

# Formative Studies + Prototyping on Easy Mode

# Reading Reflection

- Based on important themes from earlier in the course, come up with at least two additional cons around relying on think-aloud data, beyond the cons listed in the readings.
- Is there anything about talk-aloud protocols that should make us a little less nervous about these?
- Do you feel like you could already design a talk-aloud study for the language or tool you're designing for your final project?
  - If yes, what would you do?
  - If no, what part of that design process is the barrier?

# Plan for today

- A quick reminder of the prototype lessons from Tuesday
- How prototypes let us do *formative* user studies
- An easy-mode skeleton for formative studies, for those who aren't looking to explore the full space
- Prototyping+formative study in-class activity

# Prototyping

“...users can't tell you what they want, but when they see something and get to use it, they soon know what they don't want.”

# Prototype Roles

- Make you think harder, plan more thoroughly about what you want to build
- Help you solicit feedback on the thing you plan to build

# Low- vs. High-Fidelity Prototypes

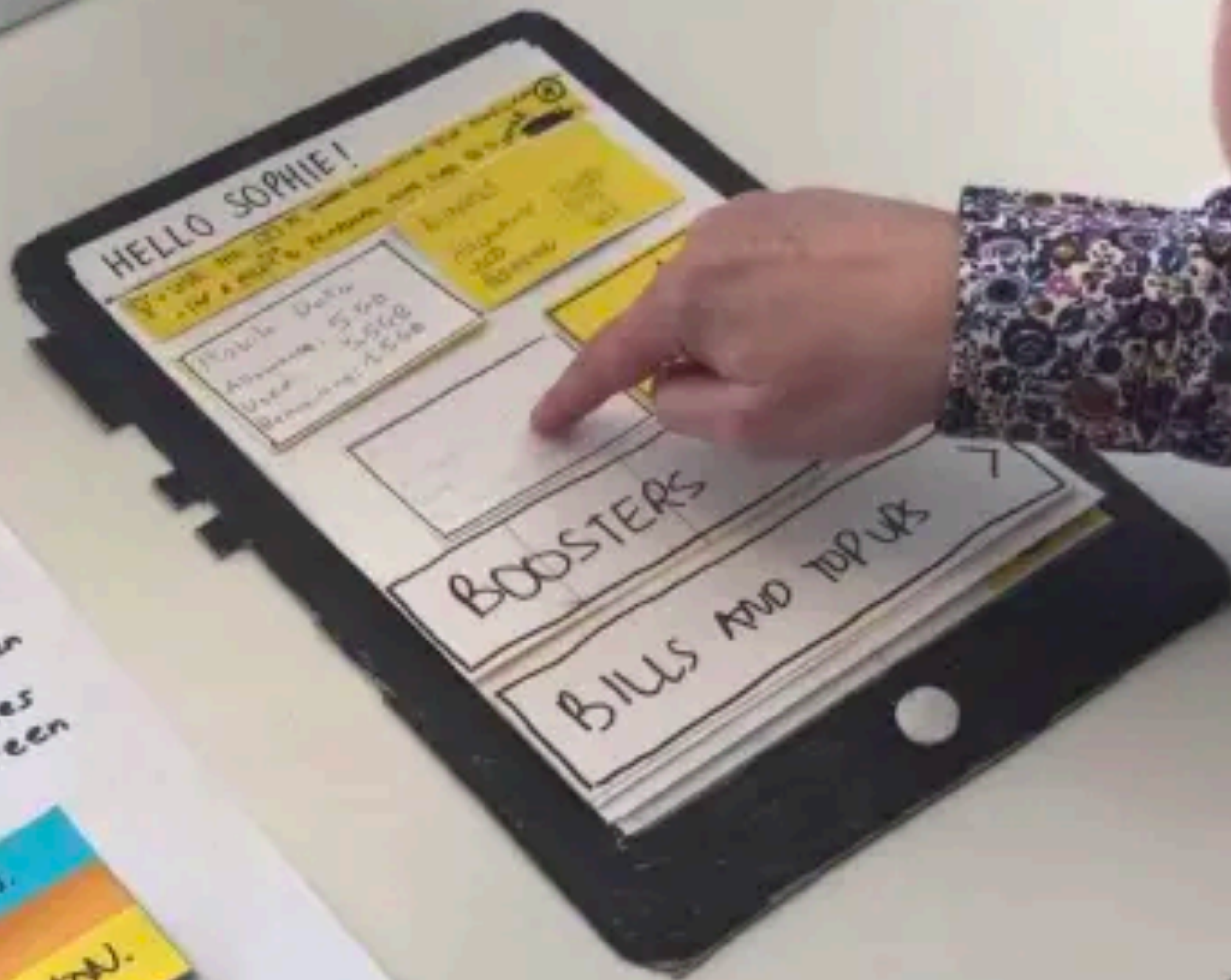
Tasks:

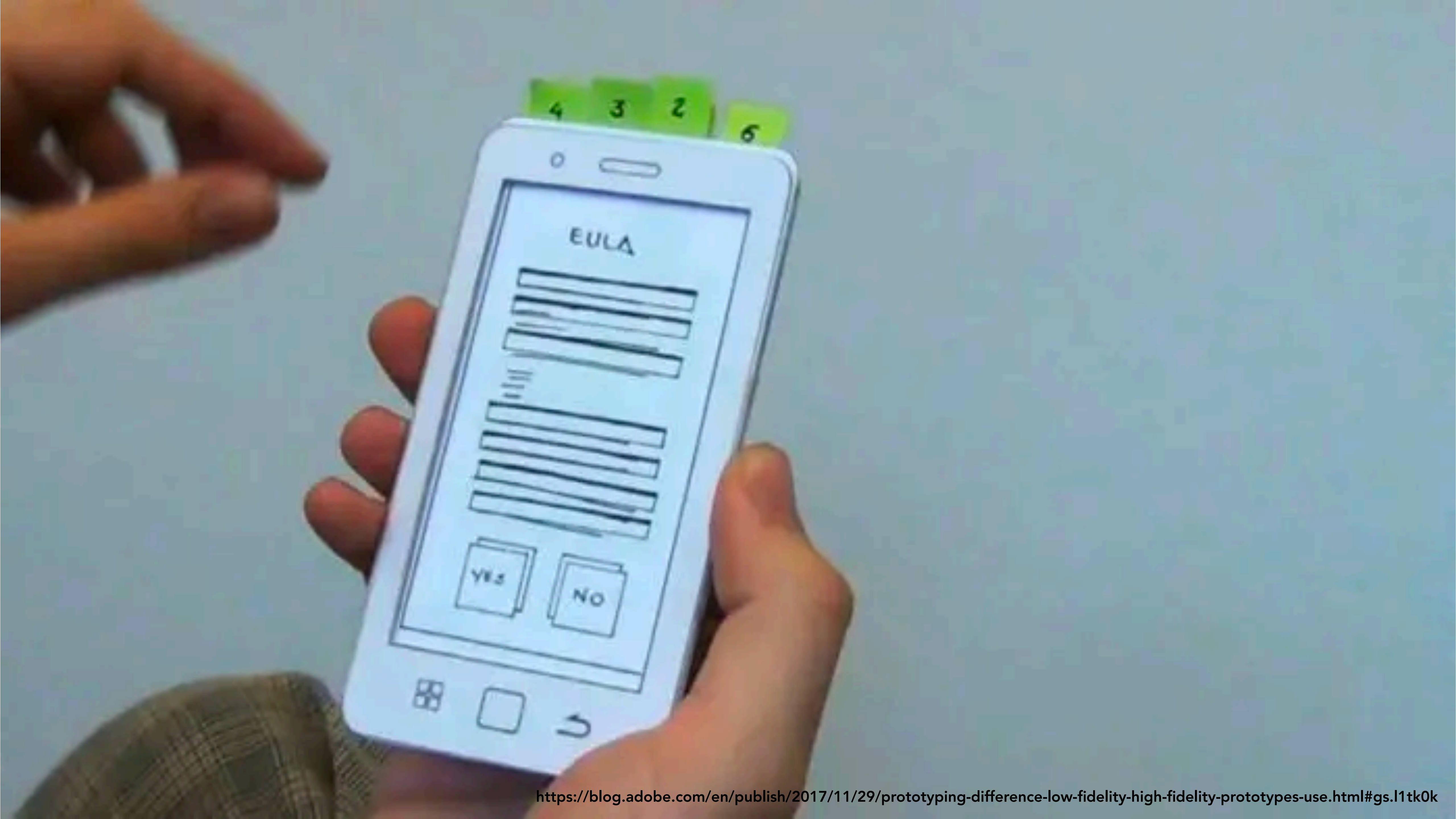
1. Open the EE app
2. Register and Log-in
3. Remove the minutes tile from your home screen
4. Place the "add \$10 Topup" tile to your home screen
5. Re-arrange the tiles on your home screen

USER NOTIFICATION

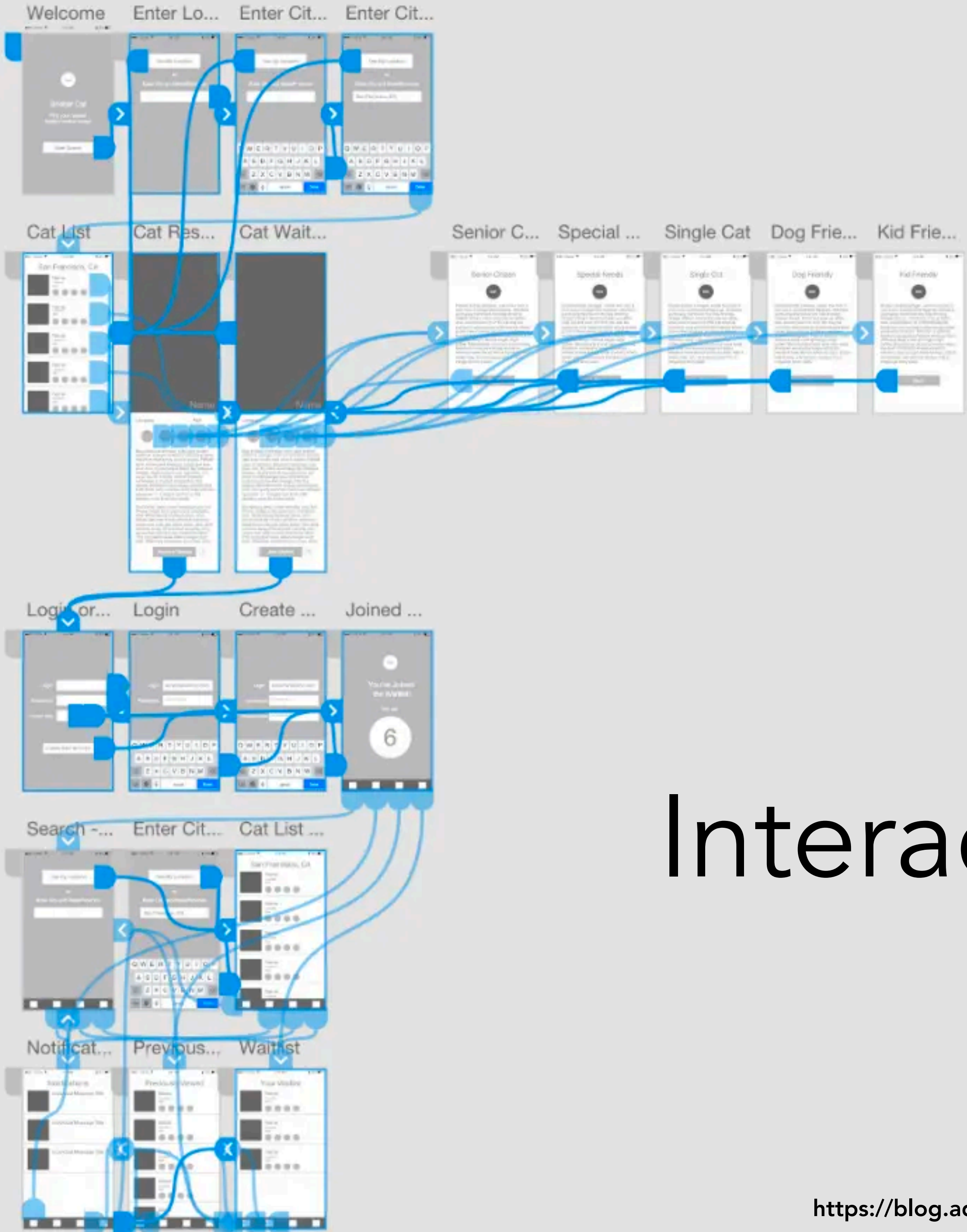
INPUT FIELD

PRESSABLE BUTTON









Interactable, higher-fidelity

# Low-Fidelity Prototypes

- Claims you may hear about low-fi prototypes:
  - People love to give you feedback on font size and if your icons make sense to them
  - If you don't want that kind of feedback, if you want feedback on elements deeper than aesthetics, consider low-fidelity prototypes
  - Also if it looks like you drew it in crayon and didn't sink a lot of time into it, people are more willing to criticize, which is what you want
- Personally haven't found research-backed evidence of the above
  - (Send me your references!)
- **But**...lots of evidence that you get just as much/just as good feedback from low-fi, and they're faster and cheaper to make, faster to tweak and change

# Low-Fidelity Prototypes

- **But**...lots of evidence that you get just as much/just as good feedback from low-fi, and they're faster and cheaper to make
- ...with the result that maybe **you're** more willing to criticize yourself and to throw things away when you realize they're not right

# Prototyping for Tiny Fingers

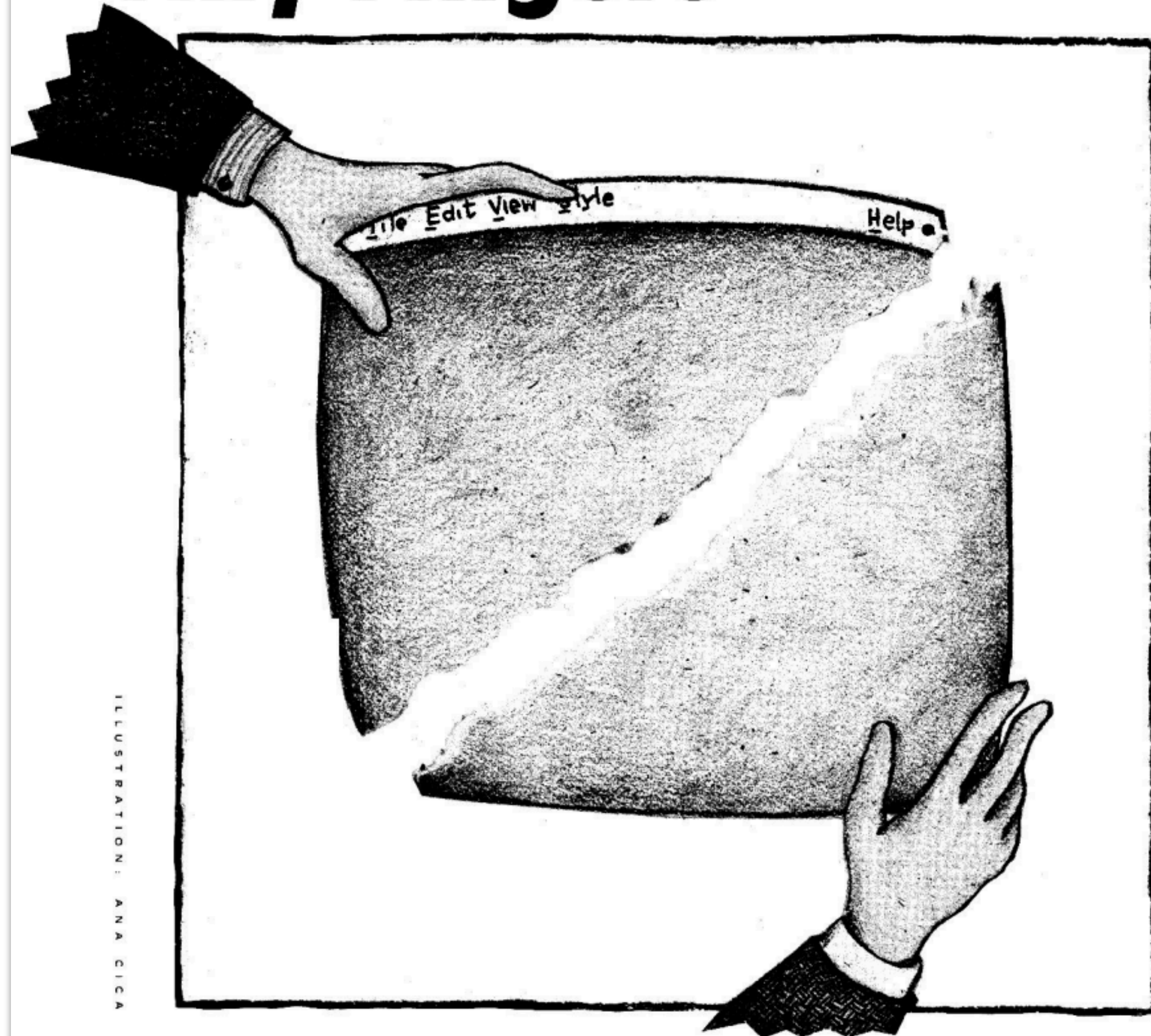


ILLUSTRATION: ANA GICA

Consider this familiar situation: a development team spends weeks designing an interface. They draw sketches on the board, discuss each point in detail, and finally specify a design. The design is either coded into the application language or simulated with a software prototyping tool. The result is finally shown to users for approval, in a session that

generates scores of comments on subjects ranging from the basic metaphor to the choice of background color. The team just barely has time to incorporate these comments into a revised design before committing



by Marc Rettig

their work to production.

Now consider a different situation, one I have witnessed first-hand over the past few months: a development team spends weeks designing an interface. During the first few days, they construct a paper prototype of their initial thinking about all aspects of the design, and test it with typical representatives of the user commu-

## A nice resource on the case for low-fi prototypes

- With good arguments for the claims mentioned on prior slides

# Wizard-of-Oz Prototyping

- Like what we did the very first day of class!
- Lets us get around engineering effort by having a human do the work that our tool will eventually automate
  - Human can be:
    - Compiler, interpreter
    - Program synthesizer
    - Programming environment
    - Program transformation tool
    - ...

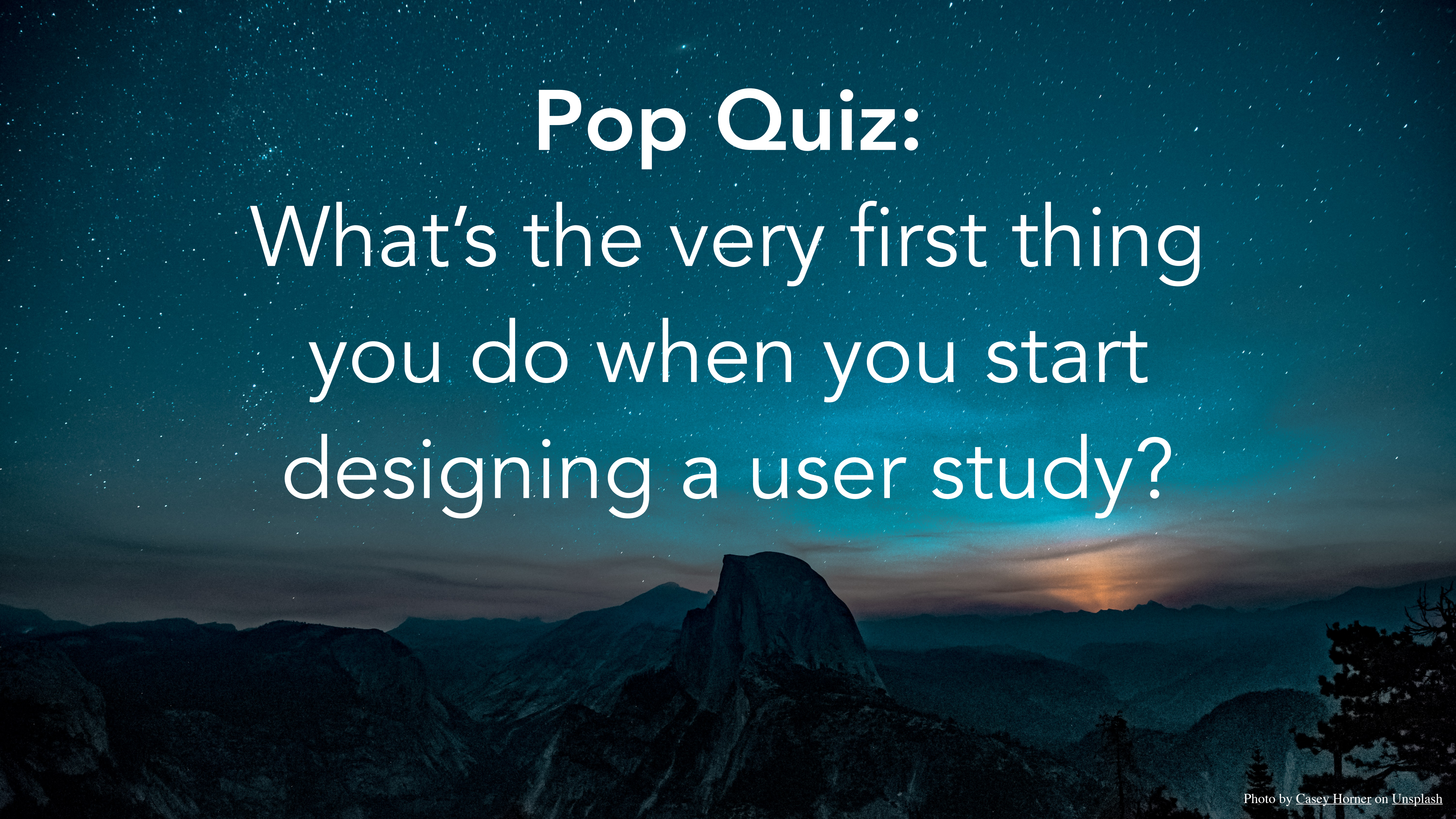
# We've talked about lo-fi...

- ...because for today's purposes, we're mostly interested in early-stage formative studies
- But of course we want to be getting feedback from users at all points!
- Calling it low-fidelity naturally suggests the existence of high-fidelity...

Type	Advantages	Disadvantages
Low-fidelity prototype	<ul style="list-style-type: none"> <li>Lower development cost</li> <li>Evaluates multiple design concepts</li> <li>Useful communication device</li> <li>Addresses screen layout issues</li> <li>Useful for identifying market requirements</li> <li>Proof of concept</li> </ul>	<ul style="list-style-type: none"> <li>Limited error checking</li> <li>Poor detailed specification to code to</li> <li>Facilitator-driven</li> <li>Limited utility after requirements established</li> <li>Limited usefulness for usability tests</li> <li>Navigational and flow limitations</li> </ul>
High-fidelity prototype	<ul style="list-style-type: none"> <li>Complete functionality</li> <li>Fully interactive</li> <li>User-driven</li> <li>Clearly defines navigational scheme</li> <li>Use for exploration and test</li> <li>Look and feel of final product</li> <li>Serves as a living specification</li> <li>Marketing and sales tool</li> </ul>	<ul style="list-style-type: none"> <li>More resource-intensive to develop</li> <li>Time-consuming to create</li> <li>Inefficient for proof-of-concept designs</li> <li>Not effective for requirements gathering</li> </ul>

# Formative Research



A starry night sky over a mountain range with a prominent rock formation in the foreground. The sky is filled with numerous stars, and the mountains are silhouetted against a dark blue and purple twilight. A large, jagged rock formation is visible in the center foreground.

**Pop Quiz:**  
What's the very first thing  
you do when you start  
designing a user study?

What's the very first thing you do when  
you start designing a user study?

**Choose your research  
question!!!!**

# Three Categories of User Study RQs

## Need Finding Study

What are interesting **problems** to solve?

## Formative Study

For a given **problem**, what are promising **solutions**?

## Evaluative Study

For a given **problem**, now that we've implemented a **solution**, did it work?

# Three Categories of User Study RQs

## Need Finding Study

What are interesting **problems** to solve?

Two weeks ago

## Formative Study

For a given **problem**, what are promising **solutions**?

## Evaluative Study

For a given **problem**, now that we've implemented a **solution**, did it work?

# Shape of a Need Finding RQ

What kinds of problems does <description of audience> face during <description of tasks>?

For this class, usually...

What kinds of problems does <description of audience> face during <description of *programming* tasks>?

# Three Categories of User Study RQs

## Need Finding Study

What are interesting **problems** to solve?

## Formative Study

For a given **problem**, what are promising **solutions**?

**This week**

## Evaluative Study

For a given **problem**, now that we've implemented a **solution**, did it work?

# Examples of Formative RQ

Now we're trying to build something, some kind of intervention. So what do we need to know about users in order to build interventions that will actually serve them?

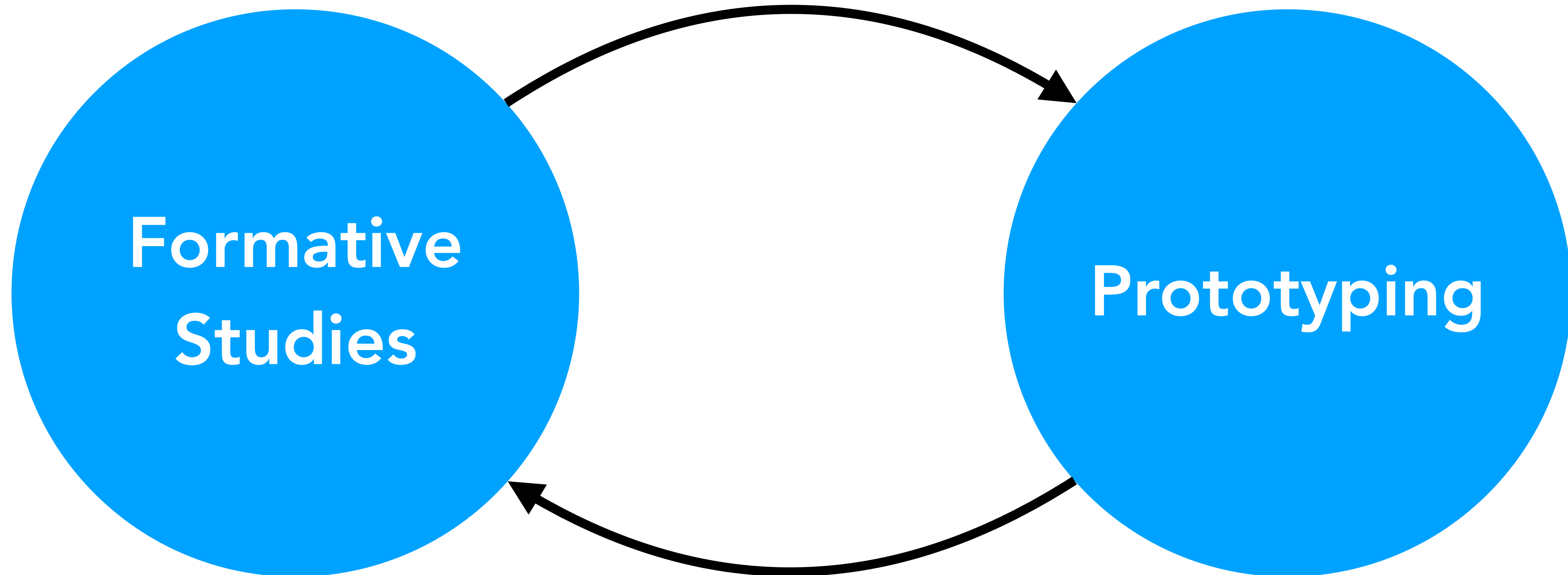
...

Are <description of audience> more <successful/efficient/bug-free/comfortable> doing interaction X or interaction Y?

When <description of audience> describe <description of task> to a human assistant, how do they explain the task spec?

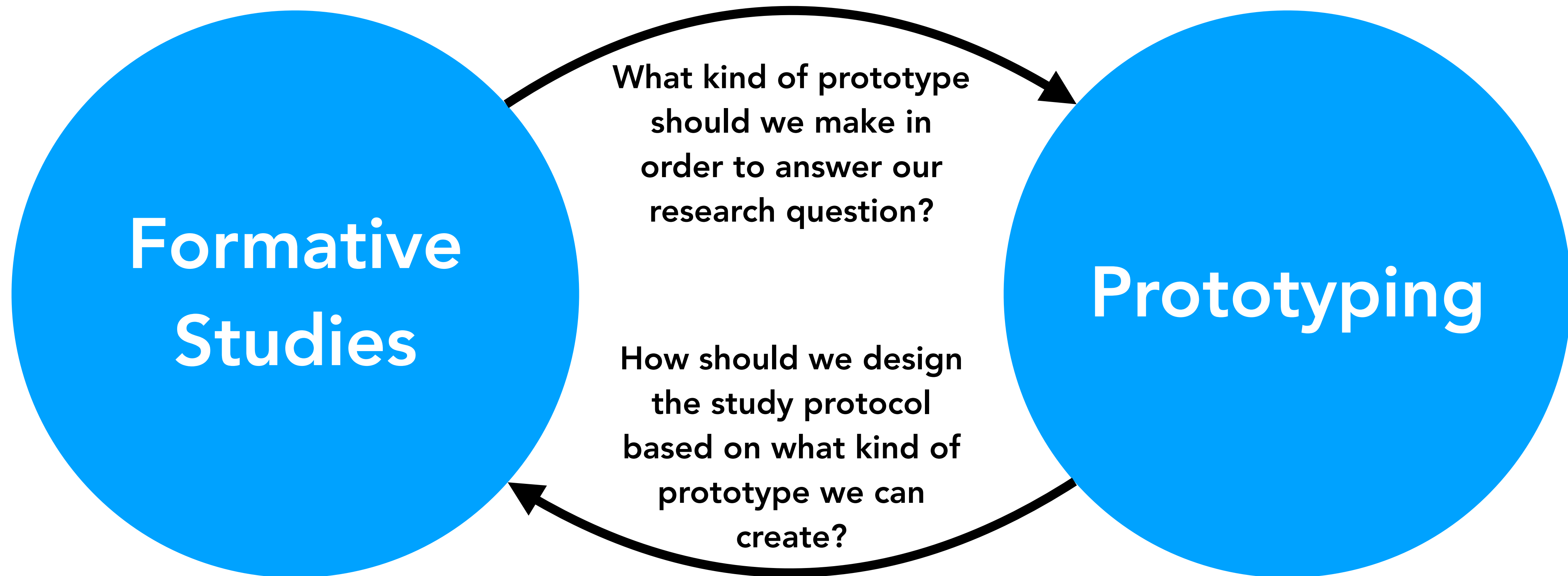
When we ask <description of audience> to do <description of task> with <tool>, what goes wrong?

Why are we treating Formative Studies and Prototyping together?

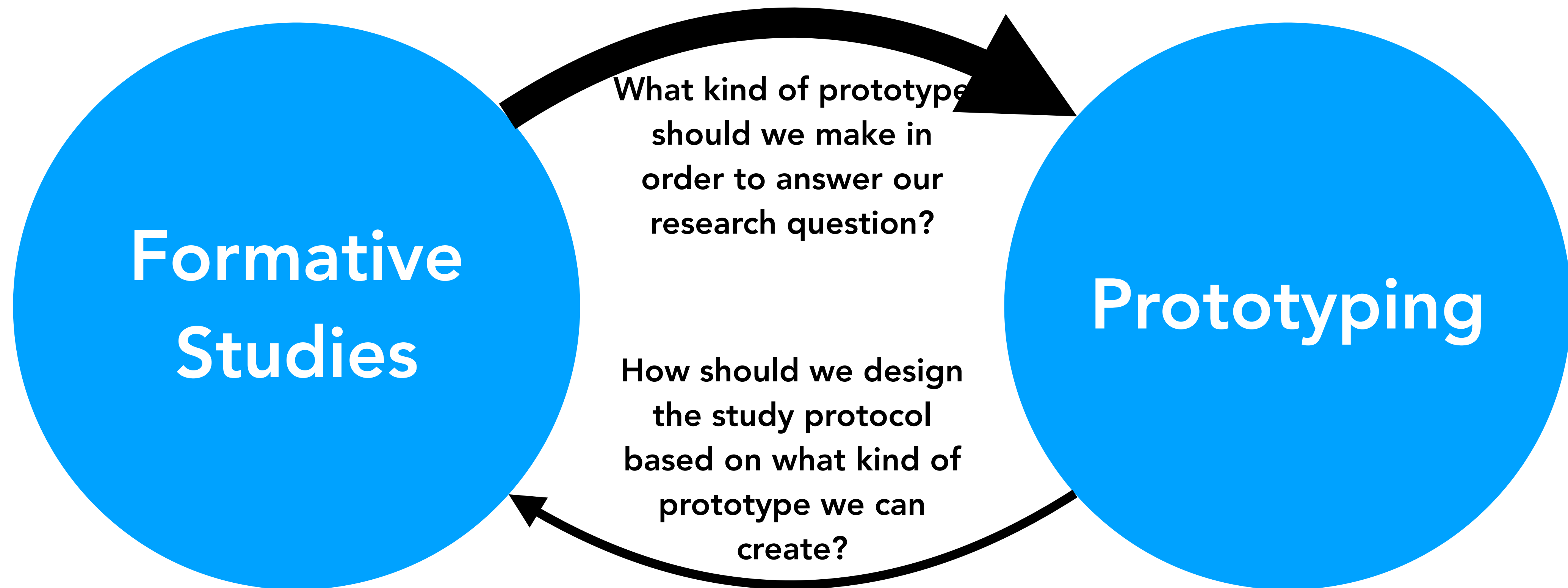




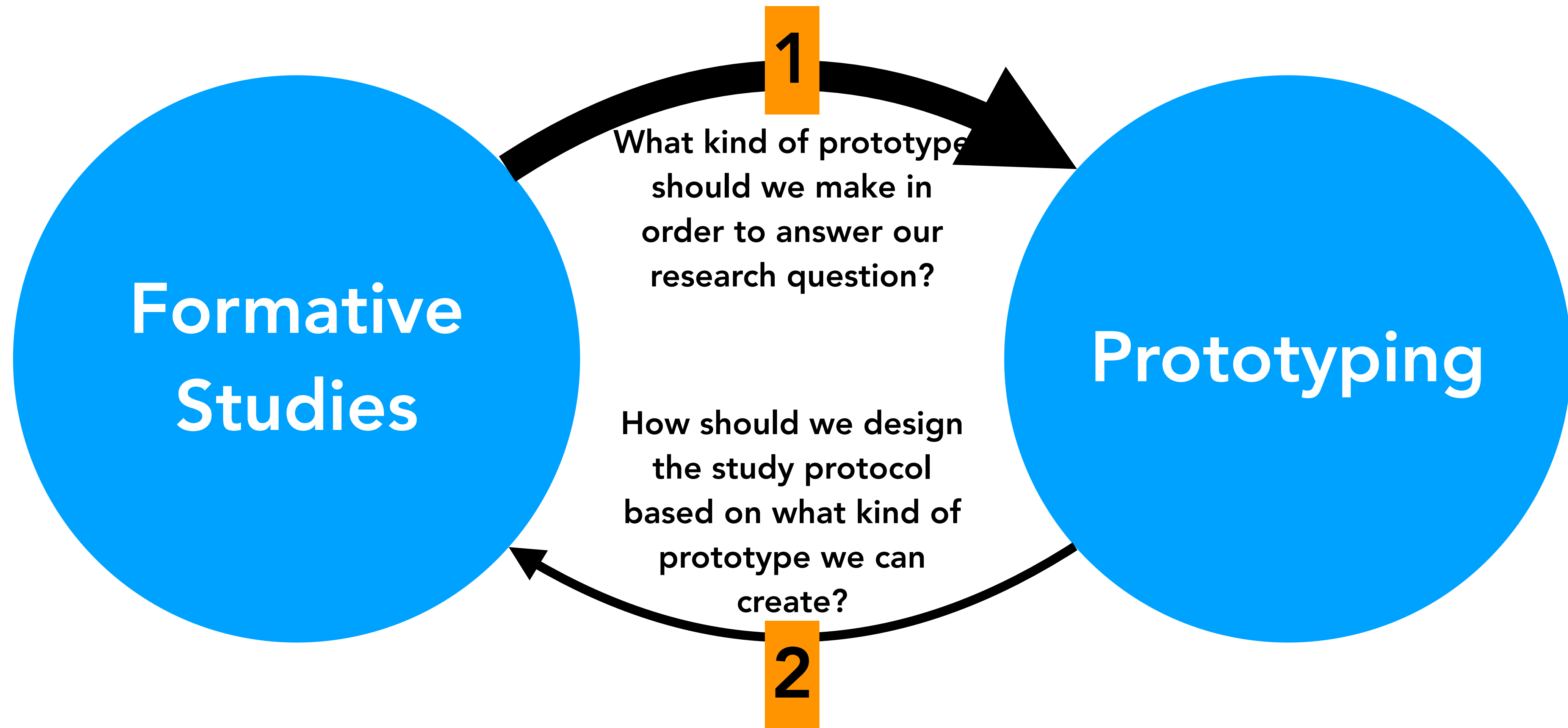
# Why are we treating Formative Studies and Prototyping together?



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# There's a spectrum



User-Centered  
language design  
on easy mode

User-Centered  
language design,  
the full experience

# User-Centered PL: Easy Mode



## Motivation:

I think programming languages and programming tools are for humans. I want to make PLs that useful and usable. But I don't care about contributing to generalizable human-centered programming knowledge.

## Approach:

- Before implementation, make slides or other documents showing worked examples for multiple approaches and discuss them with users.
- Throughout implementation, regular think-alouds with current prototype.

➤ EASY  
MEDIUM  
HARD

# User-Centered PL: The Full Experience



## **Motivation:**

I think programming languages and programming tools are for humans, and every part of my process from deciding what need to tackle to deciding how to tackle it to refining my PL will be driven by understanding users and how my tools interact with user needs.

## **Approach:**

- Contextual inquiry and ethnographic studies for need finding
- Formative studies and thorough prototyping
- Usability studies play a role in evaluation

# Qualitative vs. Quantitative Formative Studies

# Quantitative Formative Usability Studies

If you're thinking of going quantitative instead of qualitative:

- Can you actually measure the thing you're trying to measure? (How, specifically?)
- Will the particular experiment you're planning actually succeed in measuring the thing you're trying to measure?
- If you measure it successfully, will it actually help you improve your design?

If any "no"s, head back to qualitative.





# Qualitative Research Takeaways

...qualitative research helps us understand:

- Behaviors, attitudes, and aptitudes of potential product users
- Technical, business, and environmental contexts — the domain — of the product to be designed
- Vocabulary and other social aspects of the domain in question
- How existing products are used

# Qualitative Research Takeaways

To get the really exciting stuff from qualitative studies:

- Interview where the interaction happens
- Avoid a fixed set of questions
- Focus on goals first, tasks second
- Avoid making the user a designer
- Avoid discussions of technology
- Encourage storytelling
- Ask for a show and tell
- Avoid leading questions



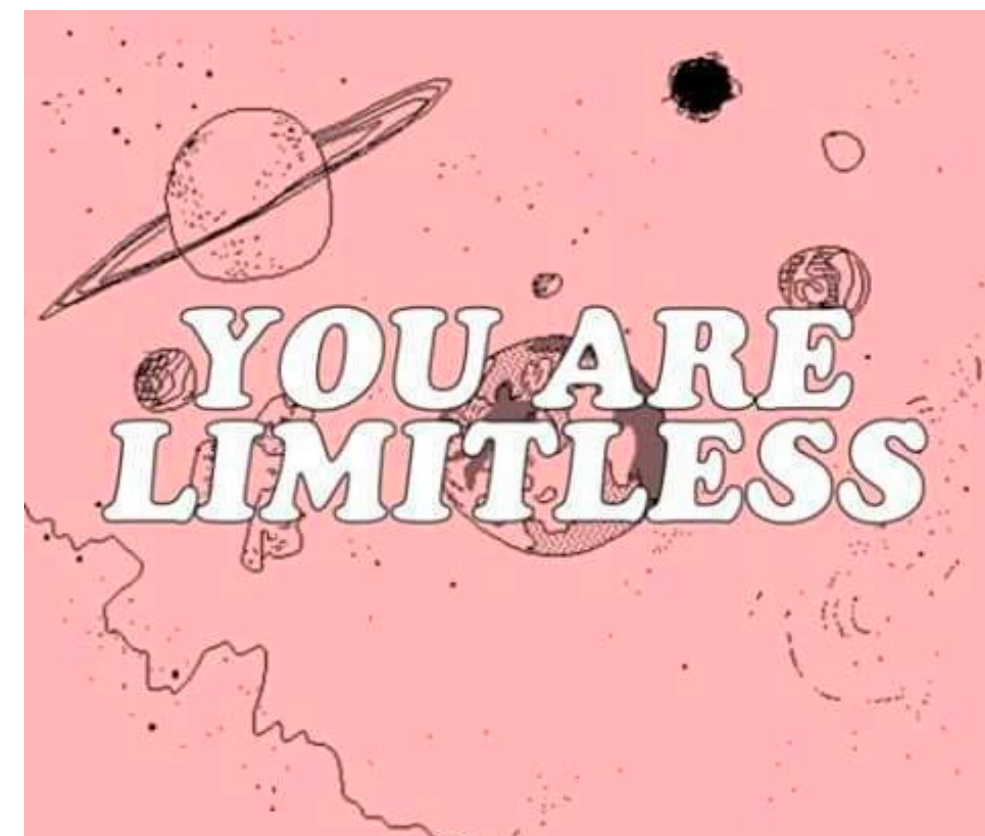
Would you use this tool feature if it were available?

Your answer \_\_\_\_\_

# Qualitative Research Takeaways

You've already seen what you can learn from qualitative research in the context of need finding

But we're not limited to need finding activities!



# Qualitative Usability Studies

...which brings us back to think-aloud studies

- Minimal planning — pick a task
- Easy and fast to run a session
- Useful at any stage of brainstorming or implementation
- Shockingly informative
- Shockingly persuasive to others
  - Great way to persuade your advisor something actually matters :)

# Qualitative Usability Studies

Usability testing is especially effective at determining:

- ▶ **Naming** — Do section/button labels make sense? Do certain words resonate better than others do?
- ▶ **Organization** — Is information grouped into meaningful categories? Are items located in the places customers might look for them?
- ▶ **First-time use and discoverability** — Are common items easy for new users to find? Are instructions clear? Are instructions necessary?
- ▶ **Effectiveness** — Can customers efficiently complete specific tasks? Are they making missteps? Where? How often?

# Qualitative Usability Studies

Programming languages, to the extent that they require even more time and effort to learn than traditional user interfaces, exacerbate some of the existing problems of usability studies (both qualitative and quantitative).

focused on assessing the first-time use of a product. It is often quite difficult (and always laborious) to measure how effective a solution is on its 50th use — in other words, for the most common target: the perpetual intermediate user. This is quite a conundrum when one is optimizing a design for intermediate or expert users. One technique for accomplishing this is the use of a *diary study*, in which subjects keep diaries detailing their interactions with the product. Again, Mike Kuniavsky provides

# Qualitative Usability Studies

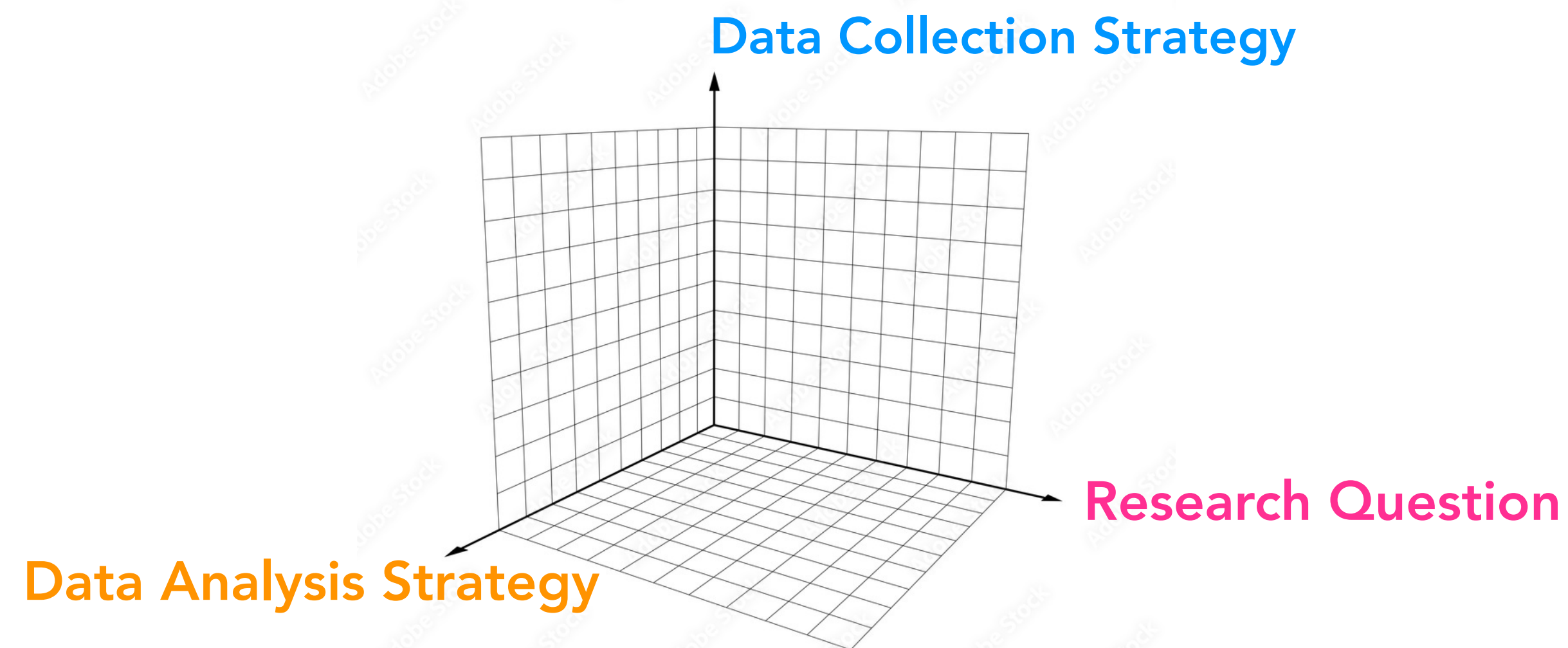
Even though qualitative usability may be more flexible, easier for you to adapt in the moment, you don't completely escape the need to plan the design!

- Am I interacting with the right users?
- Do I know what kinds of information I'm seeking? (So that I can watch the right tasks, design the right tasks, ask the right questions?)
- And remember, always always always start by knowing your research question! Why are you bothering to run this study in the first place? What's that core question you're trying to answer?

# Analysis of Qualitative Studies

All the stuff we talked about last week isn't just for need-finding studies!

As always, you don't get to just pull out a few quotes and call it a day. You need a data analysis approach that's appropriate for your data.





Final Project Chat!

# IRB...another reminder!

If you intend to publish the findings from your interactions with users/potential users, bear in mind that the IRB approval process typically takes 2 weeks.

- Submit at: <https://eprotocol.berkeley.edu/userLogin.do>
- For support:
  - [https://cphs.berkeley.edu/eprotocol\\_faqs.html](https://cphs.berkeley.edu/eprotocol_faqs.html)
  - Slack—your fellow students are experts!
  - Me

For figuring out if you need IRB approval: <https://cphs.berkeley.edu/review.html>

- Scroll to “Activities that Generally Require Review” and “Activities that May Not Require Review”

# No High-Risk Studies!

Even if you do *not* intend to publish the findings from your interactions with users/potential users, make sure you've carefully analyzed any risks to your participants. **If you identify any risks higher than the risks of day-to-day computer use, please come talk to me.**

# Formative Study Design Activity

- Pick a need uncovered in last week's need-finding HW.
- List three research questions you might want to answer in order to design a good tool intervention for addressing that need.
- Pick one! (Doesn't have to be your favorite, just any RQ.)
- Take 5 minutes to brainstorm 3+ formative studies that would let you answer it.
- Which one do you think is likeliest to get the answer to the RQ?
- Turn to a partner. Share your ideas in turn.
- Do you think your partner's idea is likely to answer the research question? What risks/threats do you see? Are there ways it might fail to answer the question? Share!

# Prototyping + Design Critique Activity

- (1) Choose a need that one or more members of your team identified from the need-finding HW.
- (2) As a team, develop documents that walk viewers through **three** possible language, tool, or environment interventions that might address the chosen need.
  - **Slides? Google docs? Webpages? Pen and paper drawings?** Up to you! Whatever you choose, you should be able to quickly present it to classmates from other teams.
  - **“Walk viewers through?”** What will the interaction look like from the user’s perspective? What will the user see on their screen? What will they see at the start, at every intermediate step, at the end? What actions is the user taking? In the terminology of today’s reading, this will be closest to storyboarding.
  - **How different should the three alternatives be?** This is up to you, but I suggest erring on the side of greater variety. You should be showing alternatives that you think are reasonable. But you’ll learn more from showing three very different alternatives than from showing slight variants on a single approach. So I encourage you to get weird!
- (3) Pair up with another team. In session 1, Team A presents to Team B, and B gives feedback. In session 2, vice versa!