks!” only to later remove his blindfold and say, “Oh, that’s not so bad,” referring to the same detail he had rejected earlier. Another analysis example suggests opportunity to explore color more deeply with blind consumers, since not all blind people are blind at birth. In one paring, a blindfolded student asked, “What color is the product?” When the team member responded that it was black, the evaluator expressed a higher appreciation for the product form under review. Discussions on aesthetics were naturally driven by tactile qualities rather than visual. This exercise provided a platform and tool for students that each repeated independently throughout the project – finding it a valuable method for questioning and making assessment. In general, with each assessment, students were able to dive more deeply into the interaction issues and subtle qualities of the product, features and details.
Research and Conceptual Development

The class embraced the challenge to conceive or redesign a consumer housewares product. Individuals found specific interest in stovetops, laundry dryer control panels, microwave and toaster oven control panels, DVD remote controls, CD player interactions, a steam iron, and a digital camera. After performing detailed task analyses for their respective products, students used physical modeling as the driver for conceptual development and testing. Because of the special needs of the blind user, it was critical for students to interview and solicit ongoing feedback of their concepts with people who were completely blind or classified as legally blind. The Carnegie Library for the Blind and Physically Handicapped, a branch of the Carnegie Library system, proved a valuable resource and tremendous support for the class project. A structured visit was designed that included the interviewing of library staff and blind patrons. For the visit each student prepared an interview kit that consisted of the actual product to be redesigned and low fidelity models of their initial redesign concepts. In addition, they prepared a questionnaire guideline as part of their interviewing strategy. In cases where materials or interactions were of concern in expressing their concepts, students brought products that performed in the manner desired, and that the patrons could handle, in order to convey intentions. As a result, patrons and library staff were highly enthusiastic about the visit and provided a dynamic exchange with students that provided insight and ongoing consultation to the class throughout the remainder of the project.

Throughout the development of their concepts, students were able to explore issues and ideas more deeply and more rapidly compared to prior classes. This is perhaps true because their thinking and insights needed to rely primarily on active physical modeling and testing with drawing playing a supporting role. Further, because their work relied on tactile aesthetics – how the user interprets and appreciates the product through qualities of touch – the level of commitment to resolving the form, its surfaces, features and details that would normally go unresolved, remained high. In the final models, many students made a sincere effort to emulate the intended tactile qualities and some expressed their final models through actual intended materials.
Challenging the emerging approaches to conceptual development

In undergraduate industrial design programs students are expected to achieve skill in representing experiences, through physical modeling and now new digital media tools, by their junior year. However the role of physical modeling, particularly modeling that represents specific tactile qualities, has become tertiary to 3D printing and digital/virtual representation because of time and cost. Even printed models, once finished in similar ways to the traditional handcrafted models, are increasingly being used to depict physical geometric qualities in support of digital/virtual presentations. Further, digital/virtual presentations are increasingly used to communicate physical characteristics of form and size often with little to no communication about the quality of finish that shapes the tactile aesthetic and experience. Consequently, students are becoming more distant from understanding with great intent the material qualities and tactile aesthetics of their product proposals. In design practice, the decision makers, those who are experienced with material qualities and trained to interpret design renderings, may see great value in new digital tools. However, for the developing student, some educators express concern that without appropriate engagement with physical making, students will not build a sufficient cognitive understanding of form or tactile aesthetic sensitivity and therefore will be less able to contribute meaningfully to products that require sensuality, whether for the blind or sighted consumers.

In this project, the traditional and contemporary conceptual tools of drawing and digital representation were less effective in helping students to explore issues and to develop possible solutions, as compared to physical modeling. Further, these tools were completely ineffective when interviewing users and discussing design proposals. While this example is admittedly the extreme, at its core there seems to be value in re-exploring the role of traditional modeling as a means to deeper sensitivities with respect to physical form. Further, a project of this nature brings forward discourse opportunity to explore the relationship between visual and tactile aesthetics.

Conclusion

Despite one’s belief about their level of sensitivity to the issues of another, designing for the blind is an awakening and humbling experience. It can remind us of all the subtleties of product interactions that people with sight take for granted. Designing for blind consumers offers a rich opportunity to address product needs while addressing the goals of inclusive design in an important way. Further, because students are required to address user needs and pay high attention to the physical attributes and tactile qualities of physical proposals, there is a greater chance to build sensitivities in the areas of form and material qualities in support of their emerging digital skills. Activities, such as blind product analysis, required students to identify and address assumptions and stereotypes of physical products and their interactions – driving greater
inquisitiveness, deeper investigation and meaningful development. These activities should be explored as a holistic part of the design process regardless of whether the project is tailored to blind or sighted persons.

1. The Center for Universal Design www.design.ncsu.edu/cud/index.htm