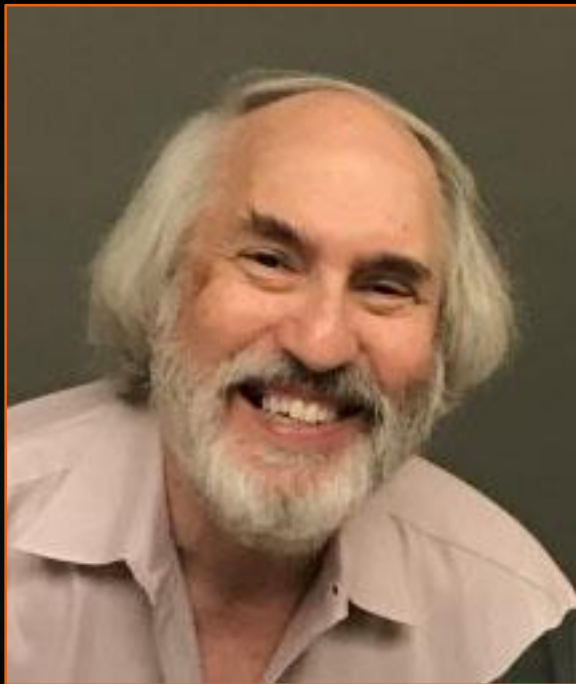January 19, 2021
Creating Assistive Technologies - Understanding the Problem

ENGR110/210
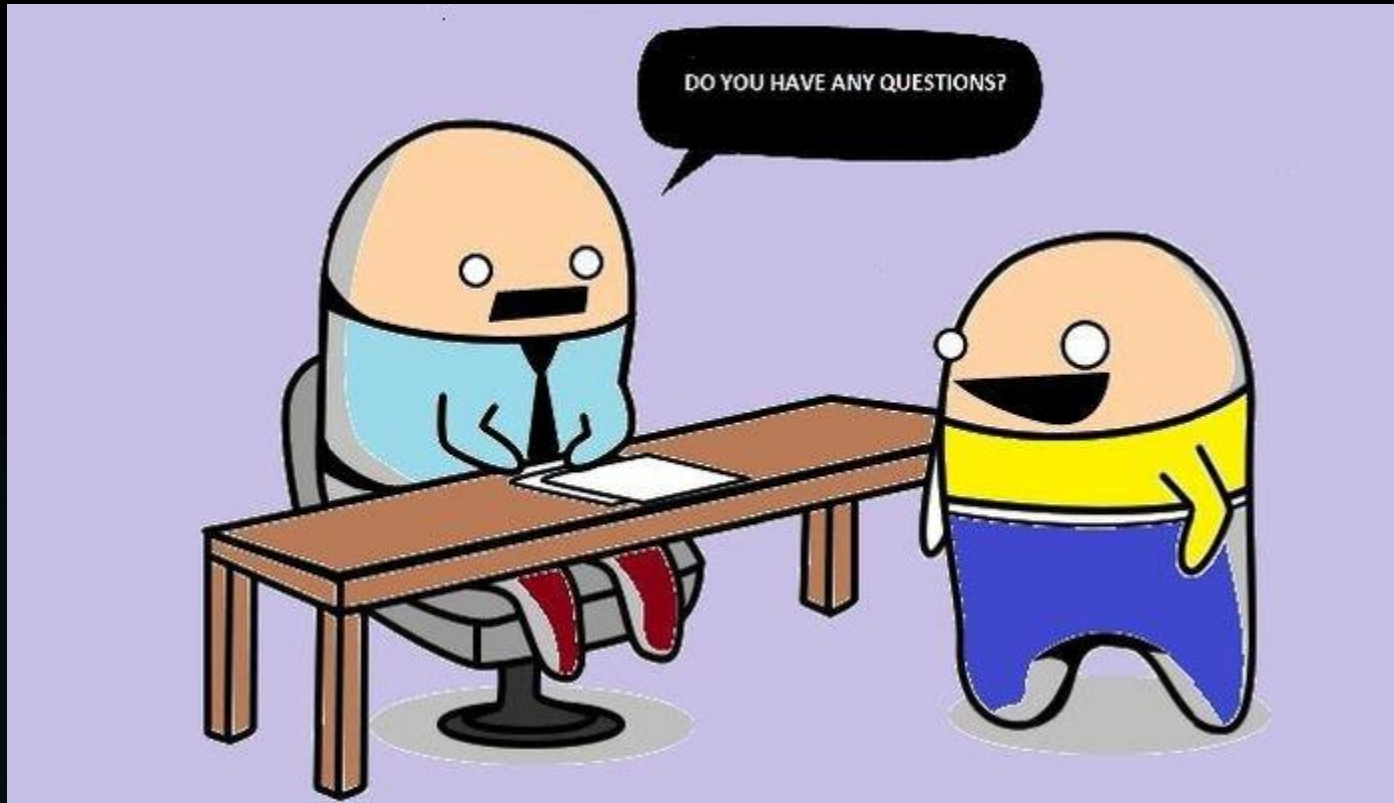# Perspectives in Assistive Technology

David L. Jaffe, MS

Instructor

15
Years

Do You Have Any Questions?

Apologies

- Lack of permissions for Meeting Signup Sheet – fixed
- Did not include Tilly's Project in Project Preferences Form - fixed
- Some Zoom sessions with Project Suggestors didn't all work
- Monday's Zoom meeting with students sent a bit late

I'm still learning details of Google Forms & Docs, trying to get into a routine / rhythm and figuring out stuff on the fly

Attendance Sheet, Evaluation Form, and Meet with Dave Signup

For all students:

- Sign Attendance Sheet - important to verify your attendance
- Sign up to meet with Dave for lecture makeup and Individual Project discussion

For everyone:

- Fill out Class Session Evaluation Form

Pre-lecture Discussion Topics

Select all topics of interest – Google Form

Pre-lecture Discussion Topics

Select all topics of interest

Hand in this form

- ❑ - Overview of Accessibility - How this design feature relates to products, with many examples
- ❑ - Ethical / Moral Dilemmas Related to Disability
- ❑ - Assistive Robotics - Robotic technology benefitting people with disabilities and older adults
- ❑ - In the News - New Assistive Technology products and research
- ❑ - Vintage Assistive Technology - Products and devices from the past
- ❑ - Ten Commandments of Making - Adam Savage's Maker Faire video
- ❑ - The Upside of Failure - Learning from prototypes that didn't work
- ❑ - Who is Disabled? - Making a determination with limited information
- ❑ - Video Theatre - Watch and discuss videos of new products and prototypes
- ❑ - Innovative Marketing Metrics - How we use words to measure and advertise
- ❑ - Famous people with disabilities - Focus on TV characters
- ❑ - Students' Choice - Class determines topic - specify _____

Mid-quarter Feedback Session Availability

Select available dates and times for this voluntary event - Google Form

For Students working on Projects

▶ Consider these options:

   ▶ Projects suggested on Pitch Day

   ▶ Student defined project

   ▶ Reports

▶ Make your selection by the end of today

▶ Fill out Project Preference Form

▶ Schedule and meet with Dave to discuss project

Deliverables

- Weekly meetings with Kat and project progress reports (alternate weeks)

- Mid-term presentation – informal, not graded

- Mid-term report – formal, graded

- End-of-term presentation and report – formal and graded

Project Policies

- **Optional** for multiple students who selected the same project to coordinate efforts to meet with their Project Suggestors and share these tasks:
  - "Understanding the problem" and "brainstorming"
  - Mid-term presentations
  - Mid-term report
- But each student must pursue a **different** solution, **present** their end-of-term efforts individually, and **submit** end-of-term reports individually.
- I'll email students' project preferences

Project Documentation

- Lab notebooks are not required
- Optional diary for your Individual Reflection
- Take photos and short videos:
  - Working with a person with a disability
  - Illustrating your design process
  - Prototypes

Work with Diligence

▶ Time is your team's most precious resource

▶ 7 weeks of class left to work on your projects

▶ Mid-term presentations in 4 weeks!

Miscellany

1. Weblinks and slides linked on lecture webpages
2. [Anonymous Suggestion Box](#) for comments and rhetorical questions
3. Last bits:
   - ▶ I have difficulty remembering names
   - ▶ I am on your side
   - ▶ I want to award good grades

Student Project Preferences

Selected Projects:

- Austin: Cutting Knife
- Abby: Improved Pooper Scooper
- Abby: Cutting Vegetables for Cooks with One Arm
- Abby: Camping Cot Project
- Olenka Magical Bridge Playground Project
- Tilly: Cell Phone Holder for Wheelchair
- Report: Disability in Sports
- Report: Autism & PACE Center
- Report: Prosthetics and Orthotics in Sports
- Project: Musical Instrument for a Person with a Disability

Student Project Preferences

Open Projects:

- Abby: Cutting Board for Cooks
- Abby: Alert Project
- Abby: Camping Cot Project
- Danny & Stanford: Wearable Storage
- Children's National Hospital: Identifying Emotional State Project

Other Items

- Your project effort is largely self-directed
- Weekly progress reports:
- Keep your receipts
- Your class participation is appreciated
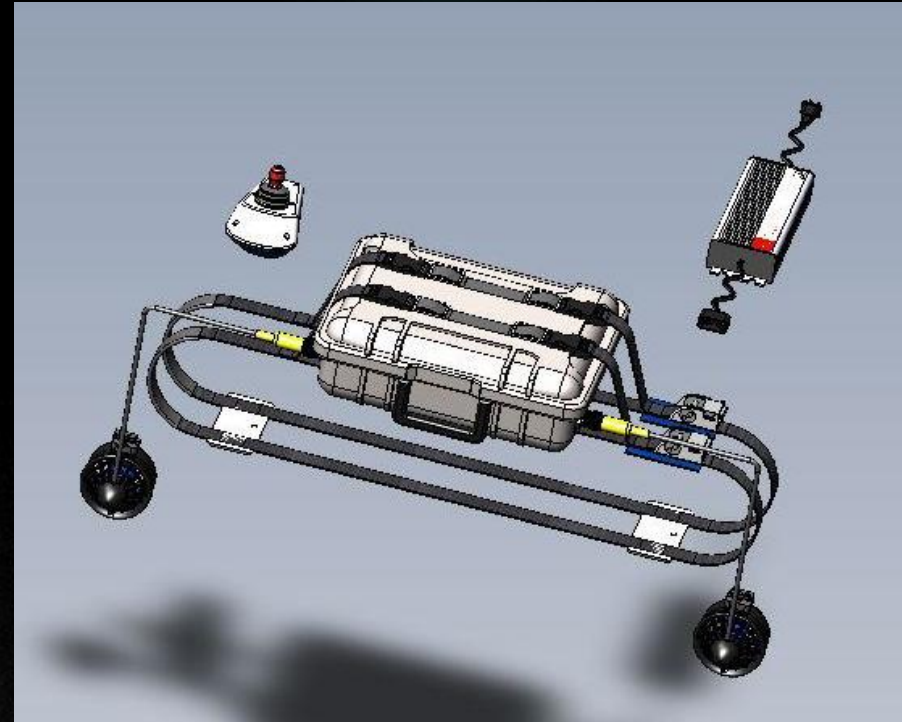
Questions?

Design Process

▶ Gayle & I have similar - but not identical - thoughts about Design Process

▶ I have an engineering outlook based on teaching this course
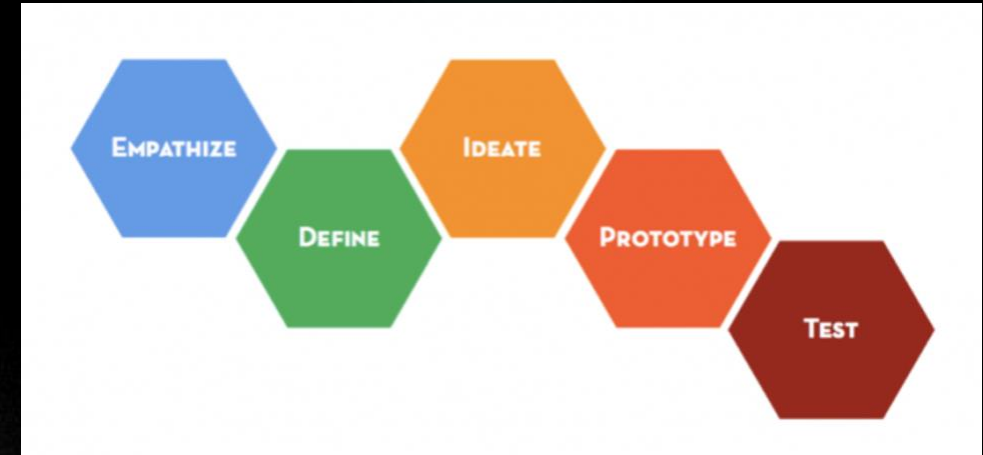
THE DESIGN PROCESS
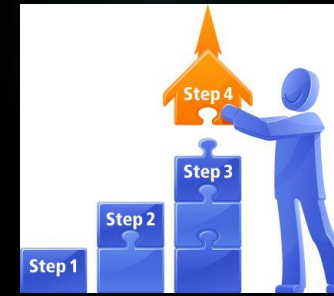
▶ A process is a step-by-step plan of action employed by makers, designers, or engineers to achieve a goal.

▶ Using a structured process increases the chances of success – and getting a good grade.
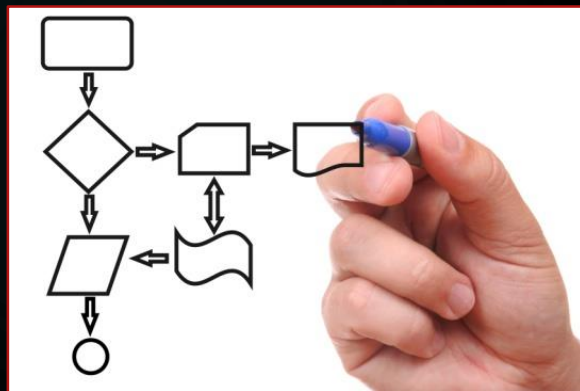
Design Processes

- Design Thinking - d.school
- Whole-Brain Engineering - Northwestern
- Human-Centered Design
- User-Centered Design
- Empathetic Design
- Compassionate Design
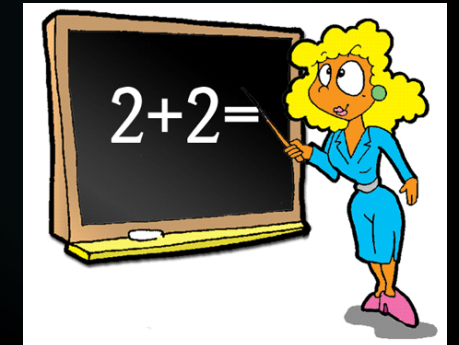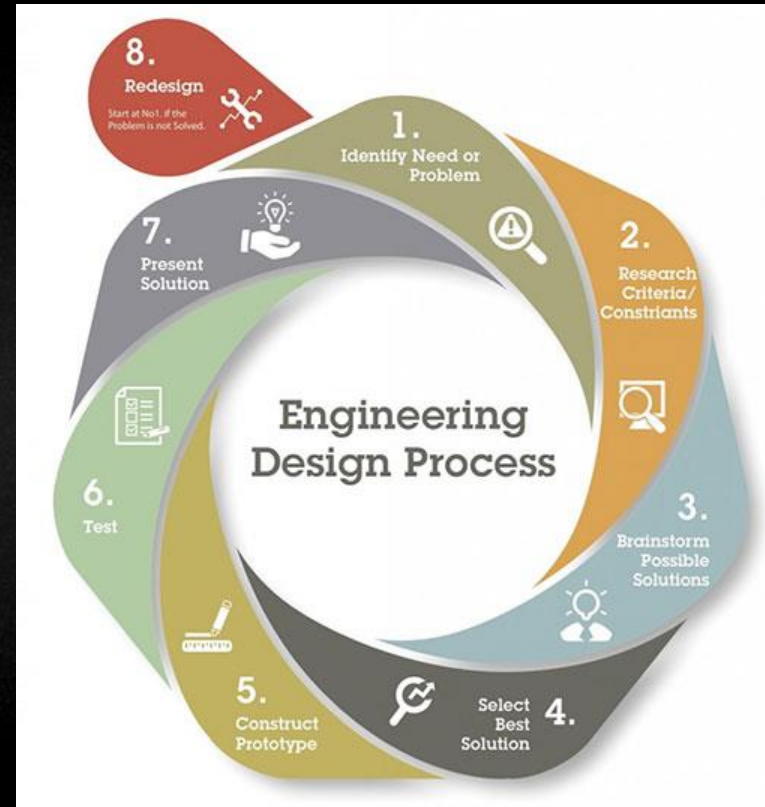- Co-Design
- Cooperative Design
- Bystander Design
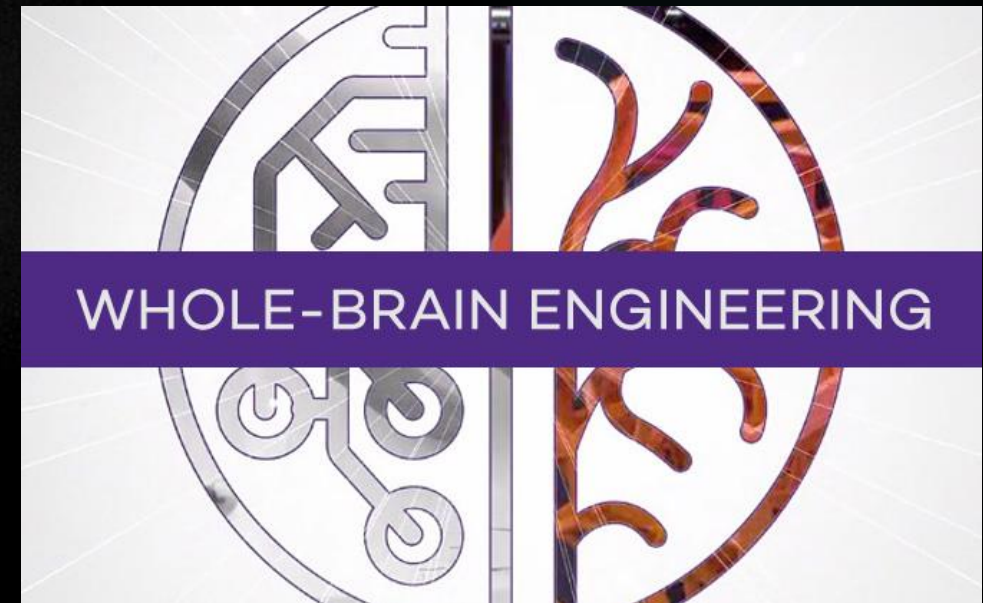
The Engineering Design Process
Activities

- **The Problem** (5 sub-activities)
- Brainstorming
- Selecting Design Concepts
- Prototyping (5 sub-activities)
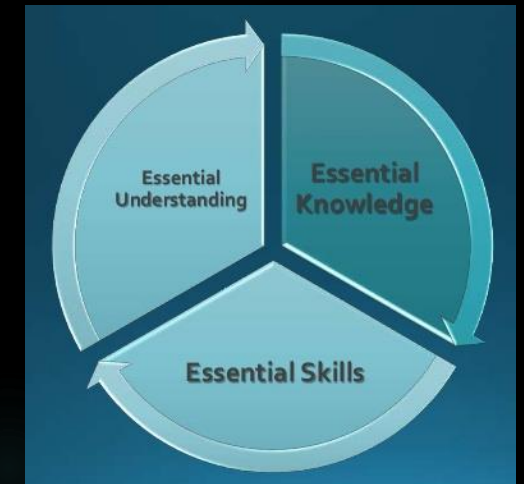- Communication (4 sub-activities)
- Role of the User

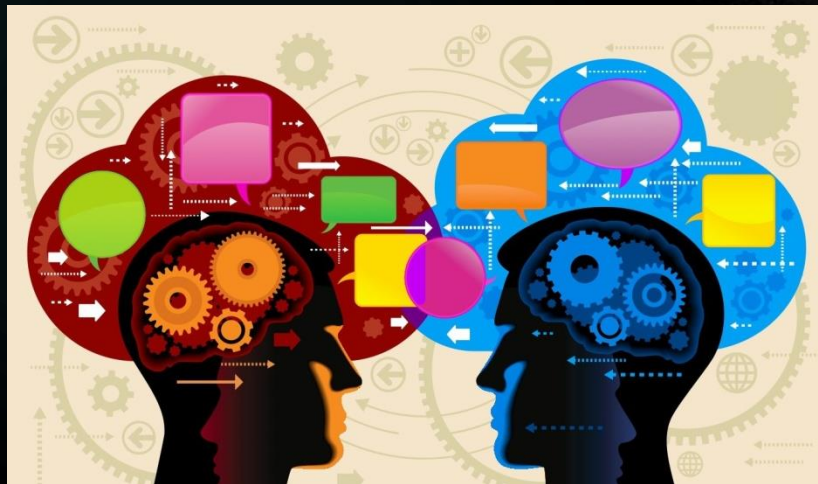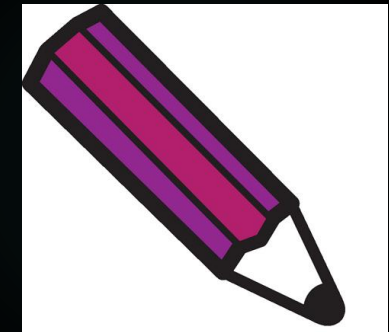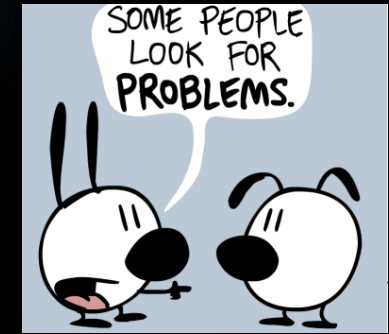# The Design Process
The Problem

1. Search for the Problem
2. Identify the Problem
3. Describe the Problem
4. Understand the Problem
5. Determine the Need

The Design Process
Search for the Problem

▶ Pick a field, user group, technology

▶ Employ ethnography, observation, discussion, interview techniques

"My team has created a very innovative solution, but we're still looking for a problem to go with it."

The Design Process
Identify the Problem

▶ Identify a specific challenge

▶ Identify the customers / stakeholders
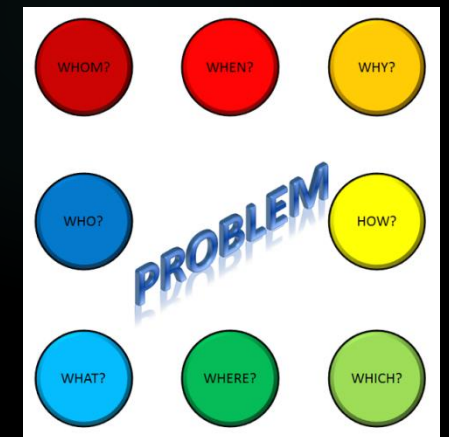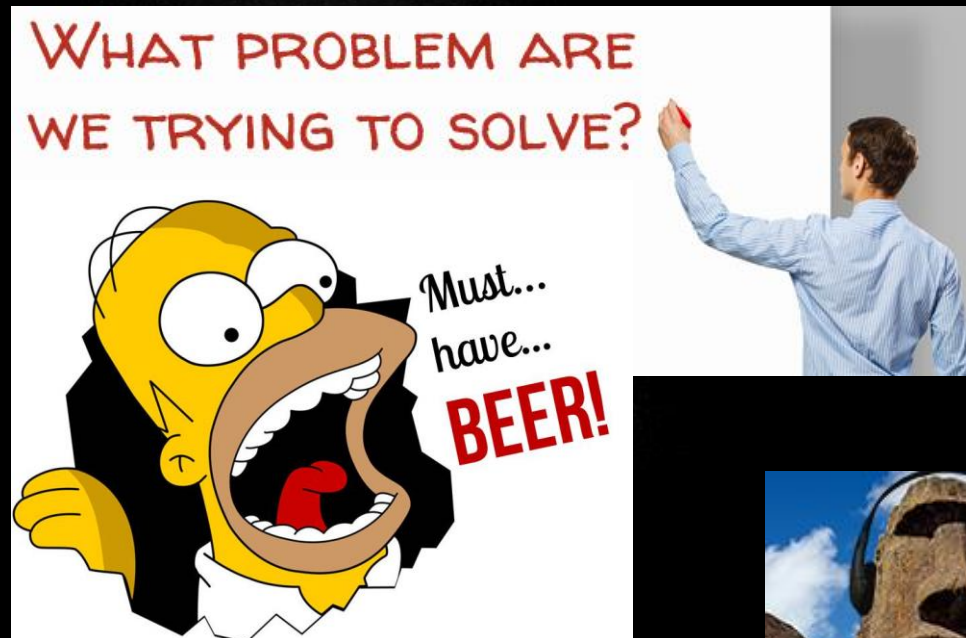
▶ Identify resources and technologies

The Design Process
The Problem Statement

Compose a written problem statement that includes:

- ▶ Project Title
- ▶ Background
- ▶ Problem
- ▶ Goal / Aim
- ▶ Design Criteria
- ▶ Other Information
- ▶ Contacts

WHAT PROBLEM ARE WE TRYING TO SOLVE?

Must... have... BEER!

WHOM? WHEN? WHY?
WHO? PROBLEM HOW?
WHAT? WHERE? WHICH?

insert title here

a catchy phrase would be great too

Problem Statement Example
Enhanced Visibility Project

▶ **Background:** The WHILL Model A is a mobility device meant to give wheelchair users a sleek alternative to standard products, which often lack aesthetic appeal and thereby reinforce stereotypes of weakness or helplessness.

▶ **Problem:** While the WHILL has built-in lights that are designed into the rear wheel cover, they are insufficient to provide adequate visibility (to see and be seen) at night.

▶ **Aim:** Explore designs that will enhance the night time visibility of the WHILL and thereby increase user safety.

▶ **Design Criteria:** The design should:
  ▶ not alter or permanently deface or damage the physical structure or operation of WHILL
  ▶ integrate well with WHILL's appearance
  ▶ provide forward illumination (like a car's headlights)
  ▶ enhance both side and rear visibility
  ▶ automatically operate based on sensed ambient lighting
  ▶ include a manual override
  ▶ optionally include a light show mode

▶ **Links:**
  ▶ Whill
  ▶ Ashley's Passion to Redefine Accessibility
  ▶ Whill's back light

▶ **Contact:**
  ▶ Whill contact
  ▶ User contact

The Design Process
Understand the Problem

▶ Clarify goals and objectives

    ▶ Incorporate users' perspectives and standards of care

▶ Gather information

    ▶ WWW, library, journals (research)

    ▶ Product catalogs (existing products)

    ▶ Stakeholders

    ▶ Experts & health care professionals
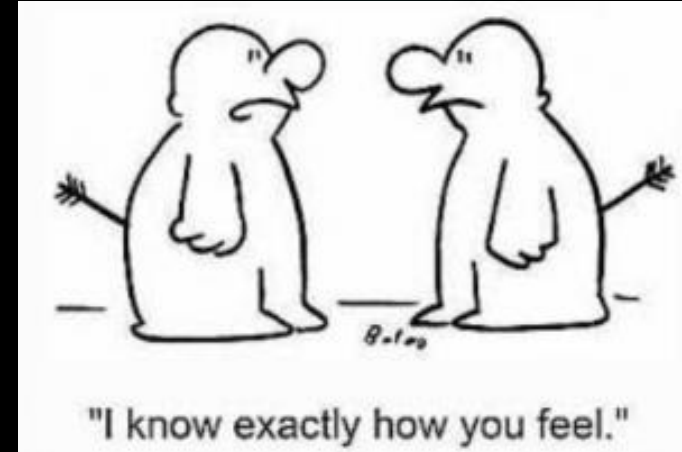
The Design Process
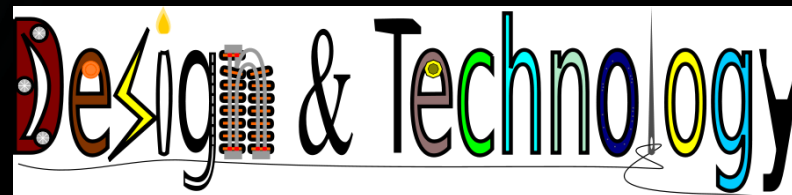## Understand the Problem

"I know exactly how you feel."

► Often called "Empathy"

► Find out as much as you can

► User's specific background and situation

► Review information on the disability condition

► Solicit the perspectives of people with disabilities and older adults, family members, friends, health care professionals, colleagues, researchers, engineers, product suppliers

► Query professionals via online listservs

PERSPECTIVES
=
EMPATHY

The Design Process
Understand the Problem

▶ *"While a user may have a good handle on The Problem, he/she may not fully appreciate the benefits and limitations of technology."*

▶ *"Since each person has his/her own circumstances, desires, and sense of aesthetics, a solution for one user may not be applicable for the entire user population."*
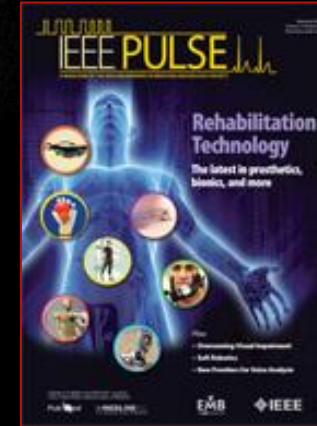
The Design Process
Understand the Problem

Research current solutions

- ▶ Published research
- ▶ Articles in popular media
- ▶ Previous student projects
- ▶ Product catalogs

The Design Process
Understand the Problem

Research current solutions

- ▶ What products currently address the problem?

- ▶ What products are most commonly used?

- ▶ What is considered the standard of care?

- ▶ You may not want to reinvent what already exists or has already been tried

- ▶ Build on existing solutions

"Sometimes the only problem is a lack of awareness of a suitable existing solution."
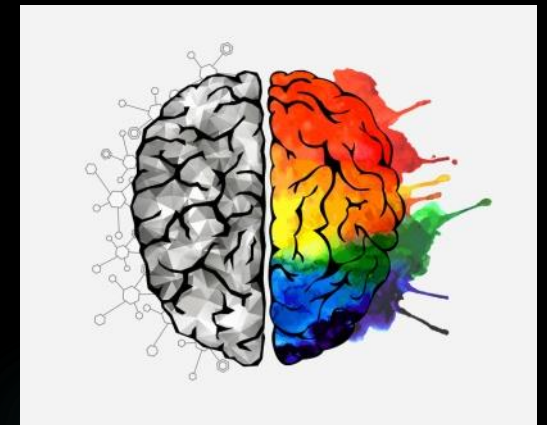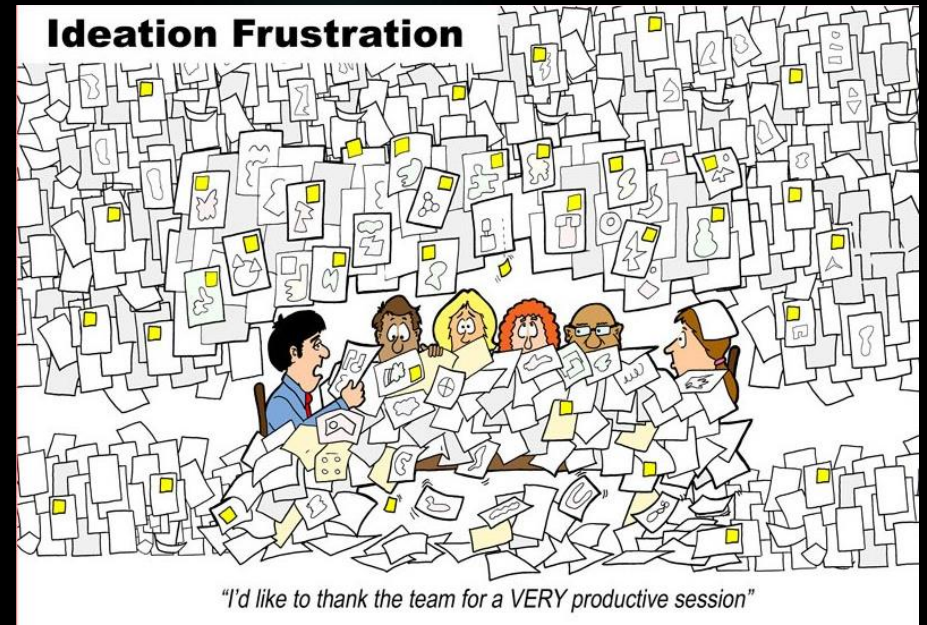
The Design Process
Understand the Problem

- Determine why current "solutions" don't work

  - Important to find limitations of current products:

    - High cost, weight, reliability, etc

    - Ineffectiveness

    - Non-compliance or non-use

    - Poor aesthetics, functionality, durability, fit

    - Does not take advantage of current technology

- Why a new solution may not work
  "The old shoe is more comfortable."
  Barbara (age 92)

The Design Process
Judge the Need

"Judge what is needed from a full understanding of the problem."

The Design Process
Brainstorming

▶ Idea Generation - also know as "Ideation"

  ▶ Morphological charts

  ▶ Brainstorming

  ▶ Other techniques

▶ Develop multiple preliminary ideas, concepts

▶ Don't get stuck on your original idea - Anchor Effect

Ideation Frustration

"I'd like to thank the team for a VERY productive session"

The Design Process
Survey Technology

▶ Seek out technology - including existing products - that could be brought to bear on the problem
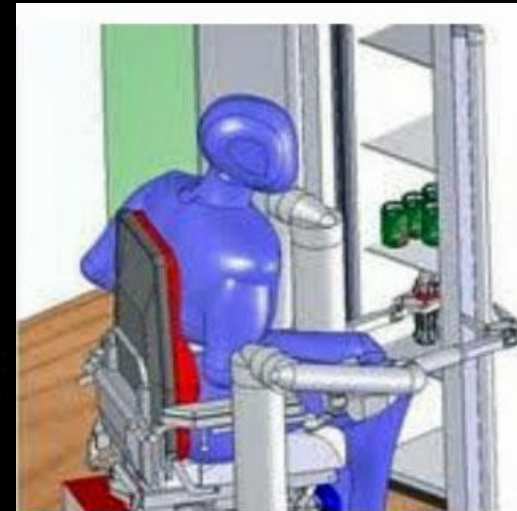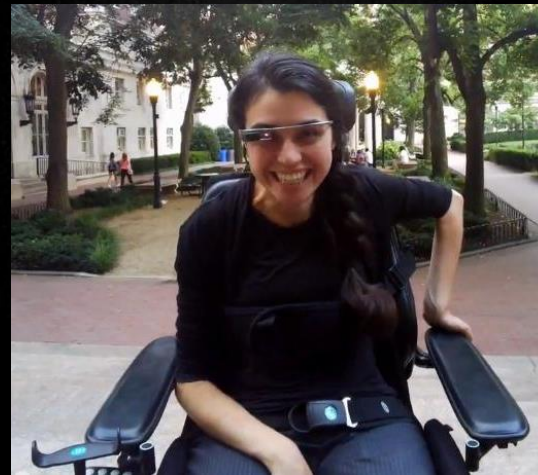
How to interact with users

▶ Observe the problem / challenge firsthand

▶ Encourage them to tell a story

▶ Understand <u>what</u> a solution should do, but not <u>how</u> to do it

▶ List design features - don't forget the "coolness factor"

▶ Recognize that you may not be aware of the limitations and benefits of technology

▶ Interact with user / suggestor

Engineering Design Process

- ► Does not include:
  - ► Building to another's vision
  - ► Making incremental improvements

- ► Utilize project resources and team skills
  - ► Person who suggested project
  - ► Course resource people
  - ► Classmates
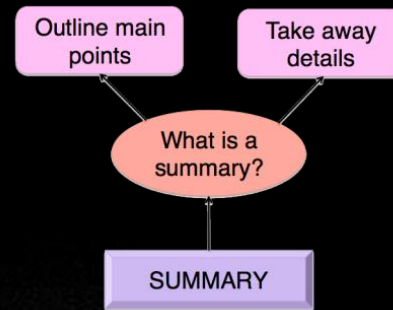 - ► Dave

- ► Make and justify all your project decisions
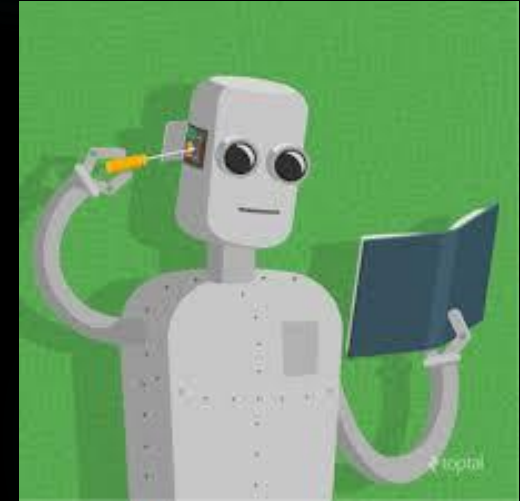
Other Observations

- Assistive Technology is a highly fragmented market
- A small market means high prices
- Avoid getting stuck in one aspect of the design process

"It's not a failure if you learn something."

SUMMARY

- **Describe** the problem
- **Understand** the problem
- **Survey** technology that addresses the problem
- Very few design concepts make it to market
- **Advice for student engineers:**
  - Employ users, caregivers, heath care providers, and experts at each stage of the design process
  - Anticipate and plan for both successes and setbacks during development
  - "Fail" early and learn from "failures"
  - Start prototyping with low cost materials
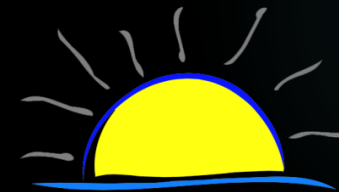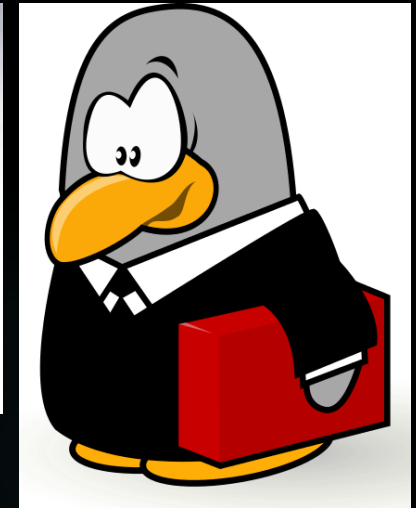
Thursday, January 21st

Bridging the Gap between Consumers and Products in Rehabilitation Medicine
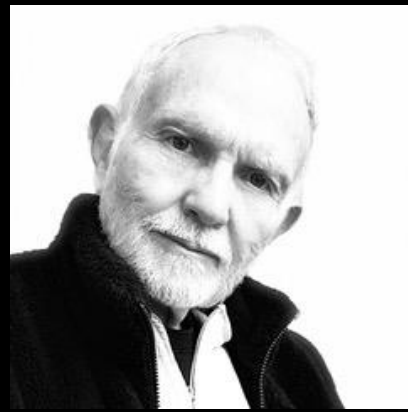
Deborah E. Kenney, MS, OTR/L

Stanford University

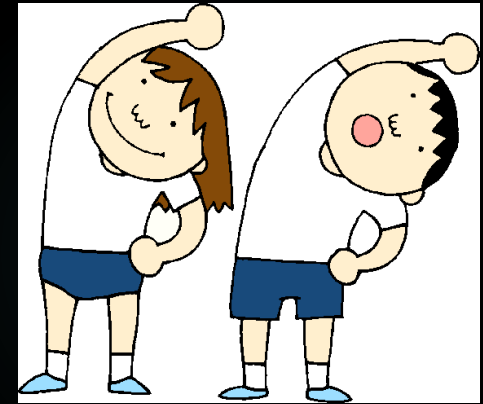VA Palo Alto Health Care System
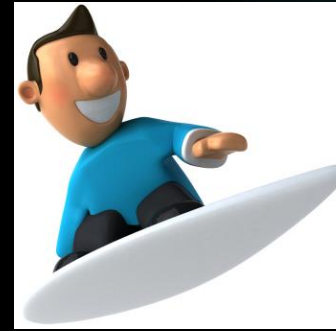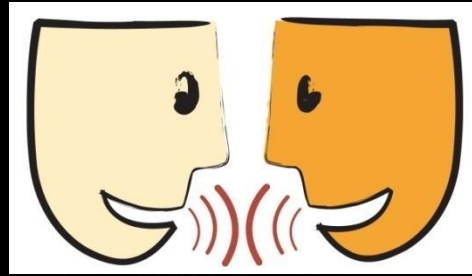
Foothill College

Today

Creating Assistive Technologies - Understanding the Problem

Gayle Curtis - UX Design Consultant

Break Activities

- Breakout rooms
- Attendance sheet
- Stand up and stretch
- Take a bio-break
- Text message
- Web-surf
- Respond to email
- Talk with classmates
- Reflect on what was presented in class

Short Break