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Everyday Thoughts

Turn Design Education Upside Down

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I am invited occasionally to guest-lecture at industrial design schools, about design, research, and usability. Upon visiting, every school representative provides a similar description of their program. It goes something like "We're different from past, traditional industrial design programs. We're all about understanding people. We take a human-centered approach."

Me: "Oh, that's great. Do you require courses in ergonomics or biomechanics?"

Them: "No."

Me: "How about psychology?"

Them: "No."

Me (wondering): "Well if you're not about the physical body, and not about the mind, what part of the human are you about?"

Being truly inclusive requires knowledge in a wide range of human-centered topics. A review of industrial design programs, even at some of the best design schools, reveals a pattern that's unlikely to get us there.

First year classes provide an introduction to design. Required courses may include drawing, color, 3-dimensional modeling, design history, and sometimes a class about art and culture. There may or may not be requirements for elective courses – classes outside the design department. Within the department there may be a single required course focused on human understanding, although it's rare. When it does occur it's just that - a single course. It's not a plan for inclusivity.

Topics to include

In my talks I typically discuss physical aspects of products as they relate to usability. And because there's a lot for students to absorb in the 60– to 90– minute time slot that's usually allocated for the talk, I'm at least hoping to instill awareness of the importance of these topics – or in some cases simply their existence. The talks implant the idea that if products are going to be usable, and inclusive of people who may not have the same physical abilities as others, then an understanding of basic physics, along with the body-mechanics involved even in simple tasks, need to be incorporated early in the design process. My discussion of physics includes a quick overview of weight, gravity, and balance. A poorly balanced hand tool will require more work to operate and can cause someone to be less accurate in its use because the hand is also trying to control its out-of-balance weight. An understanding of leverage is also important. Many hand tools are designed to provide a mechanical advantage. A waiter's corkscrew for instance provides leverage that helps extract a cork

from a bottle of wine. It puts waiters' fingers on the mechanically advantaged end of a lever, with the corkscrew situated between the fingers and a pivot point positioned on the far edge of the bottle's mouth. In simple math, the ratio of the distances, pivot-point-to-fingers divided by pivot-point-to-corkscrew, defines the mechanical advantage. For a waiter's corkscrew, it's usually on the order of 3-to-1. For many products we encounter everyday, leverage determines usability.

Some products place a person on the short end of a lever. A broom handle, for instance, puts a person's hands on the short side– a disadvantage in leverage but with the advantage that a shorthand movement allows a wide sweep of the bristle end of the broom. Using a wooden spoon to stir something in a pot is similar – small wrist movements result in lots of stirring.

This is all elementary. However, it's clear that many of the students have never thought about, understood or considered these basic principles. My talk eventually leads to the fact that every bone in a body is controlled by muscles that mechanically are on the short side of a lever. Because of that, forces within our bodies are surprisingly high. Biceps, a major muscle in the upper arm causing the arm to bend at the elbow, is attached to one of two bones in the forearm. The biceps' attachment is close to the elbow's pivot point. The hand, and anything that it's holding, is at the opposite end, far from the pivot point. This requires the biceps to exert a lot of pulling force even for simple actions. Holding a 2-kilogram frying pan readily requires more than 30 kilograms of muscle pull. (I should be reporting these forces in Newtons, but kilograms may be more relatable for most readers.) Usually these pull forces present no problem; our bodies are designed to work this way. However not all bodies are alike. Some people may not have enough strength and will either be unable to perform common tasks or may tire more readily. Tiring can lead to accidents. Dropping things in the kitchen is a common complaint among people with arthritis, for instance – pinching and gripping can be difficult.

Cognition

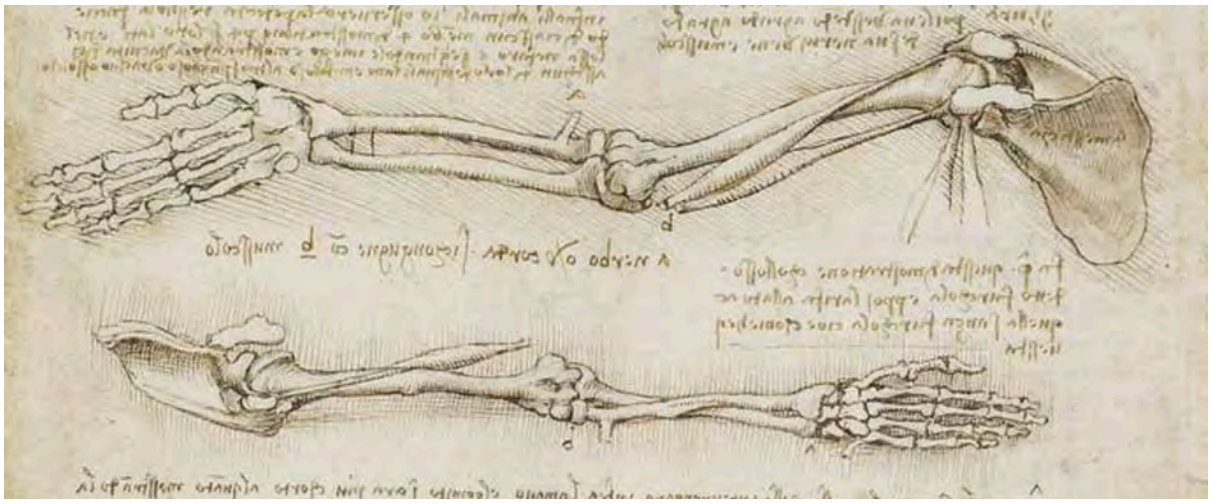
Cognitive issues are also important to address. Considerations include the fact that:

- instinct has an overriding influence. We are all pre-wired to react in specific ways.
- shapes of a product or a product's components can readily communicate their function. Or not – shapes can either help or be misleading.
- preconceptions about a product can cause misuse. A product in a person's past, even if not related to the product at hand, can lead to a person's unexpected behavior.
- stress has an effect. Self-injecting a medication can blur thinking – no one likes needles and clear thinking may be clouded by anxiety. Stress can be a factor even for common tasks – the need to take a picture quickly for instance can lead to some wrong button presses and a missed photo.

Other human-centered topics in psychology important to consider include motivation, behavior, information processing, decision making and memory.

Anthropometry, physiology and other pertinent topics

Variations in the sizes of people (a.k.a. anthropometry, the measure of people) is a factor. Small hands and big hands will interact with a product differently, often to the disadvantage of smaller hands. Smaller hands can mean smaller not-as-strong muscles, and reaches that relegate use to fingertips, not stronger middle segments



of the fingers. Understanding basics of biomechanics of the hand – the muscles involved, bones within the hands, range of motion, arm angles, wrist angles and the ability of each finger to contribute to a task, is critical to the design of products that will enable people. It will make those tasks easier, faster, more accurate, or for some people make those tasks possible at all.

The design of a hand tool doesn't stop with the tool – the fingers, wrist, forearm, upper arm and shoulder all need to be taken into account. Considerations for hand tools should start with the shoulder and end at the far "working end" of the tool. The body's ability needs to be understood first. Mechanics of the hand and arm are rarely part of a design student's education.

Visibility of a product, its components, or graphics on a product depends on size, color and contrast. For text and symbols, typeface and line weights will affect readability. Knowledge about the physiology of the eye can lead to products that accommodate a wider range of visual abilities, or usability in different lighting situations.

Literacy is another important topic in inclusivity. Instructions can be notoriously difficult to read and interpret. They may also be written in a person's non-native language. Culture and language are considerations, especially in the design of products that will be distributed globally.

Social and environmental issues also must be included in design. Products and services exist within a context. Cost as well, since a product can't be inclusive if its price is out of reach.

A brand's positioning is another factor. Successful brands don't just provide products – people are drawn to brands that stand for something. Inclusivity is an important characteristic of some brands. The products they offer need to support their mission, they are the best representatives of a brand's purpose. The business of brands, how a product can add to that brand's equity, is an aspect to be addressed in the creative process.

These are just some of the topics on the critical path to usability and the design of inclusive products. It is doubtful that someone can create successful, inclusive products and services without adequate knowledge in these topics. Few or none of these topics may be covered in current design curriculums.

Design is a group effort, and although there are many people behind the launch of a product, the topics mentioned here need to fall within the realm of the designer. Designer Raymond Loewy is famously quoted as saying *"Design is too important to be left to designers."* We need to turn design education around to change that.

Is design education about to be reinvented?

Can these topics be covered within current curriculums in design schools? If the thought "design is about people, not things" is to be realized, design education can benefit from a significant re-thinking. Current design curriculums need to be turned upside-down. To set a foundation for a people-based line of thinking, the first year of undergraduate design education should not be about design at all – at least not in the way most programs are set up now. The first year should be used to instill knowledge about people. Before students even start to design objects, services or interfaces, they should understand the people they are designing for. Design education needs to establish a more holistic mindset, and establish it early.

The field of design over the last 40 years has focused on the process of design, methods employed to approach a design project step by step. Once considered unique (as evidenced by design firms in the late 1970s and throughout the 1980s diagramming their very similar "unique process"), the process of design has become a commodity, practiced more-or-less the same around the world. Looking ahead, designers need to focus on knowledge in design. Design can be a powerful force for change, but to fully realize its effect on people and society designers need to understand people.

A few schools in industrial design are offering some of this. Carnegie Mellon University's design department requires industrial students to take a course in psychology in their first semester in the program, although it's not within the design department. TUDelft requires a course in "Understanding Humans" in the first semester of the industrial design program. Such courses are not commonly required.

Perhaps I'm stating the obvious, that a human-centered education in design should start with the human. The aspirations of inclusive design are to make a difference. Design schools need to revise their programs to truly focus on understanding people. In the first year – don't wait, introduce basic human considerations as early as possible. Save the more traditional design courses for later, when those principles can be applied, and use that knowledge and mindset throughout the rest of the school program. And carry it into practice.

Rethinking design education is not a new idea. In their article "Changing Design Education for the 21st Century" (2020) Michael Meyer and Don Norman open with this:

"Designers are entrusted with increasingly complex and impactful challenges. However, the current system of design education does not always prepare students for these challenges. When we examine what and how our system teaches young designers, we discover that the most valuable elements of the designer's perspective and process are seldom taught."

Can change take place within current industrial design programs? Is it ironic that industrial design, a field promoting itself as master of change and innovation, would have difficulty reinventing itself? Or even shaking off the antiquated name "Industrial." (Although "product design" is commonly substituted, even that term places focus on the product, not the person.)

The publication *she ji*, a journal focused on economics, design and innovation, devoted a recent issue to design education. An article by Meredith Davis and Hugh Dubberly cautions:

"A field is less likely to reinvent itself when practitioners maintain an identity associated with a long-standing view of the field, as they do in design." Davis, M., & Dubberly , H. (2023).

If change cannot be undertaken by a field that bases its value on change and innovation, then it may be quicker to establish an entirely new human-design-based discipline. And come up with a new name for it. Any ideas?

References:

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Dan consults with companies and organizations worldwide on design and innovation. An early proponent of "design for all" (a.k.a. Inclusive Design), he also lectures internationally on research and the future of design. He established his company ThinkActHuman with the goal of design for a better world. Dan holds degrees in product design, ergonomics and biomechanics. In addition to ThinkActHuman, he co-founded 4B Collective, focused on design and gender, and co-founded the Masters in Branding program at the School of Visual Arts in New York.

He is the recipient of numerous awards, including Smithsonian's Cooper-Hewitt National Design Award (on behalf of Smart Design). He also received IxDA's first annual Interaction Design Award, in the

"Disruptive" category, for his work with Ford Motor Company. His work is included in the permanent collection of the Museum of Modern Art. He appears in a number of documentary films on design, including the award winning 2020 Life on Wheels.