CS181DT Class 17: Evaluation

Figure 8.6

NASA Task Load Index

Hart and Staveland's NASA Task Load Index (TLX) method assesses work load on five 7-point scales. Increments of high, medium and low estimates for each point result in 21 gradations on the scales.

Name	Task	Date

Mental Demand — How mentally demanding was the task?

Very Low — Very High

Physical Demand — How physically demanding was the task?

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Temporal Demand — How hurried or rushed was the pace of the task?

Very Low — Very High

Performance — How successful were you in accomplishing what you were asked to do?

Perfect — Failure

Effort — How hard did you have to work to accomplish your level of performance?

Very Low — Very High

Frustration — How insecure, discouraged, irritated, stressed, and annoyed wereyou?

Very Low — Very High

Exploration

It was easy for me to explore many different options, ideas, designs, or outcomes without a lot of tedious, repetitive interaction.

Agree | | | | | | | | | | | | | | | | | | | | Disagree

Collaboration

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Engagement

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Effort/Reward Tradeoff

What I was able to produce was worth the effort required to produce it.

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Tool Transparency

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NASA-TLX and CSI, two likert-based evaluation schemes

Class 17 agenda

- Zipcrit
- P2M3: Wizard-of-Oz prototype
- Studio: Wireflows
- Break
- Lecture: Evaluating tools
- Announcement: Your grade on Canvas is probably lower than it actually is, I will rebalance by end of week

Milestone 3: Wizard-of-Oz Prototypes

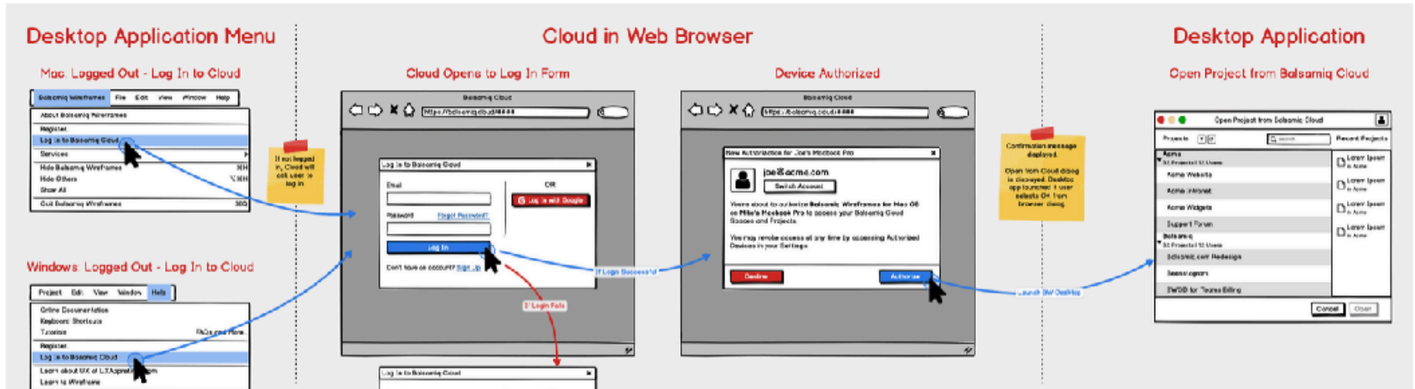
Due 2:30pm Tues, March 26.

At this point you've made a scenario paper prototype of the most critical interaction of your tool. Hopefully you have iterated on your designs and ideas a bit based off of initial feedback and in-class user tests. In this milestone, we'll flesh out the full tool in Figma as well as plan metrics to gather during our in clas evaluation on Tues, March 26. Your Wizard-of-Oz prototype should focus on *breadth over depth* (so show the range of all possible interactions, but it's OK to have canned user inputs).

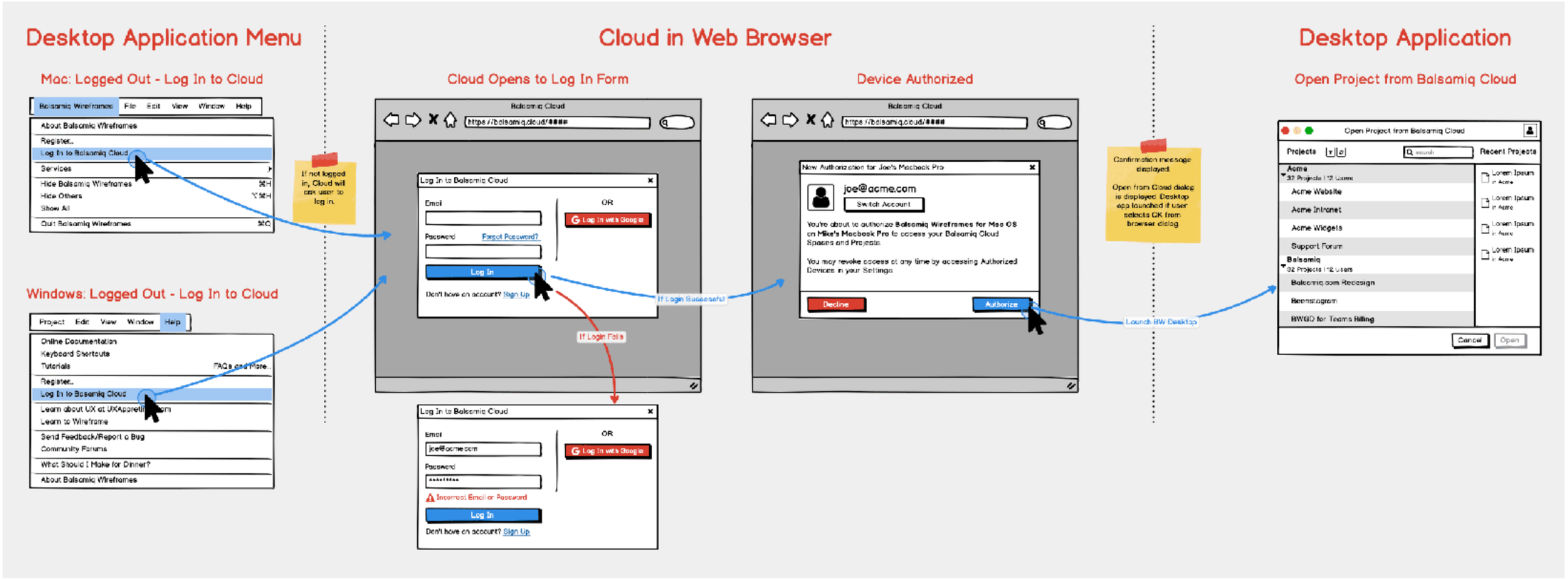
The learning goals of this milestone are to engage in the design process to have a working, high-fidelity WoZ prototype to test with your classmates.

Step 1: Breadth wireflow

While you now have a better idea of how one interaction works, it's time to flesh out the full interaction for your tool. Before diving into Figma, I recommend discussing and agreeing as a group on flow-based wireframes (a wireflow) for your entire tool. Plan out how your tool works. What is the screen users see when they first open the tool? What are all the tasks you want to support, and how do users transition from one screen to another?



Breadth wireflow



- 30 min to start creating a full wireflow of your tool. Treat this as a blueprint for your higher fidelity prototype
  - What is the first screen? What are other screens? How do users transition?
- Use post-its for comments; keep the canvas design-only
- I'll come around and give feedback/answer Qs, 5 min each group

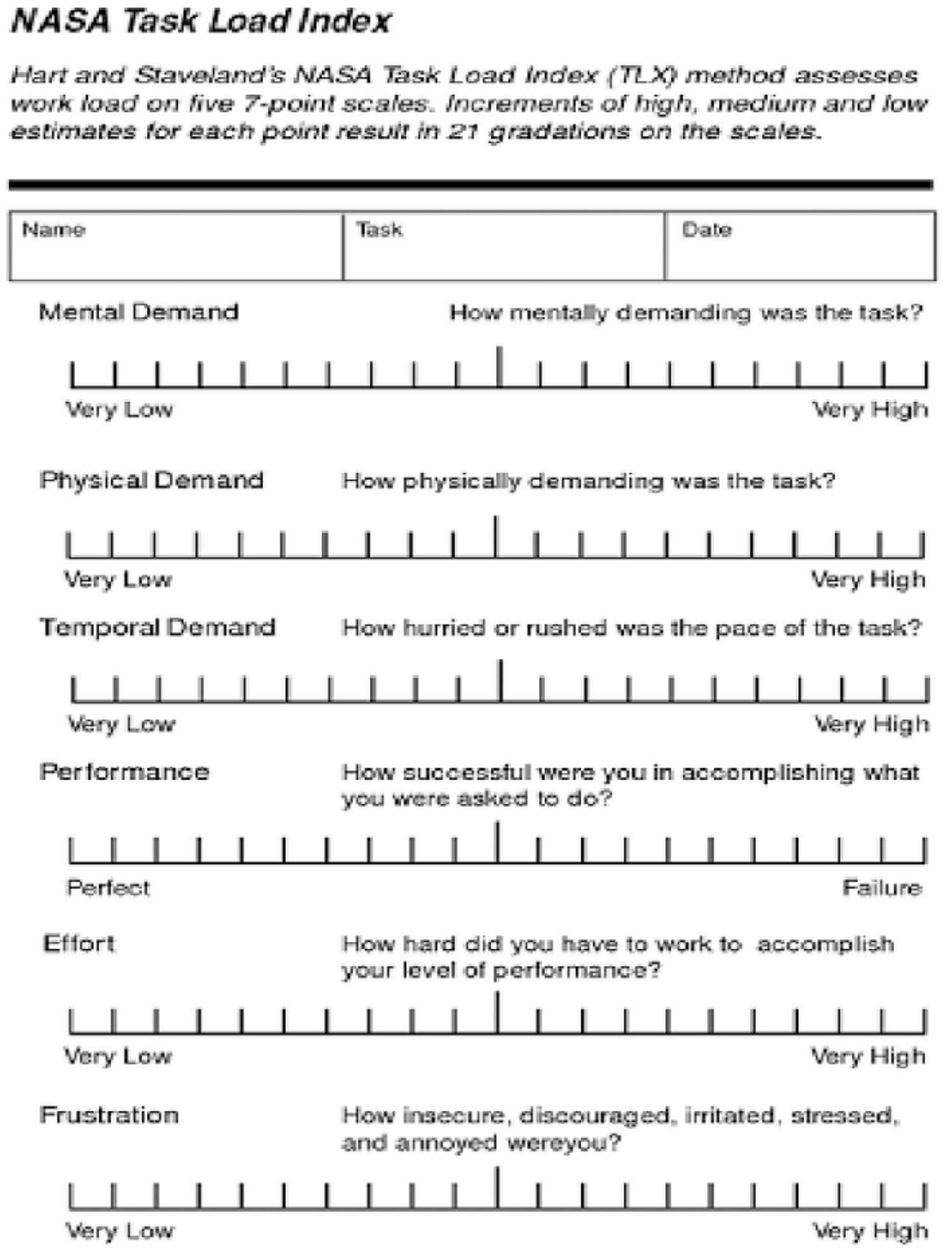
Evaluating tools

Why evaluate?

- How do we know if we met our design goals?
- How do we know if our tool is good?
  - Good could mean useful, expressive, helps you do something faster, enables an interaction that isn't enabled before, gives users more power…up to you to choose what "good" is, as long as you have *operationalizable metrics*

Common metrics: NASA-TLX

- NASA-TLX uses self-reported **likert scales** (rating 1-7) to convert qualitative feelings into quantitative numbers (ordinal data)
- Across categories of
  - Mental demand
  - Physical demand
  - Temporal demand
  - Performance
  - Effort
  - Frustration



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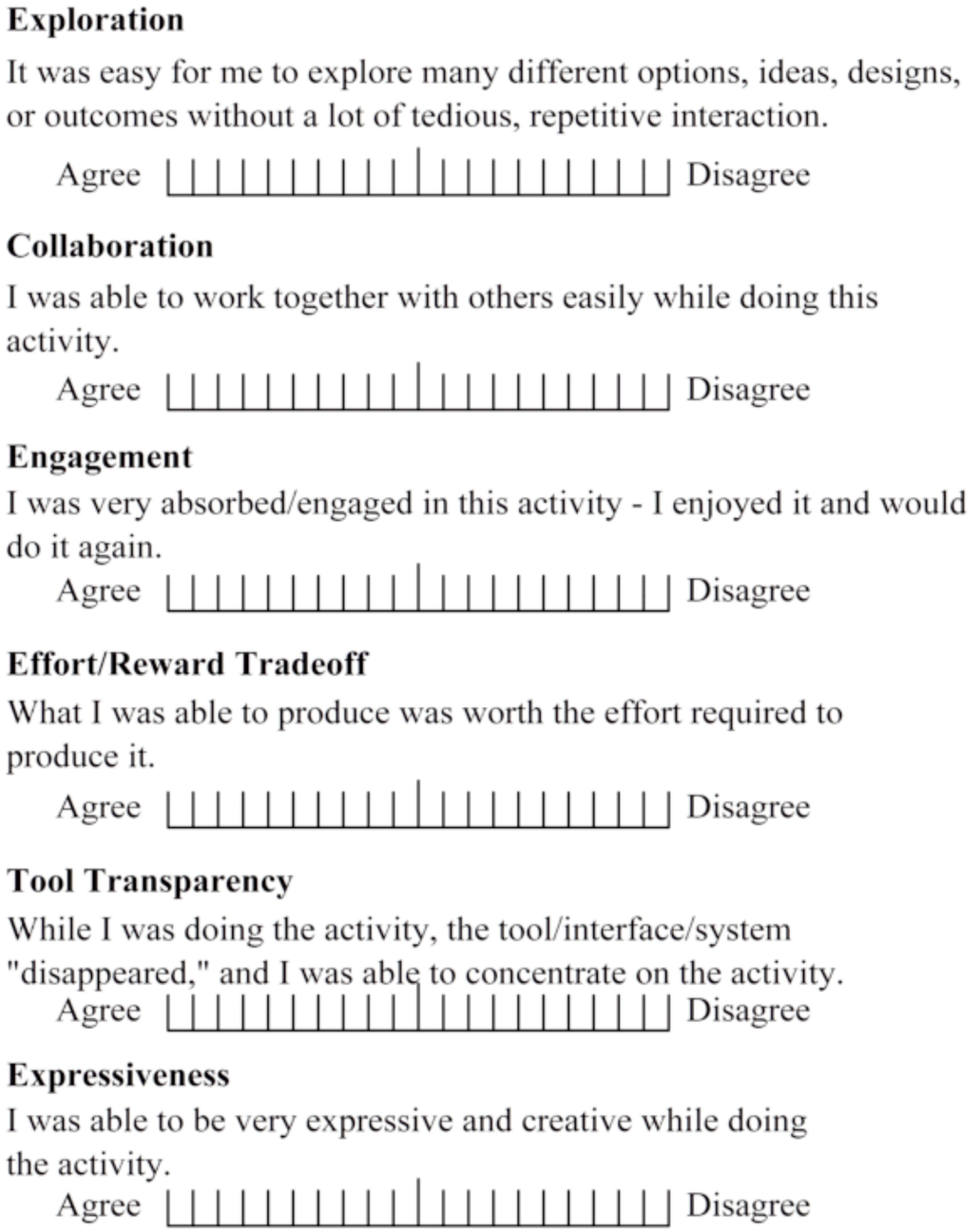
Common metrics: CSI

- Similar to the NASA-TLX, but specifically developed for creativity support tools
- Across categories of
  - Exploration
  - Collaboration
  - Engagement
  - Effort/Reward Tradeoff
  - Tool Transparency
  - Expressiveness

Discuss: What are some shortfallings of self reported likert scale evaluations?



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Creativity is hard to measure

- Seriously, there is no research or literature that agrees on how to measure creativity
- Part of this is that creativity is often *domain specific*
- My personal opinion is quantitative studies are less well suited for creative tools (but certainly useful for other kinds of tools)

Hypothesis testing

- We can frame our evaluations as hypothesis tests and conduct quantitative experiments of statistical significance for evaluation.
  - Hypothesis: What do you want to believe to be true about your tool?
  - Independent variable: the thing you’re changing
  - Dependent variable: the metrics you’re measuring to see how they are affected by changing the independent variable

Between vs within subjects design

Between subjects

Two participant groups.

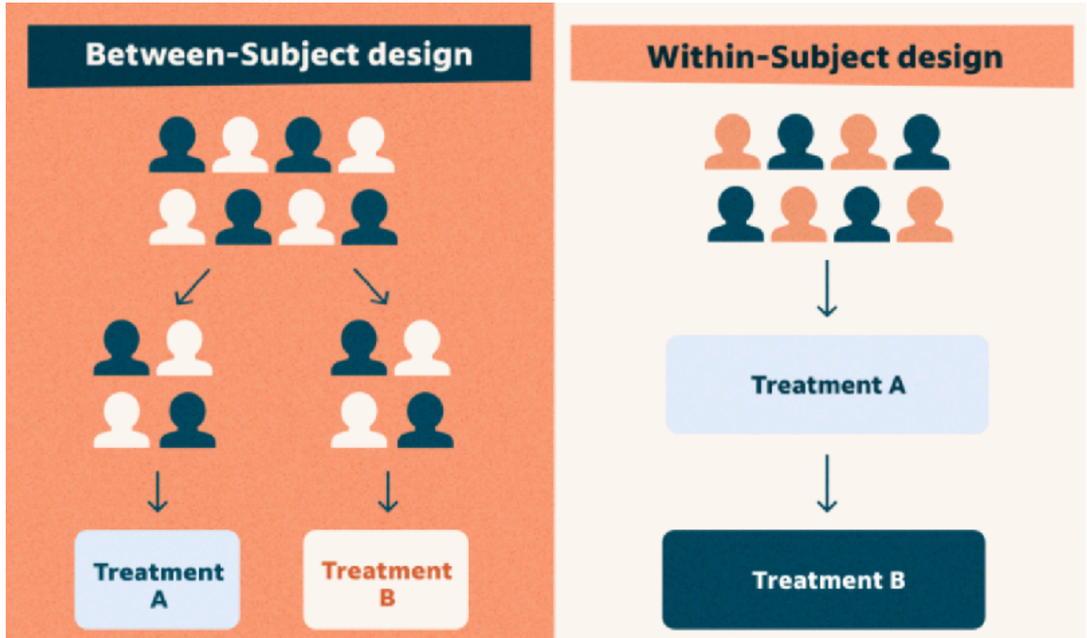
1 group only uses design A.

1 group only uses design B.

Within subjects

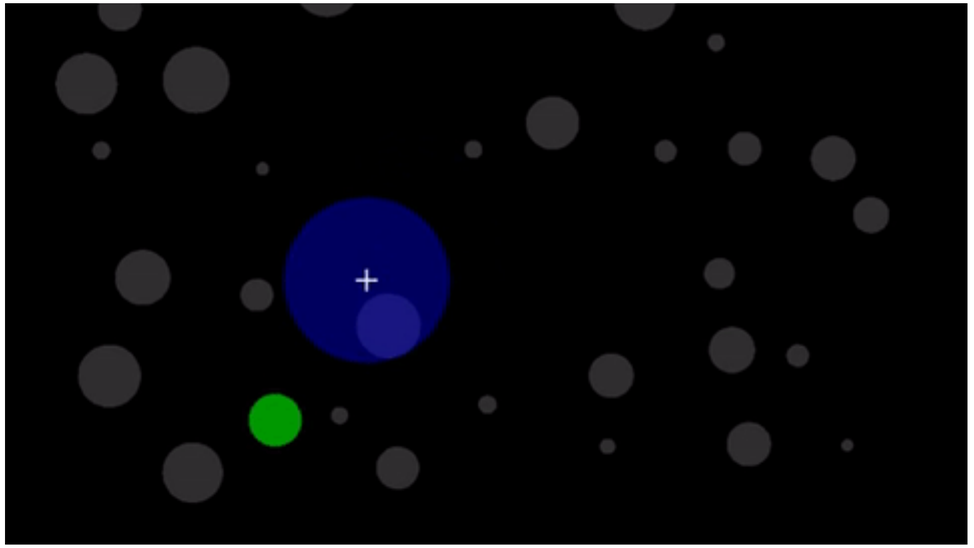
Everyone uses design A and B.

Random ordering (A first or B first) is important to avoid temporal bias!



Example: bubble cursor

- Hypothesis: Users click on targets faster with the bubble cursor
- Independent variable: Cursor type (regular vs bubble)
- Dependent variable: Movement time
- Within subjects study



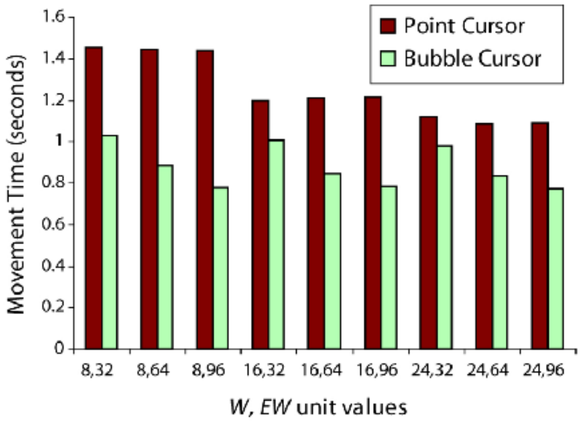


Figure 6. Movement time by *W*, *EW* values for both cursors, averaged over all *A* values.

Grossman et al. The Bubble Cursor. CHI 2005

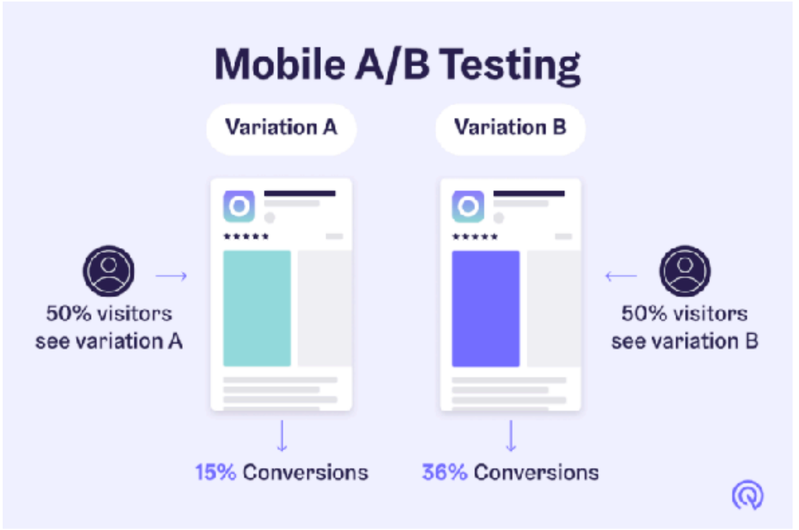
Experiments in the real world

- Research conducted at an institution needs to go through IRB (Institutional review board) approval for ethics
- Requires obtaining the informed consent of participants and identifying potential harms
- Requires detailing study design, variables, randomization, and trials
- Class projects do not need IRB approval :)

Thanks Philip Zimbardo and the Stanford Prison Experiment

How about for design?

- A/B testing: Between subjects testing of one page version or another, usually has dependent variables like click through rate
- For your tool, if you want to do quantitative studies, you could consider comparing to an existing tool as the “control group”

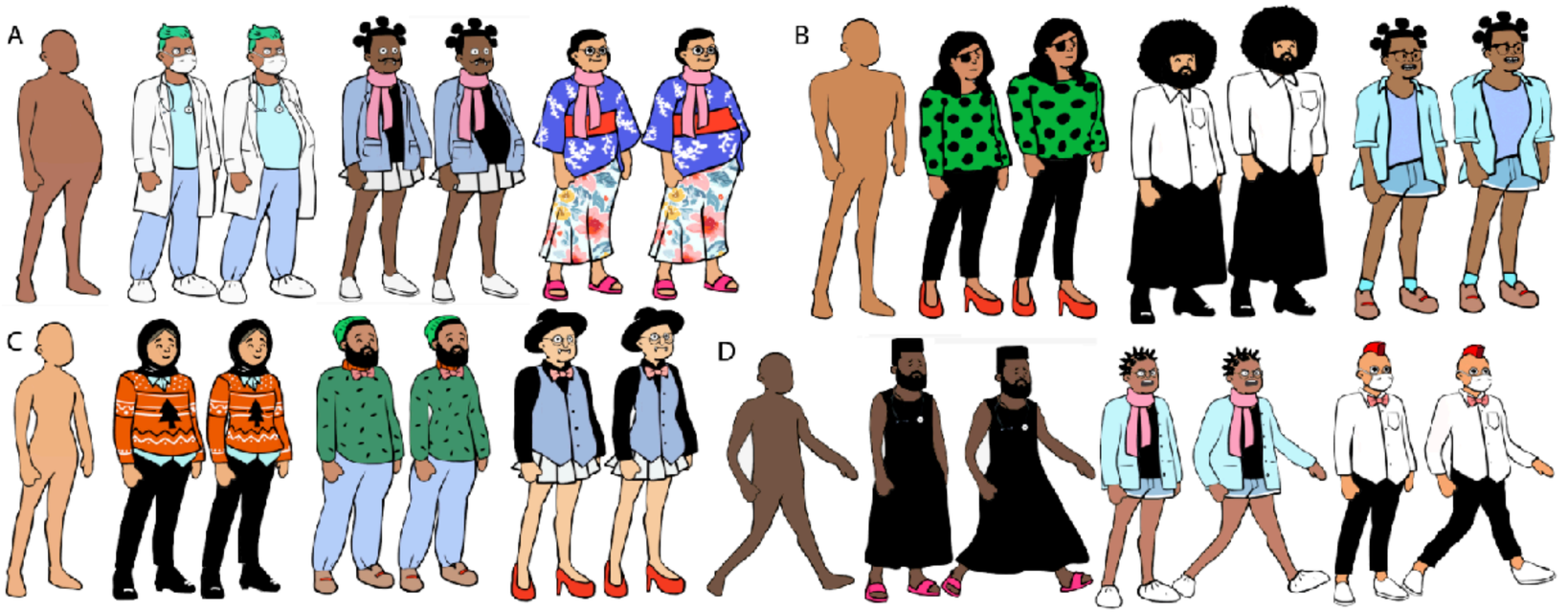


Qualitative studies

- We've already learned about think aloud protocols, semi-structured interviews, and contextual inquiries
- These are all methods of collecting *qualitative* data
- Other methods:
  - Longitudinal studies: give the tool to users for weeks+, collect usage data (also quant), conduct post-usage interviews. Benefits: ecological validity (done "in the field" in real contexts of use versus a controlled lab environment)
  - Thematic analysis: from your qualitative data (e.g., interview transcripts), annotate for common "themes" that emerge

Existence proof

- Some HCI researchers believe that the tool existing (and showing a range of artifacts the tool can generate) is enough evaluation
- Reviewers can look at the results to make their own judgement calls



Existence proof by generating a wide range of examples with the tool

Your turn

- Activity: **How should you evaluate your tool?**
  - In groups, first brainstorm and write in your design documentation 2-3 initial hypotheses you have about your tool right now that can be answered through *observation.* These are more hypotheses for iteration and feedback rather than final evaluation
  - Then write the independent and dependent variables for each hypothesis, and potential metrics for *how* you'll get the data. (A/B test it? Likert scales? Observation?)
  - Let this guide your in class evaluations on Tuesday!

- Example: drawing fading strokes tool
- Hypothesis: Using this tool will reduce the pressure of getting started with drawing
- IV: Tool usage; DV: Time it takes to get started drawing.
- Metrics: collect timing information (quant), post-interview asking about feelings getting started (qual)

Class 17 recap

- Next class: Zipcrit from Ryan
- TODO
  - Next Tuesday: WoZ Figma prototype
  - There’s nothing else due besides this because **this prototype will be a lot of work**
  - Please come to OH if you have any trouble