

Design Discovery

Prof. James A. Landay
Computer Science Department
Stanford University

Autumn 2025

September 24, 2025

* some slides based on those of Julie Stanford, Sliced Bread Design

DESIGN FAILS



https://youtu.be/rxdyp_dyYZU
by [AX Ali](#)

“What we are working on is going to be ridden in, sat upon, looked at, talked into, activated, operated, or in some way used by people individually or en masse. If the point of contact between the product and the people becomes a point of friction, then the industrial designer has failed. If, on the other hand, people are made safer, more comfortable, more eager to purchase, more efficient—or just plain happier—the designer has succeeded.”

— Henry Dreyfuss, *Designing For People*, Simon and Shuster, 1955



Hall of Fame or Shame?

<http://www.dol.wa.gov>

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Update your driver license/ID card ▶	Get WA license plates ▶	Look up a professional or business license ▶
Check the status of a license/ID card ▶	Buying a vehicle ▶	Setup account access ▶
Learn how to reinstate your driver license ▶	Selling a vehicle ▶	Uniform Commercial Code (UCC) ▶
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- + UI is (mostly) clean & uncluttered
- + Most common task prominent (renew)
- + 3 other key users/tasks right up front
- + Less important info (tweets, videos) below *fold*
- + Multiple language options are clearly indicated
- + *Similarity & connectedness* gives strong aesthetic & indicates navigation
 - examples of [Gestalt Principles](#)
- A bit busy overall, but easy to fix
- Update at top seems weird (really an update?)

Design Discovery

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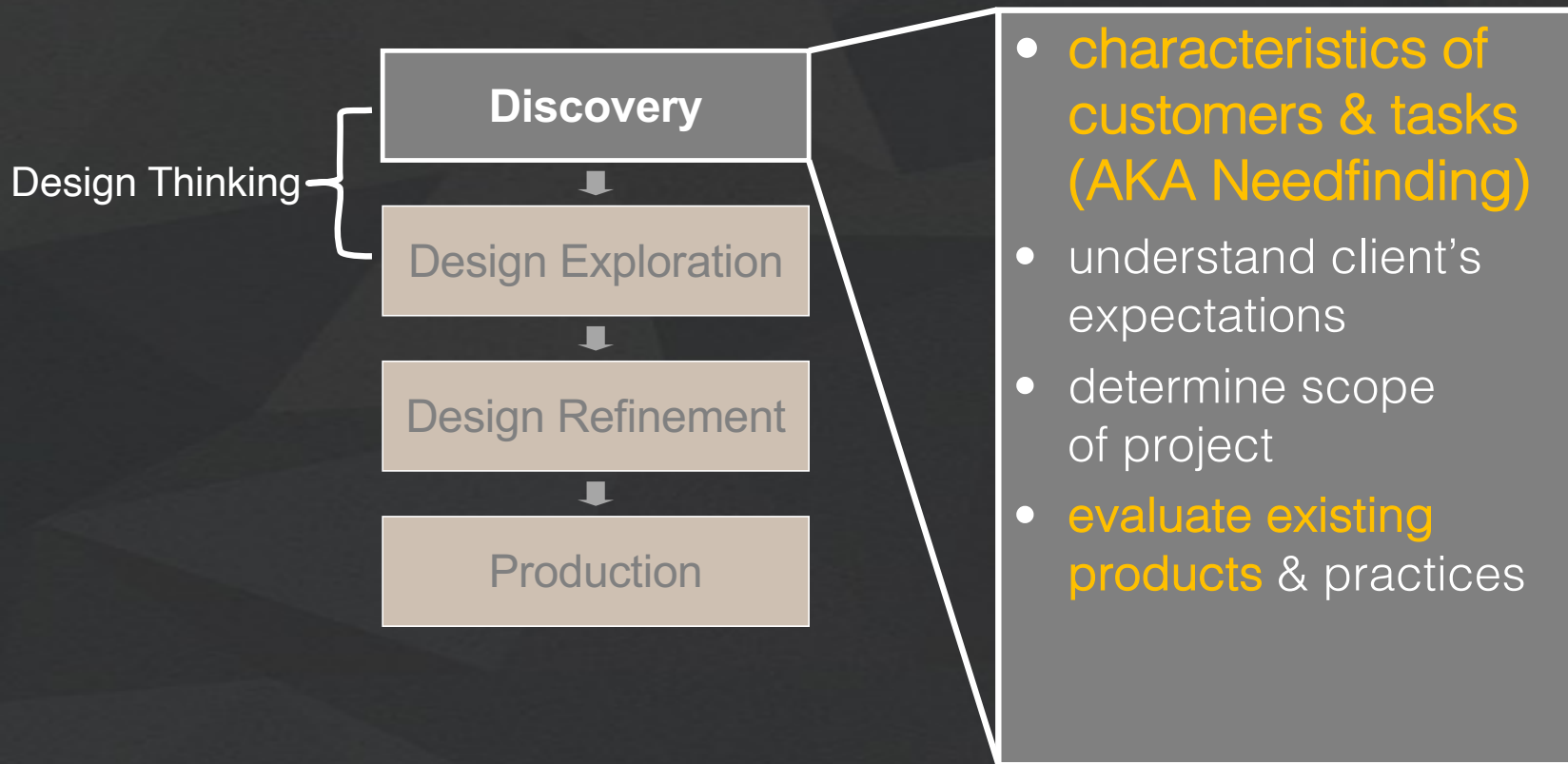
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Outline

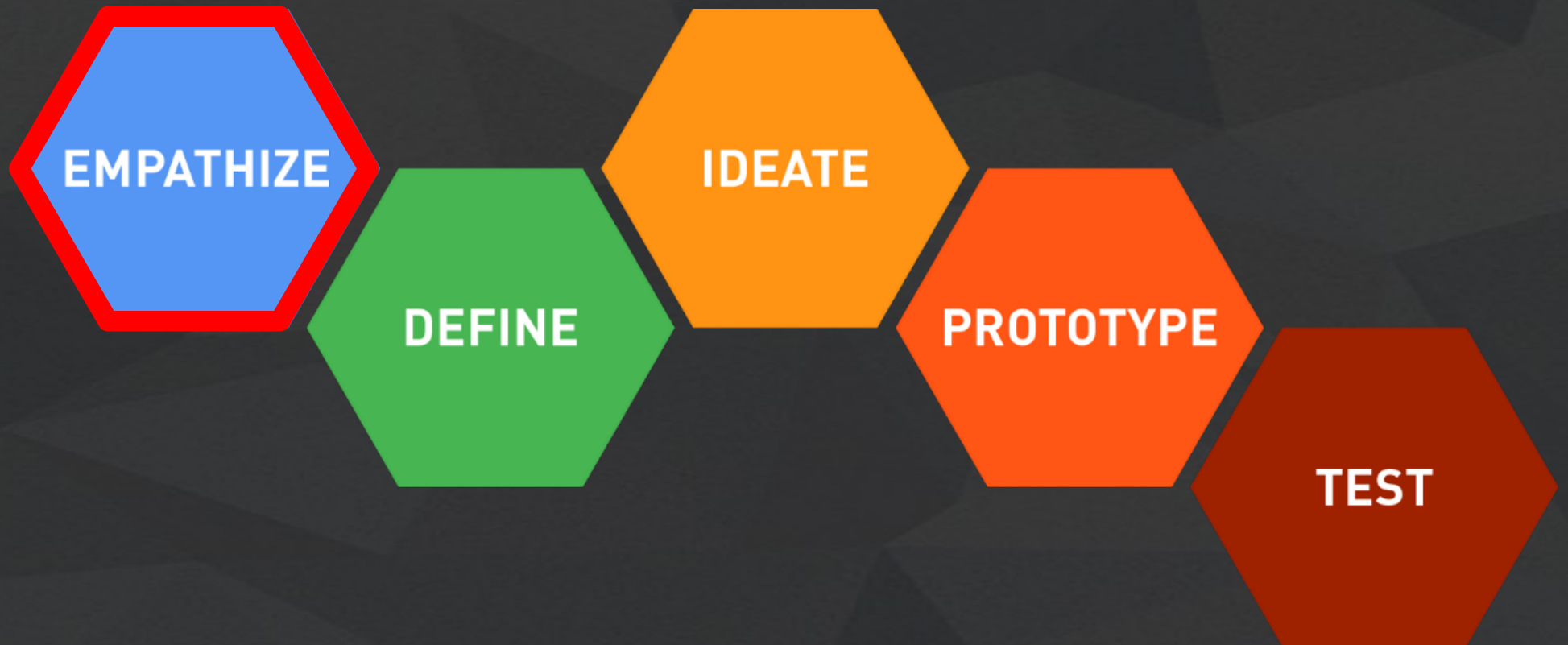
- Design Discovery
- Needfinding



Design Process: Discovery



Design Thinking Process



Empathy: Feel what they feel



Principles

- 1) Immerse
- 2) Observe
- 3) Engage

<https://hci.stanford.edu/courses/cs147/2024/au/readings/FIELDGUIDE-Screen-DTBC-March-2015-V2.pdf>

“You Can Observe a Lot
Just by Watching”
–Yogi Berra

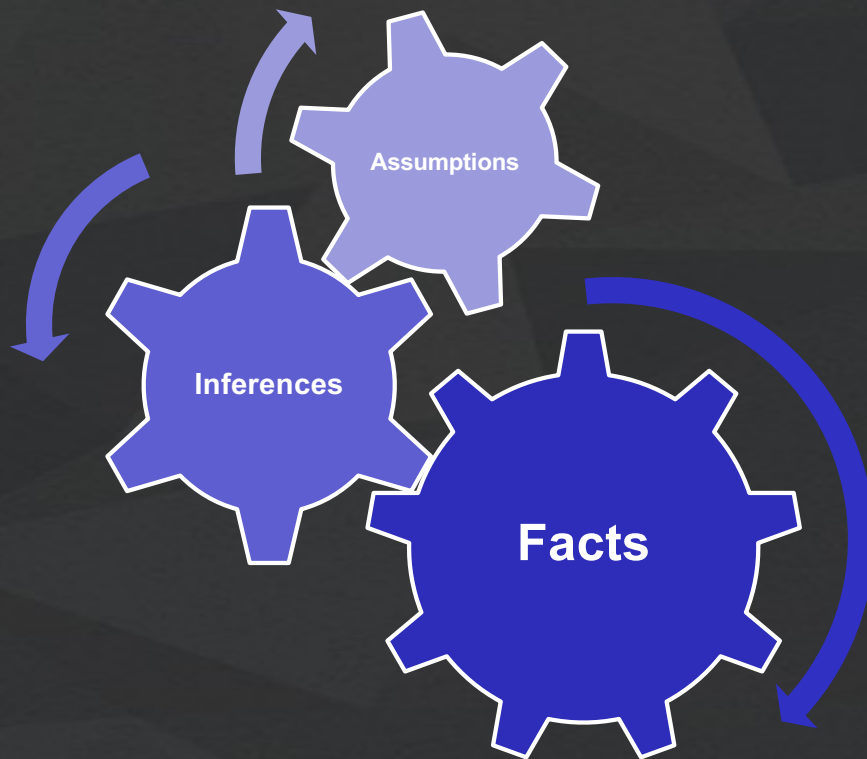


Bronislaw Malinowski Learning From Trobriand Islanders (1914)



Image Courtesy Wikipedia: https://upload.wikimedia.org/wikipedia/commons/1/1e/Wmalinowski_trobriand_isles_1918.jpg

Technique: Active Observation



Observe & interview
without knowing what
you are looking for

discover what is interesting!



Needs
gaps within
a system



Needfinding
discovering
opportunities
by recognizing
those gaps



Desire line

“traces of use or wear that indicate preferred methods of interaction with an object or environment”
– Universal Principles of Design, P. 76

Figure out
the story of
what and
why . . .



And tell a
new one

Pay attention to *all* the artifacts

Look for workarounds & hacks

“Errors” are a goldmine

Getting to Why



Needfinding starts with basic questions of everyday experiences

But moves from

- closed ended questions to *open ended* questions
- “whats” to “whys”
- actions to feelings

Engage people in *their environment*



A needfinding interview is....

One in which the *interviewee* speaks 90% of the time.

Be ready to hear something new and be changed by it.



Defer your agenda &
unlock their world

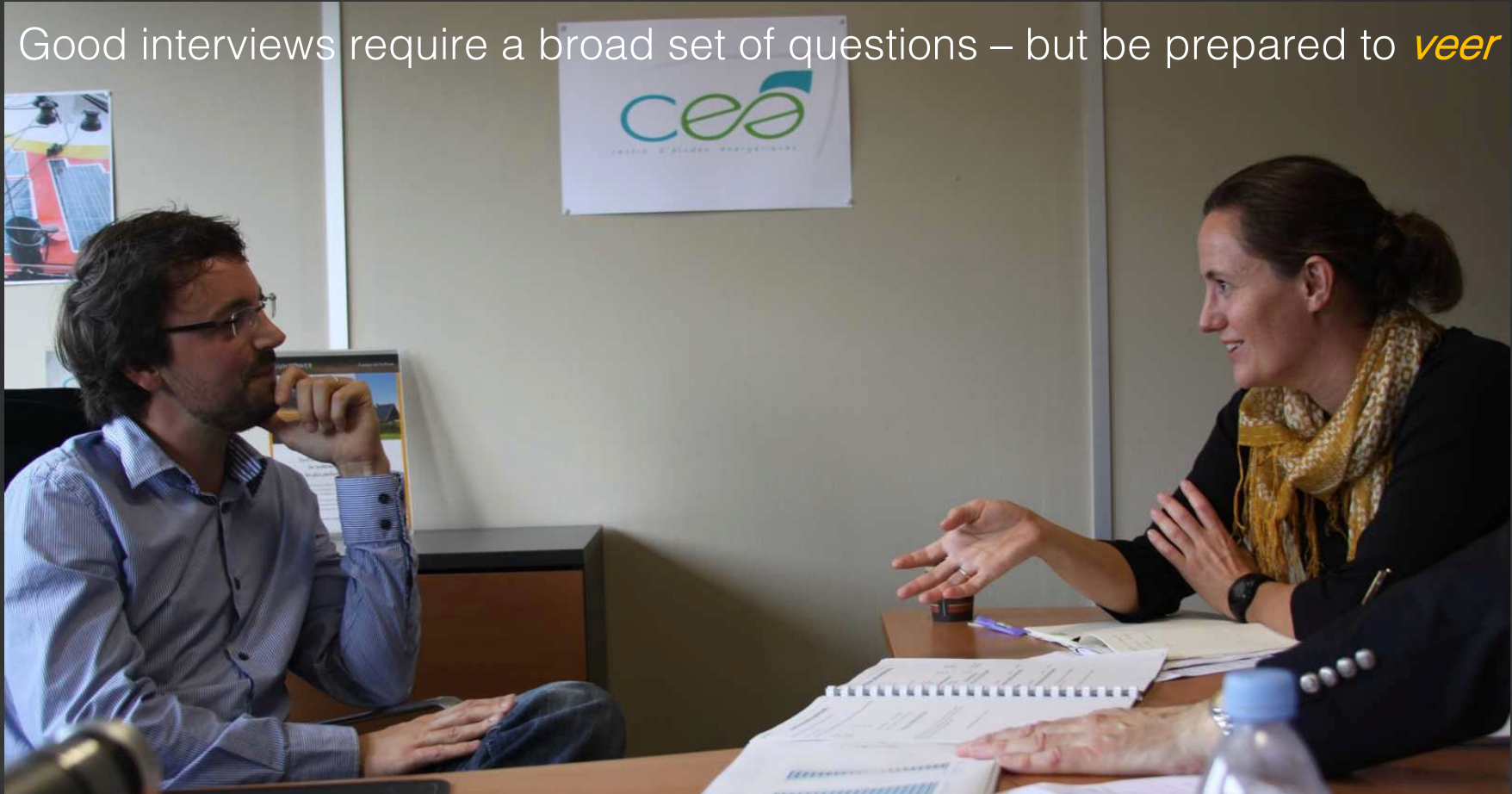
Step into the interviewee's shoes

Be curious

Have a "beginners' mindset"

Interview

Good interviews require a broad set of questions – but be prepared to *veer*



Interview

Interviews typically share the same basic structure as a story



Interview



An Introduction...



Interview Questions – Background



- **Background** — “Tell me about what you do here.”
- **Sequence** — “Walk me through your day yesterday...then what do you do next?”
- **Physical tour** — “Take me on a tour of how you build the panels...”
- **Virtual tour** — “Walk me through your sales process from the beginning...”
- **Participation** — “Can you show me exactly how you prepare a customer bid?”
- **Exhaustive List** — “What are all the different municipalities where you sell?”

Interview



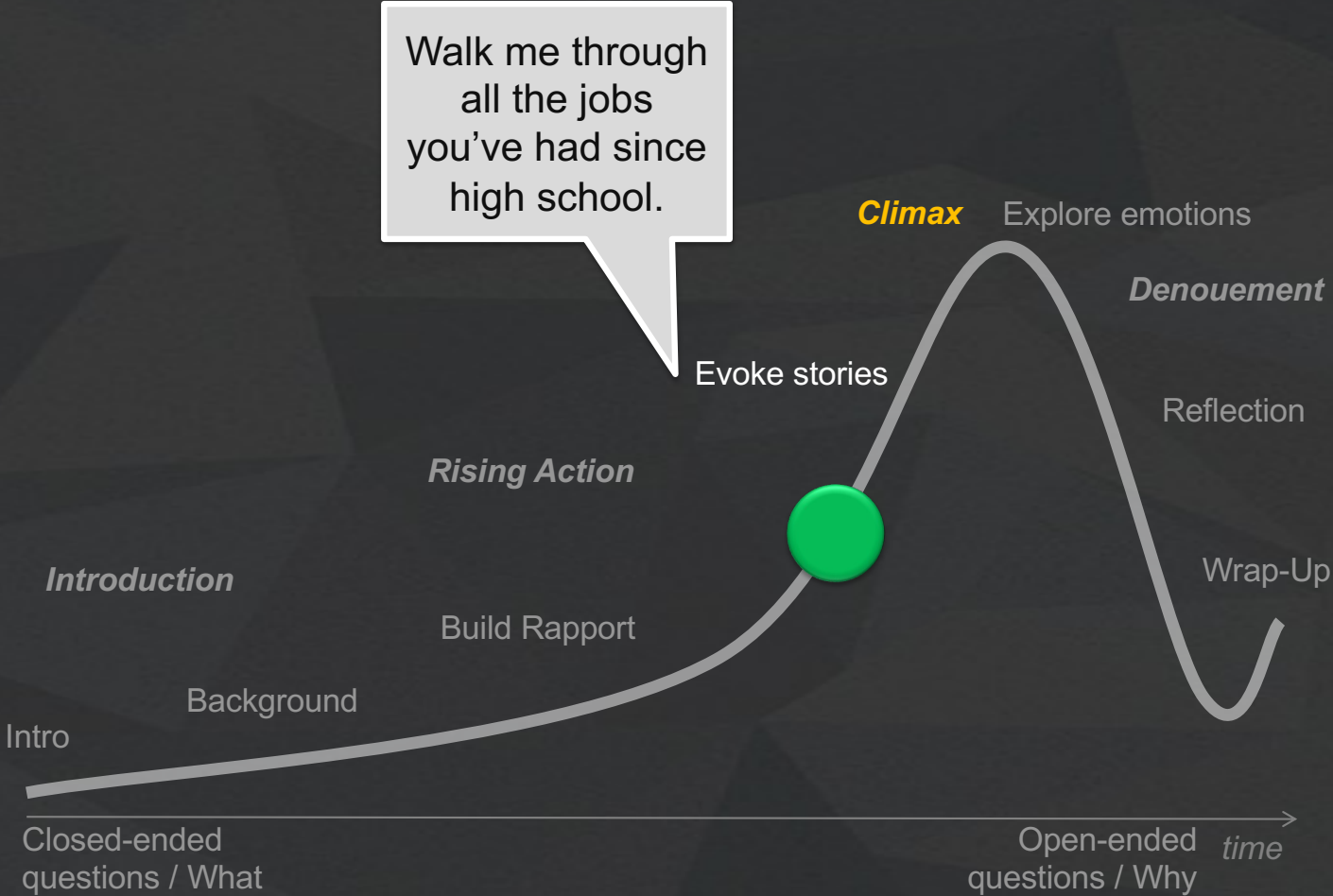
Interview Questions – Build Rapport



- **Naïve Outsider Perspective** — “I’m not from LA, how does the housing market work here?”
- **Changes Over Time** — “How are things different than they were last year?”
- **Reflecting Back** — “So, what I hear you saying is..... is that right?”
- **Quantity** — “How many of your competitors fall into that category?”
- **Tasks and organizational structures** — “Can you draw me a diagram of your org. chart?”
- **Native Language** — “Why do you call your office ‘the command post’?”

Interview

Walk me through all the jobs you've had since high school.



Interview Questions – Stories & Emotions



- **Clarification** – “...and when you say ‘I’m a closer,’ what do you mean exactly?”
- **Success and Failure** – “Describe your most successful sales call. Now tell me about a sales call that was a disaster.”
- Peer Comparison – “Do your colleagues share your sales techniques?”
- Other Viewpoint Comparison – “What would other solar owners think about that?”
- Characterization and Comparison – “Could you characterize your sales style and compare it to Mike’s?”



Follow up and pull that thread

- Adjust your questions to their previous answers
- Ask questions in language they use / understand
- Pick up on / ask for examples
- Be flexible



Interview

I heard you say that you were reluctant to talk to John... tell me more about that.





Interview

You mentioned you were focused on a calm year, but I hear you say you have no time to plan a vacation...



Interview Questions – Reflection



- Point to Their Reaction – “Why do you roll your eyes when you say that?”
- Suggestive Opinion – “Some people have very negative feelings about emotional sales pitches. What are your feelings about it?”
- **Contradictions** – “You tell me you can sell ice cubes to Eskimos, but you also tell me you have a deep concern for your customers. How do these two work together?”

Interview





A few last tips

- Remember that people make sense (to themselves)
- Your job is to be able to *explain how they make sense*
 - get to the bottom of things & understand the what & the *why*
- Create a discussion guide with lots of questions (themes), but be *ready to veer to pull threads*

Administrivia

- 1) Fill out studio form by today at 5 PM
<https://hci.st/cs147-25au-studios>
- 2) Studio assignments come out late Wed PM (or early Thur AM)
 - attend assigned studio unless pre-cleared by staff
 - inform your CA if you will not be there this week (e.g., have excused absence)
- 3) Studio absence policy
 - 1st absence is *free* for a legit reason (*must* inform CA in advance)
 - 2nd absence for a legit reason requires make-up assignment (*must* still inform CA in advance)
 - after that you start to lose participation points

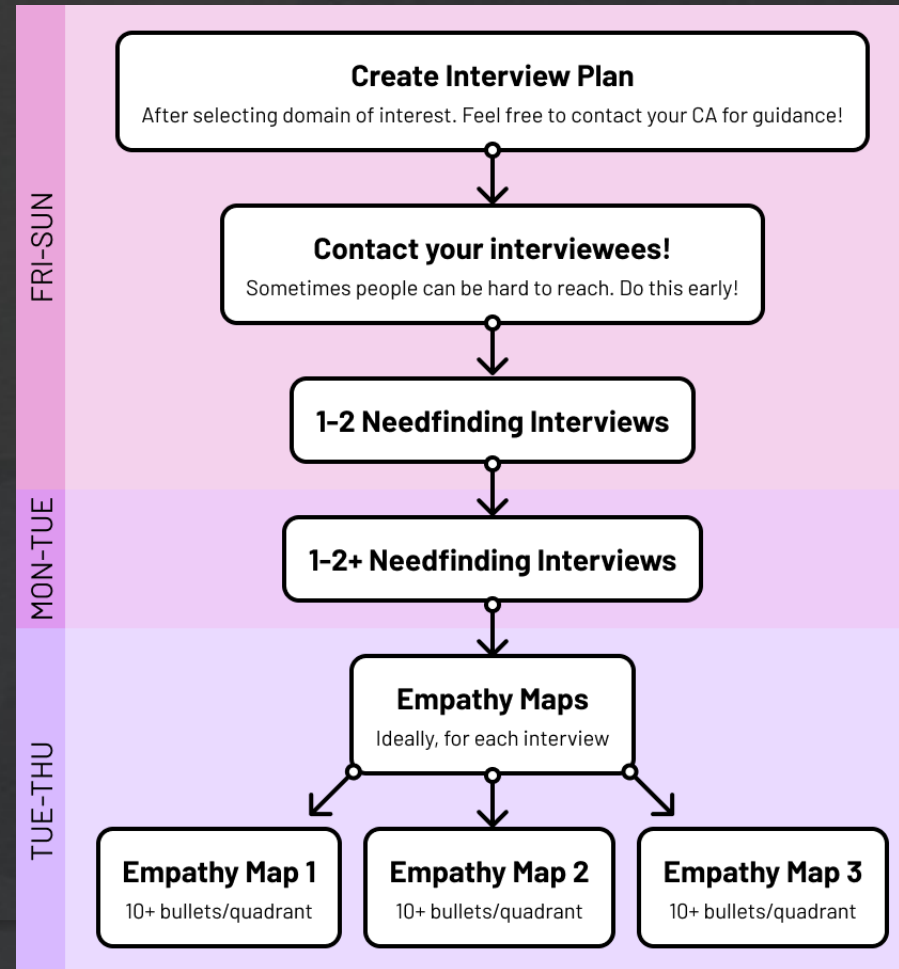
Administrivia

- 4) Teams will be arranged by Friday night/Saturday afternoon at latest
- 5) Use the slack channels to keep up with Q&A & announcements
- 6) James' office hours: Tue 4:20 PM-4:50 PM, E354 CoDa
- 7) Make sure to regularly check course web site:
cs147.stanford.edu

Calendar

Week	Assignments	Monday	Wednesday	Studio
Sep 22-26	A1 Needfinding (group) due next studio (Oct 2-3) Studio Preference Form due Wed, Sep 24 at 5:00 PM Student Conflict Form Team Mixer CoDa E160, Tue Sep 23, 6:00 - 7:30 PM	Introduction (PPT)	Design Discovery Holtzblatt & Beyer, Contextual Design: Principles of Contextual Inquiry (Ch 3) d.school's Empathy Fieldguide Carter, Greenberg, & Walker (2017). Should Professors Ban Laptops? How classroom computer use affects student learning. Watch: ABC News Nightline IDEO Deep Dive July 1999 (22 minutes) Optional: ABC News, 60 Minutes, IDEO Design Thinking, January 2013 (13 minutes) Optional: Holtzblatt & Beyer, Contextual Design. In: The Encyclopedia of Human-Computer Interaction, 2nd Ed.	Design Project 0
Sept 29- Oct 3	A2 POV, HMW, Experience Prototypes (group) due next studio (Oct 9-10)	Define Tips for Working Successfully in a Group by Randy Pausch The Discipline of Teams, by Katzenbach and Smith, Harvard Business Review "How to Survive a Critique: A Guide to Giving and Receiving Feedback" by Karen Cheng	Fieldwork for A1	A1 Presentation POV Development

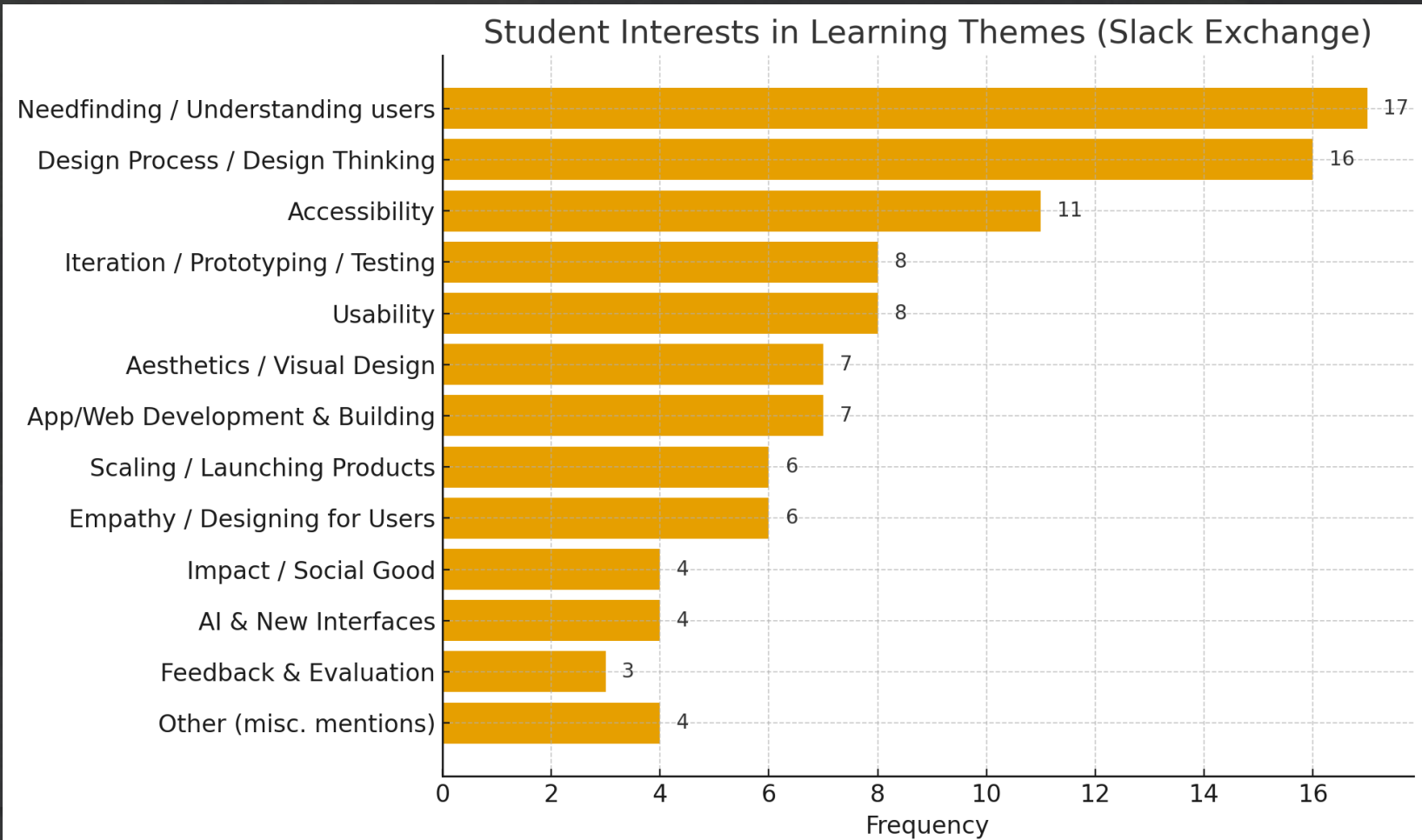
Assignment #1 – Needfinding (due next week)



Project / Team Questions

- You can bring a team (but better all sign up for same studio preferences) or we put you on a team based on skills & studio preferences
- Designing with AI in final hi-fi prototype
 - 1) you can fake hard to implement features (hardcoded/Wizard of Oz)
 - 2) AI is easier now than many other features
 - 3) we are going to have an “implementing AI” workshop

What You Want to Learn in CS147



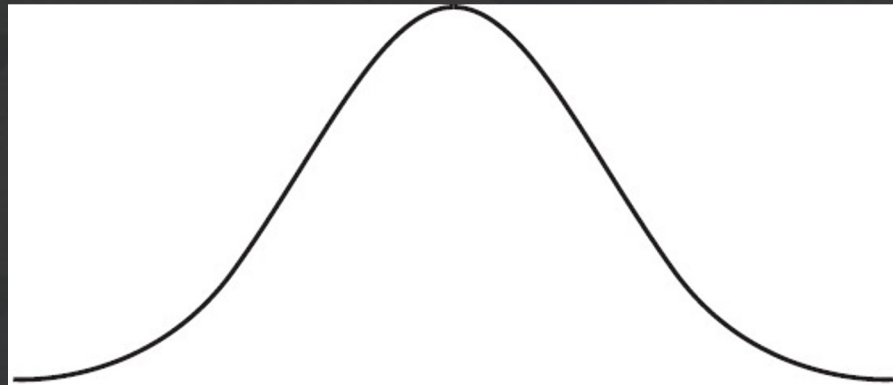
BREAK

Choosing Participants

- Representative of target users (current or future users)
 - usually *not* Stanford students
- Interview people on both sides of an interaction (e.g., Lyft)
- Experts good for background but aren't substitute for users
- Consider interviewing at least one *extreme* user
 - e.g., airport design: flies every week vs. never flown vs. a wheelchair user
- Typically interview 6-12 people individually for 30-90 min
- **Note:** interviewing children may require permission

Choosing Participants: Extreme Users

- Users are often distributed in a bell curve with mainstream users in the center & 'extreme users' on either end



- The spectrum can relate to any aspect of their identities
 - ability
 - socioeconomic status
 - interest in a topic
 - situation
 - behavior
 - ...

Whose Perspectives are Missing?

- Fast-paced iteration can limit who we talk to
 - when including certain people, we implicitly decide who to exclude
- How can we *include* & *learn from* people with different identities?
 - e.g., people with disabilities, racially marginalized communities
- Be mindful of who tech has historically underserved
 - e.g., Joy Buolamwini from MIT showed that Facial recognition AI is less accurate for women of color, since training databases are predominantly white & male

Where to Recruit

- Depends on target audience...
- Nextdoor.com
- Facebook / wechat groups
- Craig's List
- Reddit (but might not work well for finding local people)
- Local email lists (e.g., parents, etc.)
- *Snowball sampling* – when you recruit someone ask them to pass it on to others that they think would be good...
- What's worked for you????

Types of Questions to *Avoid*

- What they would do / like / want in hypothetical scenarios
- How often they do things
- How much they like things on an absolute scale
- Avoid *binary* questions (e.g., yes/no)
- “Tell me a story about yourself”



Common Pitfalls – Suggesting Answers



“How was that decision reached? Was there a big meeting? Did your boss decide without you?...”

- Let the informant paint his or her own categories of meaning
- Avoid suggesting answers
- Trust the question – ask it & **stop** talking

Let there be silence

Common Pitfalls – Hypothetical Situations



“What if I designed something that wasn’t as round and soft and annoying as your current thing and instead bounced up and down. Would that work for you?”

“What about your friends? What would they do?”

- Ask about events & things that **actually happened/exist**
- Get their point of view, **not what they think someone else might do**

Good Questions



(a little bit of)
Silence is Golden

There is More Than One Way to Ask “Why?”



- Tell me more about that
- Tell me what you mean when you say XXX
- [last phrase the person said]?

What mistakes do you spot?

<https://www.youtube.com/watch?v=U4UKwd0KExc&feature=youtu.be>

What mistakes do you spot?

Share your Feedback Here:

Join by Web PollEv.com/jameslanday032



What works well?

<https://www.youtube.com/watch?v=eNMTJTnrTQQ&t=213s>

What works well?

Share your Feedback Here:

Join by Web PollEv.com/jameslanday032



“Hearing is through the ears, but *listening* is through the mind.” – Someone



What Are the Gems?

- You've uncovered a **surprise**/found what is **missing**
- You can explain **why** people **do unusual things**
- You **want to tell others** about what you learned

Share With Your Team

- Stories
- Photos
- Sketches
- Quotes

Form groups of 3 with those around you

You have been hired by Caltrain to reimagine the rider experience for the new electric Caltrain launch.



In each group: One person will be an **interviewer**, one person will be a **participant** (a rider with a specific persona: daily commuter, occasional rider, tourist, etc.), one person will be a **note-taker**.

After 5 minutes, switch roles.

After two rounds (I'll call time) one person to share with the Slack:

One person from the group choose(s) one to share in the #lecture Slack:

- An interesting **insight or story** about a commuter's experience
- Something that **went well** in current experience (e.g., interacting w/ transit info)
- Something that **didn't work** or could be improved with the current experience

What stories did you hear?

Share your Feedback Here:

Join by Web PollEv.com/jameslanday032



Users: Unique or One of Many?

“Take the attitude that nothing any person does is done for no reason; if you think it’s for no reason, you don’t yet understand the point of view from which it makes sense.

Take the attitude that nothing any person does is unique to them, it always represents an important class of customers whose needs will not be met if you don’t figure out what’s going on.”

(p. 63, Contextual Design)

Ethical Considerations in Needfinding

- Power
- Language
- Standpoint
- Inclusion

Ethical Considerations in Needfinding: Power

Testing/fieldwork can be *coercive* if there is a power imbalance (e.g., in under resourced communities)



<http://centread.ucsc.edu/CenTREAD%20photos/BrianDowd2.JPG>

People may feel no option but to speak to you or give you their time even though they may not get anything of value in return.

Can also be *extractive*



Resulting in disproportionate benefits – researchers get a paper or fame, whereas participants leave with (e.g., \$15)

Ethical Considerations in Needfinding: Power

Power imbalances between the researchers and interviewees may create bias in results



<http://research.microsoft.com/pubs/163718/CHI2012-Dell-ResponseBias-proc.pdf>

“When the interviewer is a foreign researcher requiring a translator, the bias towards the interviewer’s artifact increases to 5x.”


Ethical Considerations in Needfinding: Power



Get paid \$0.01 for every 2 images you annotate!

Flexible work from home! Work the hours that *you're* free!

KEYBOARD SHORTCUTS: Scroll: Shift + up/down [Open Image](#)



Extract purchased items from a shopping receipt (1-2 items)
Hit Reward: \$0.01 for first 2 items + Bonus: \$0.01 for every 4 items.

! CAREFUL! Walmart receipts are tricky.
View [example receipt](#) to ensure you earn reward for this HIT.

Real readable original receipt Not a receipt or not readable

#	Type	Qty	UPC	Price	Per Item
#	Item	3	EXAMPLE UPC 1052345678912	20.07	8.99
1.	Item	1			
2.	Item	1			

What is the transaction date & time on the receipt?
12/13/2016 HH : MM

SubTotal:

Sales Tax:

Total:

If total not captured in image, mark receipt above as "Not Readable or Not Receipt"

Note: your HIT will be reviewed within 3 full days.
Have a [question](#) about this HIT?

USE ARROW UP TO VIEW ENTIRE RECEIPT

Ethical Considerations in Needfinding: Power



Turkopticon was created to organize mutual aid, resources, and advocacy for Mechanical Turk Workers



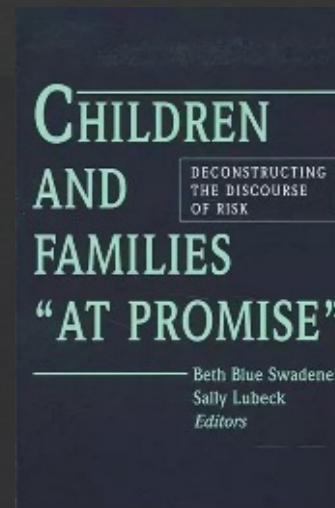
<https://turkopticon.net/>



Lilly Irani, UCSD

Ethical Considerations in Needfinding: Language

The language used to describe underserved communities may contain historical prejudice and may affect the way we understand and address their needs and interests.



<http://www.sunypress.edu/>

Of Promise and Penalties: How Student Racial-Cultural Markers Shape Teacher Perceptions

[Yasmiyn Irizarry](#)¹, [Emma D Cohen](#)²

[▶ Author information](#) [▶ Article notes](#) [▶ Copyright and License information](#)

PMCID: PMC10846897 NIHMSID: NIHMS1908737 PMID: [38322646](#)

The publisher's version of this article is available at [Race Soc Probl](#)

Abstract

Scholars document considerable disparities in teacher perceptions of students, yet absent from this literature is an examination of how race, ethnicity, and immigration status intersect to influence teacher ratings. This study extends previous research by examining variation in teachers' ratings of academic ability across four conventional racial/ethnic groups as well as thirteen racialized subgroups. Using data from the Early Childhood Longitudinal Study—Kindergarten Class of 1998–1999, we find that black first-graders receive lower ratings in language and literacy, a pattern that holds for both black Americans and black immigrants. In contrast, Asian

“the ‘at-risk’ label is highly problematic and often implicitly racist and classist... [it] locates problems in individuals, families, and communities, rather than in institutional structures that create and maintain inequality.”

Ethical Considerations in Needfinding: Standpoint

- Our ability to empathize with people who are different from us may be affected by a variety of situational factors
- Empathetic design requires *acknowledging* that members of underserved communities & underrepresented minorities have *perspectives that are not immediately accessible* to the more privileged & empowered
- Listening & *incorporating their standpoints* is crucial as a point of departure for research

Ethical Considerations in Needfinding: Standpoint

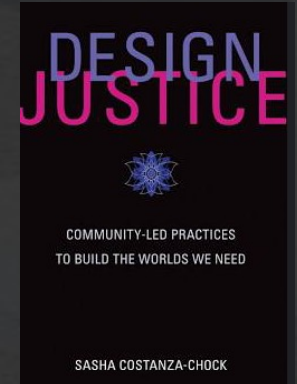
Users not only have greater knowledge of their wants/needs but also of their *assets*

Emergent Strategies: “whenever people face challenges, they are always already working to face those challenges”

– Sasha-Constanza Chock, *Design Justice*

Watch HCI Seminar (CS 547 from April, 2019)

“Design Justice and the distribution of affordances and disaffordances under the matrix of domination”



<https://design-justice.pubpub.org>



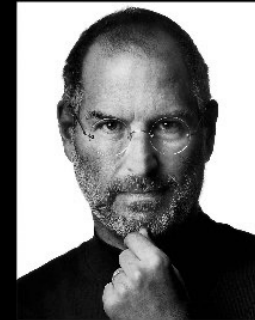
<https://www.akpress.org/emergentstrategy.html>

Ethical Considerations in Needfinding: Inclusion

- Accommodation
 - meet your interviewees where they are (not just physically)
 - making people comfortable & safe leads to the best interviews & insights
 - accommodations vary depending on who your interviewee is (signers for hearing-impaired, interpreters for non-native English speakers, etc.)
 - be mindful of power dynamics
- Accountability
 - involve interviewees in later stages of the design process as well
 - does your design address their wants & needs?

Caveats of User-Centered Design

- Politics
 - “agents of change” can cause controversy
 - important to get buy-in from all those involved
- Customers are not always right
 - cannot anticipate new technology accurately
 - your job is to design & build system customers *will want*, not system customers *say* they want
 - “Henry Ford-Steve Jobs Fallacy”
 - If Ford asked/observed what *problem* people had, he’d have found:
“we want to get places faster, cheaper, more comfortably”
- Design/observe forever without prototyping
 - rapid prototyping, evaluation & iteration is key



*“A lot of times,
people don’t know
what they want
until you show it to
them.”*

*- Steve Jobs, Co-
founder of Apple*



Discussion Guide Resources

- [Creating an Effective Discussion Guide for User Research](#), Medium
- [5 Steps to Create Good User Interview Questions](#), Medium
- [Asking the right questions during user research, interviews, and testing](#), uxdesign.cc, Medium
- [Sample UX Research Plan \(discussion guide + context\)](#), Smashing Magazine
- [Just Enough Research](#), by Erika Hall of Mule Design, Talk at UX Salon 2016 (30 min. video)
- [HCI Guidelines for Gender Equity and Inclusivity](#), by Morgan Klaus Scheuerman, Katta Spiel, Oliver L. Haimson, Foad Hamidi, Stacy M. Branham
[note: lots of good material on this page, but linking directly to the survey section, as relevant for everyone]

Further Reading

- Books
 - *User and Task Analysis for Interface Design* by Joann T. Hackos, Janice C. Redish
 - *The Inmates are Running the Asylum* by Alan Cooper
 - *The Design of Everyday Things* by Don Norman
 - *Observing the User Experience*, Goodman, Kuniavsky & Moed
 - *Design Justice*, Sasha-Constanza Chock
- Institute of Design at Stanford (AKA the d.school)
 - lots of online materials at <http://dschool.stanford.edu>

Further Reading on Ethical Issues With Community-based Research

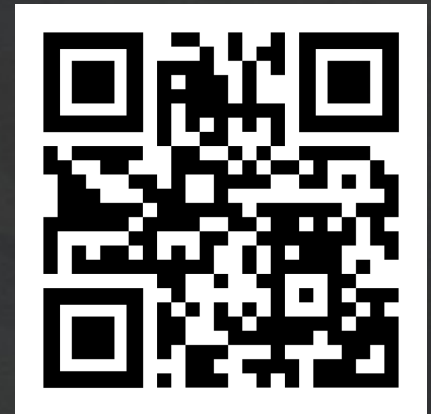
- Children and Families “At Promise”, Beth B. Swadener, Sally Lubeck, editors, SUNY Press, 1995, <http://www.sunypress.edu/p-2029-children-and-families-at-promis.aspx>
- “Yours is better!” Participant Response Bias in HCI, Proceedings of CHI 2012, by Nicola Dell, et al., <http://research.microsoft.com/pubs/163718/CHI2012-Dell-ResponseBias-proc.pdf>
- “Strangers at the Gate: Gaining Access, Building Rapport, and Co-Constructing Community-Based Research”, Proceedings of CSCW 2015, by Christopher A. Le Dantec & Srah Fox, <http://dl.acm.org/citation.cfm?id=2675133.2675147&coll=DL&dl=ACM>
- “Imperialist Tendencies” blog post by Jan Chipchase, <http://janchipchase.com/content/essays/imperialist-tendencies/>
- “To Hell with Good Intentions” by Ivan Illich, speech to the Conference on InterAmerican Student Projects (CIASP), April 20, 1968, https://www.uvm.edu/~jashman/CDAE195_ESCI375/To%20Hell%20with%20Good%20Intentions.pdf
- “Embracing Four Tensions in Human-Computer Interaction Research with Marginalized People”, by Calvin Liang, et al., <https://calvliang.github.io/projects/TOCHI2021>
- *Ruined by Design: A Design Ethics and Activism Book* by Mike Monteiro, 2019

Further Reading on Ethical Issues

- Christina Harrington (et.al.) [Deconstructing Community-Based Collaborative Design: Towards More Equitable Participatory Design Engagements](#). *Proceedings of the 2019 CHI Conference on Human Factors in Computing Systems*. Association for Computing Machinery, New York, NY, USA
- Ihudiya Finda Ogbonnaya-Ogburu (et. al.) 2020. [Critical Race Theory for HCI](#). *Proceedings of the 2020 CHI Conference on Human Factors in Computing Systems*. Association for Computing Machinery, New York, NY, USA, 1–16.
- Irizarry and Cohen, 2018. [Of Promise and Penalties: How Student Racial-Cultural Markers Shape Teacher Perceptions](#). *Race Soc Probl.* 2018 May 10;11(2):93–111. doi: [10.1007/s12552-018-9231-7](#)
- Rosanna Bellini (et. al.) 2018. [Feminist HCI: Taking Stock, Moving Forward, and Engaging Community](#). In [Extended Abstracts of the 2018 CHI Conference on Human Factors in Computing Systems \(CHI EA '18\)](#). Association for Computing Machinery, New York, NY, USA, Paper SIG02, 1–4.
- Katta Spiel (et. al.) 2019. [Queer\(ing\) HCI: Moving Forward in Theory and Practice](#). In [Extended Abstracts of the 2019 CHI Conference on Human Factors in Computing Systems \(CHI EA '19\)](#). Association for Computing Machinery, New York, NY, USA, Paper SIG11, 1–4.

Needfinding Summary

- Build *empathy* with customers
- *Listen* to them to *discover* interesting insights



- **Exit Ticket #1b:** hci.st/cs147-25au-exit-1b-456
due in 24 hours (by Thursday, Sep 25th, 3:30 PM PT)

Next Time

- Studio
 - Design Project 0 – and team preferences
- Lecture
 - Monday – Define: *Unpacking* needfinding results to define problem/domain of interest
- Readings
 - *Tips for Working Successfully in a Group* by Randy Pausch
 - *The Discipline of Teams*, by Katzenbach and Smith, Harvard Business Review
 - *How to Survive a Critique: A Guide to Giving and Receiving Feedback* by Karen Cheng
- Listen: *Invisible Women, 99% Invisible, Episode 363* (39 minutes)