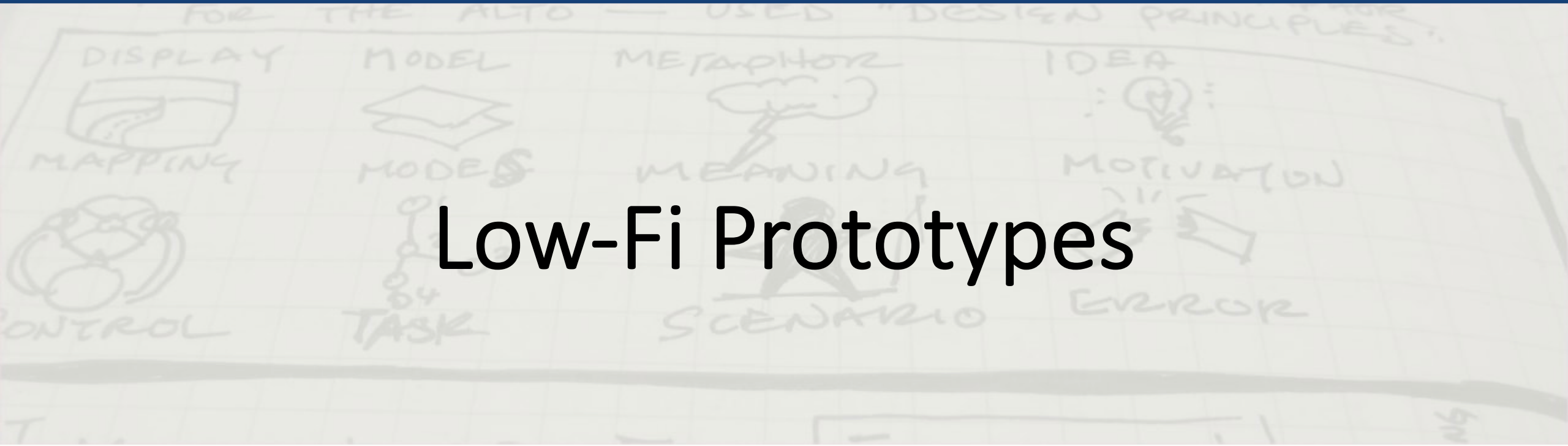
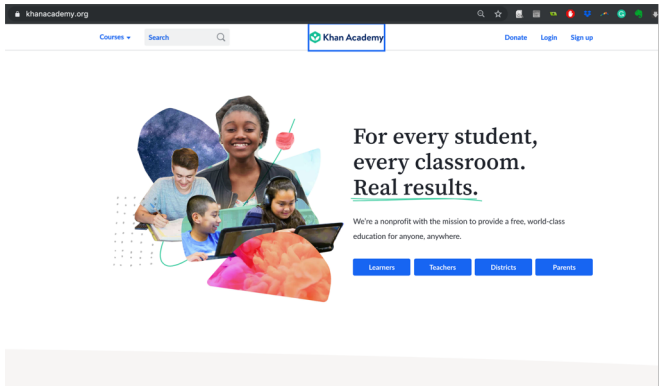


Low-Fi Prototypes

Prof. Lydia Chilton
COMS 4170
25 March 2024

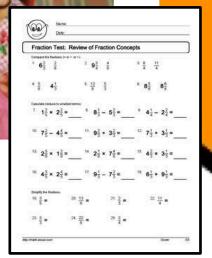
The biggest misconception about creativity

Idea



Product

Creativity is a Process



Person with a challenge

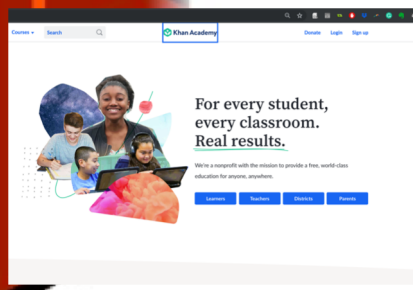
- Brainstorm
- Interview
- Research

Synthesize into insights and ideas

Ideas

- Prototype solutions
- Explore technical options

Test them



Product

Understand the problem

Solve the problem

Final Project:

- Design and build a **web** application
- To help a user learn an introductory topic **interactively**
- Within a **domain of your choosing**
- The interactive experience centers around **media** (image, video, audio..)
- And help them assess their learning with a **quiz**.
- And keep learning through **feedback** from the quiz.
- In under **10 minutes** total

The **user** is your TA.

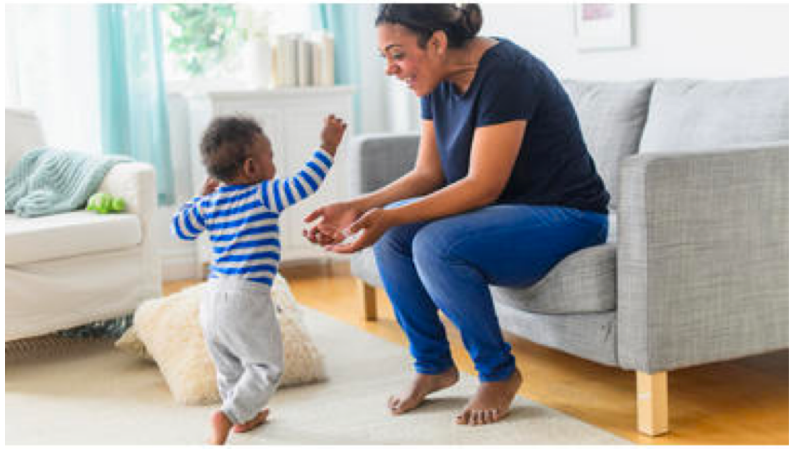
- And more generally, people in this class.
- This way, you can test your designing on people in this class.
- Your TA must also want to learn this topic, and must be able to give you feedback on it.
- Your TA will also grade you, so listen to their feedback and take it.

The **topic** may be in a domain of your choice, but it must be focused enough to teach in 10 min.

- Examples of broad domains:
  - chess,
  - basketball,
  - art history,
  - music
- Example focused topics
  - **Chess**: how and when to perform 3 different opening moves in chess for chess beginnings
  - **Basketball**: how to run a pick and roll in basketball for casual NBA fans
  - **Art history**: how to tell impressionist paintings from post-impressionist paintings for ArtHum students
  - **Music**: how to mix a drop swap for aspiring DJs

Design insight:

People learn through interaction and feedback, not from reading/watching long dumps of information



Learning to walk

Playing an instrument

```
void loop() {

float humidity = 452;
for( int counter = 0; counter < 1000; ++counter ) {
  digitalWrite(13, HIGH);   // set the LED on
  delay( 200 );             // wait for a second
  digitalWrite(13, LOW);    // set the LED offer
  Serial.pirnt( "Hello " );
  Serial.println( counter );
  delay(200);               // wait for a second
  humidity += 0.5;
}
```

100 %

Error List

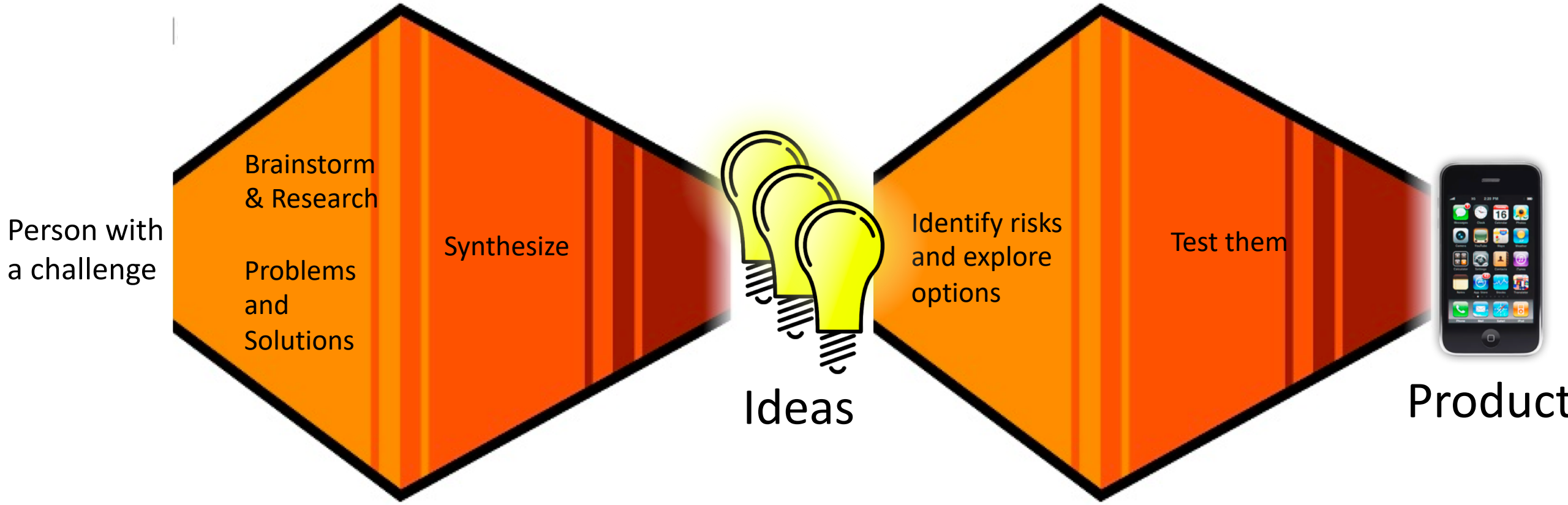
2 Errors | 1 Warning | 0 Messages

	Description
1	IntelliSense: class "Serial_" has no member "pirnt"
2	In function 'void loop()'
3	23:10: error: 'class Serial_' has no member named 'pirnt'

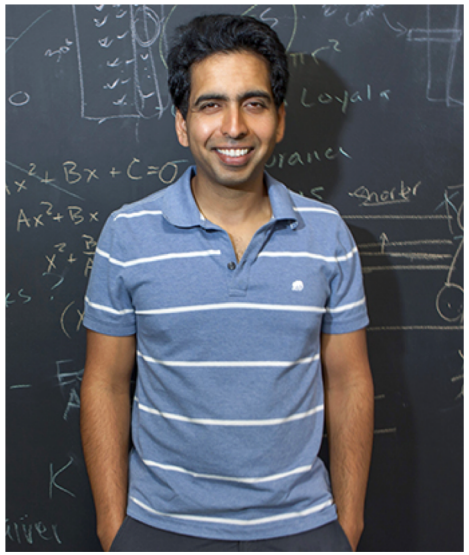
Code

Flare and Focus

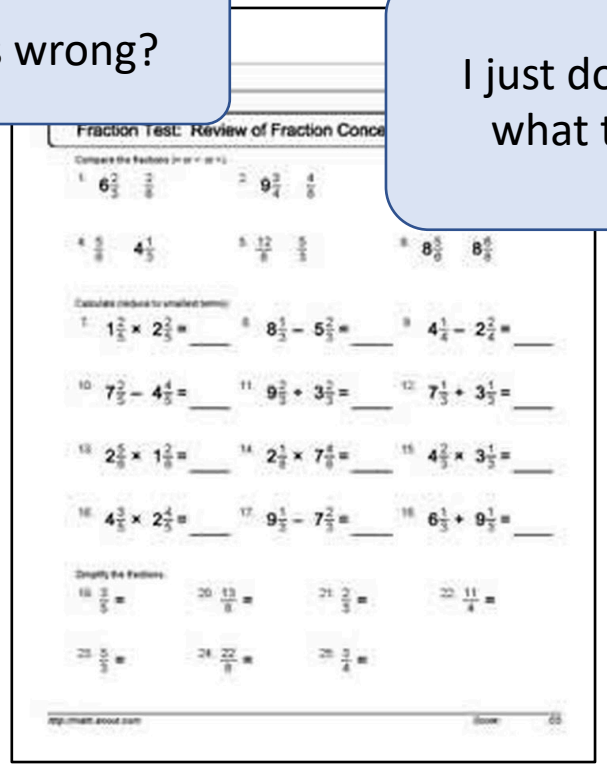
The Double Diamond Process



Design is a process where you work with users to understand their problems…

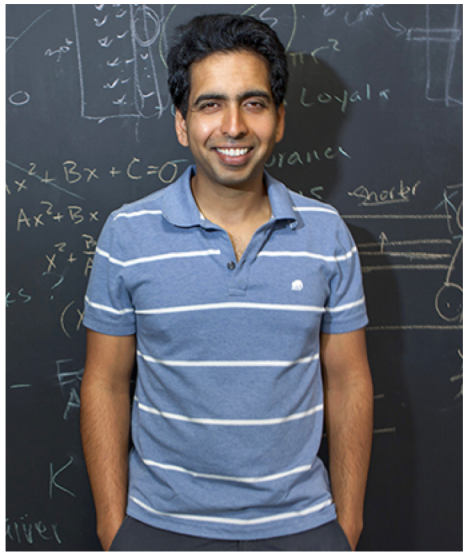


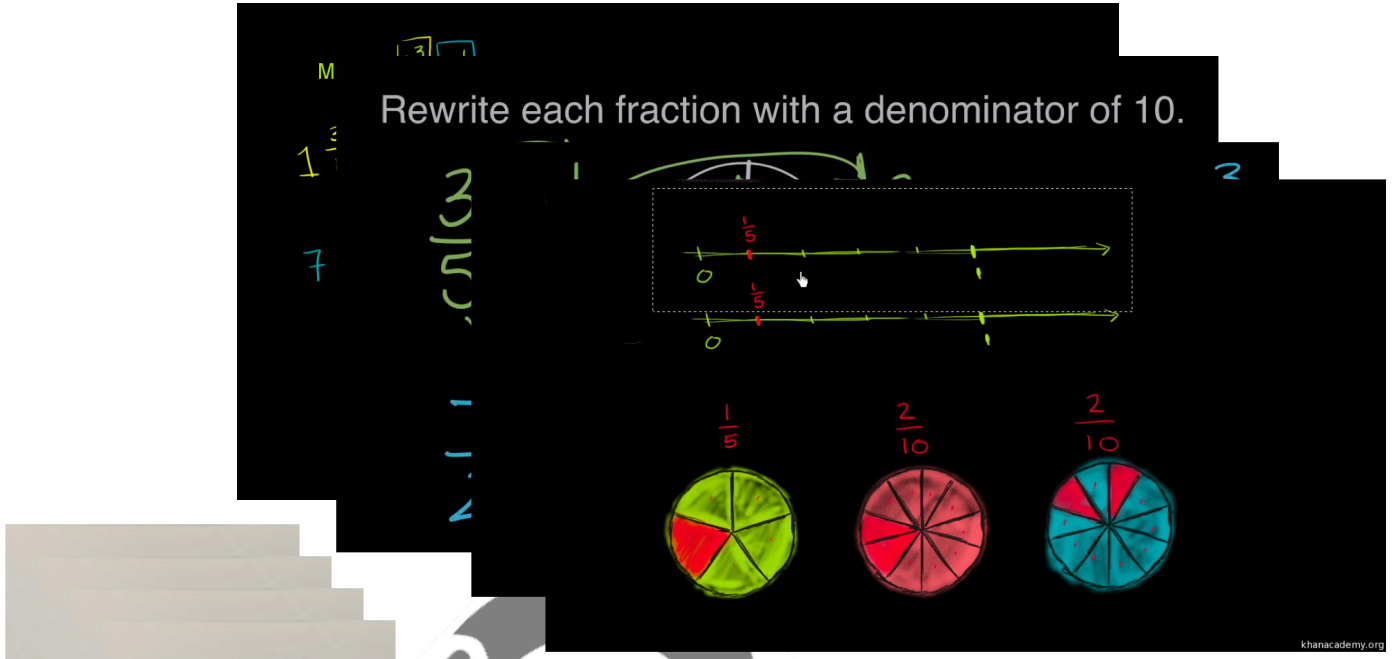
What's wrong?

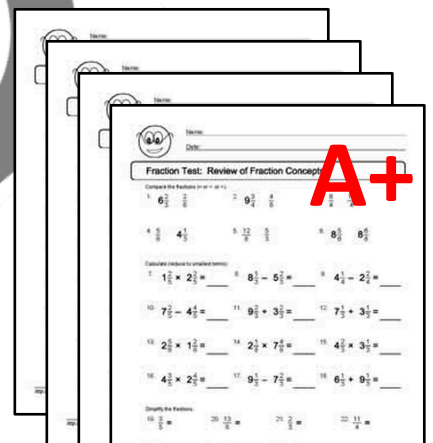


I just don't get what to do.

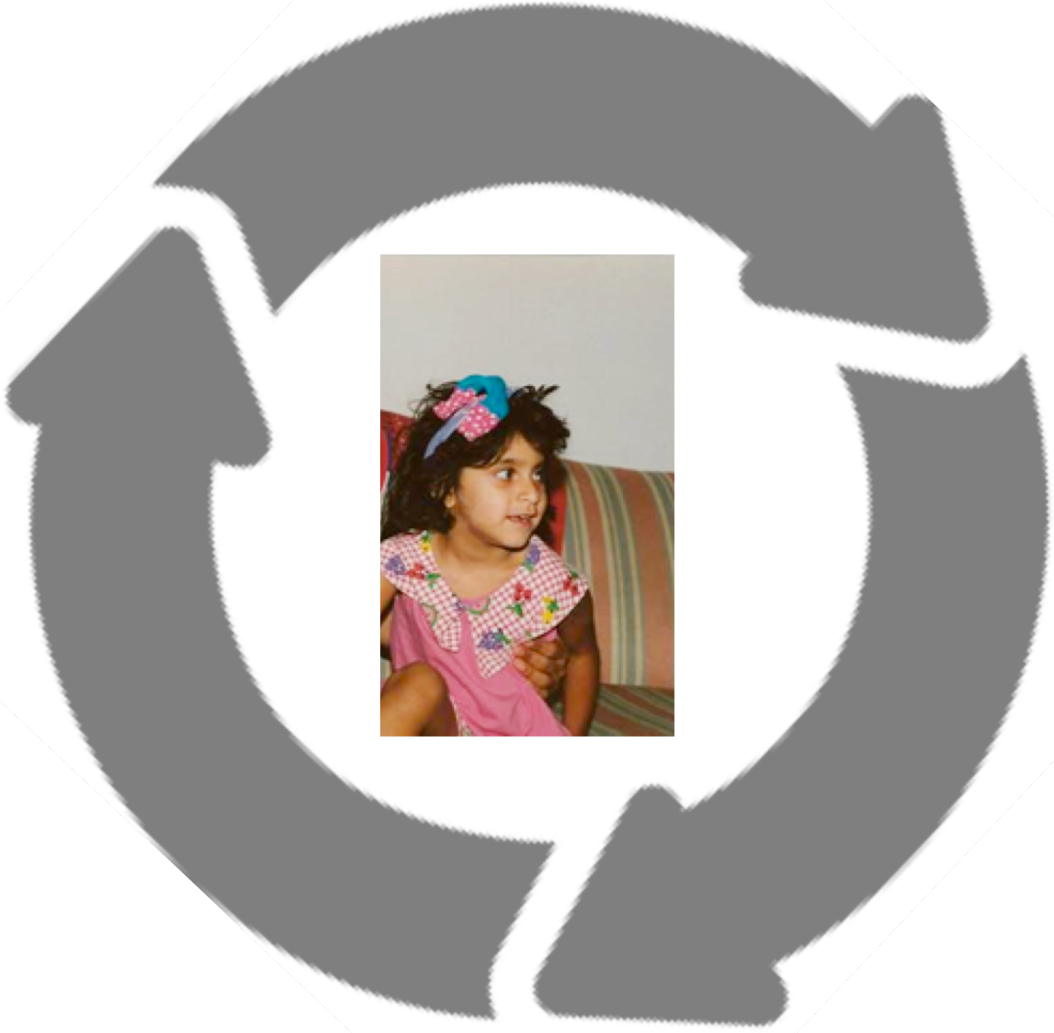
And test solutions with users until it solves the problem.





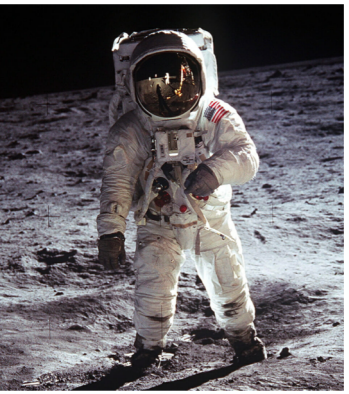


The **user** is at the center of the process



The Design Process

What I **expect** the design process to be:

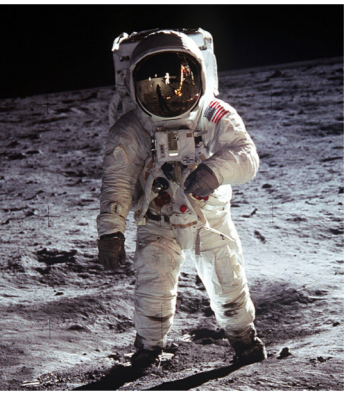


Challenge

Idea

Product

What my design process **actually is**:



Challenge

Brainstorm utter bullshit

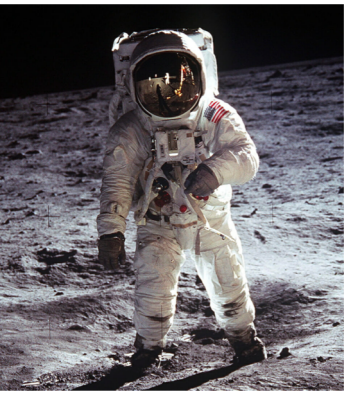
Despair

Caffeine-induced optimism

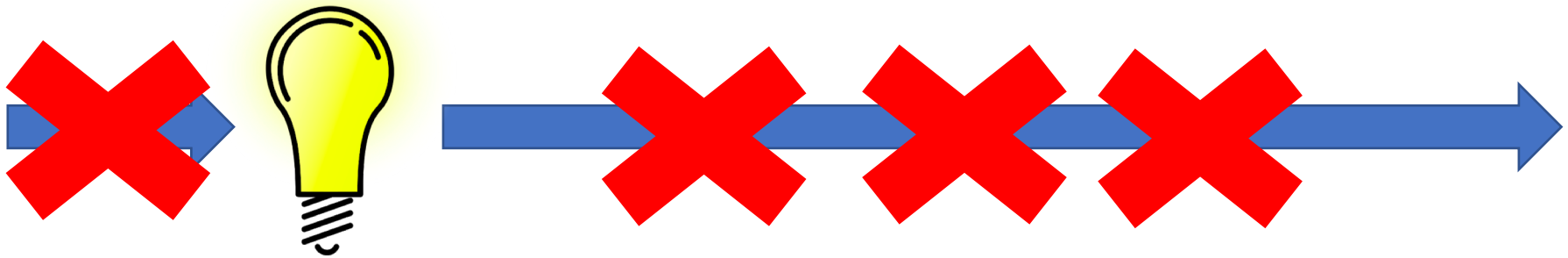
“Omg it’s still bullshit”

Move on to next shiny thing

If you expect the design process to be straightforward, you will probably be frustrated.



Challenge

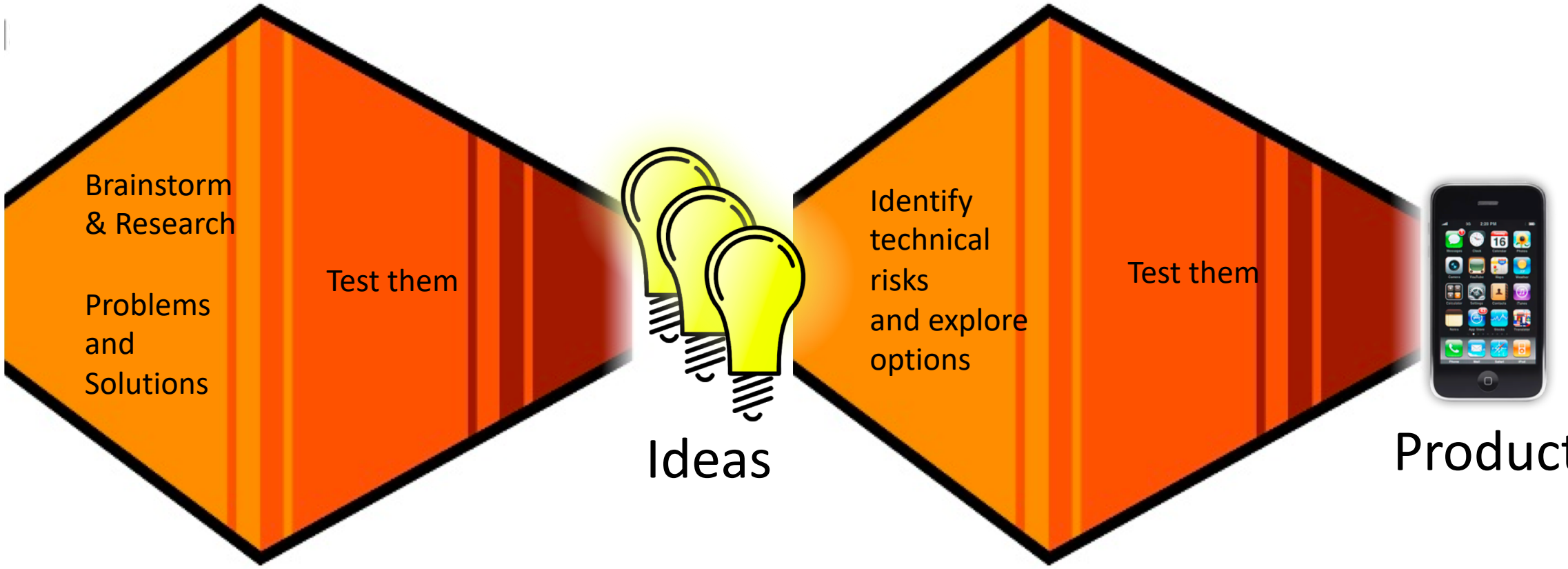


Idea

Product

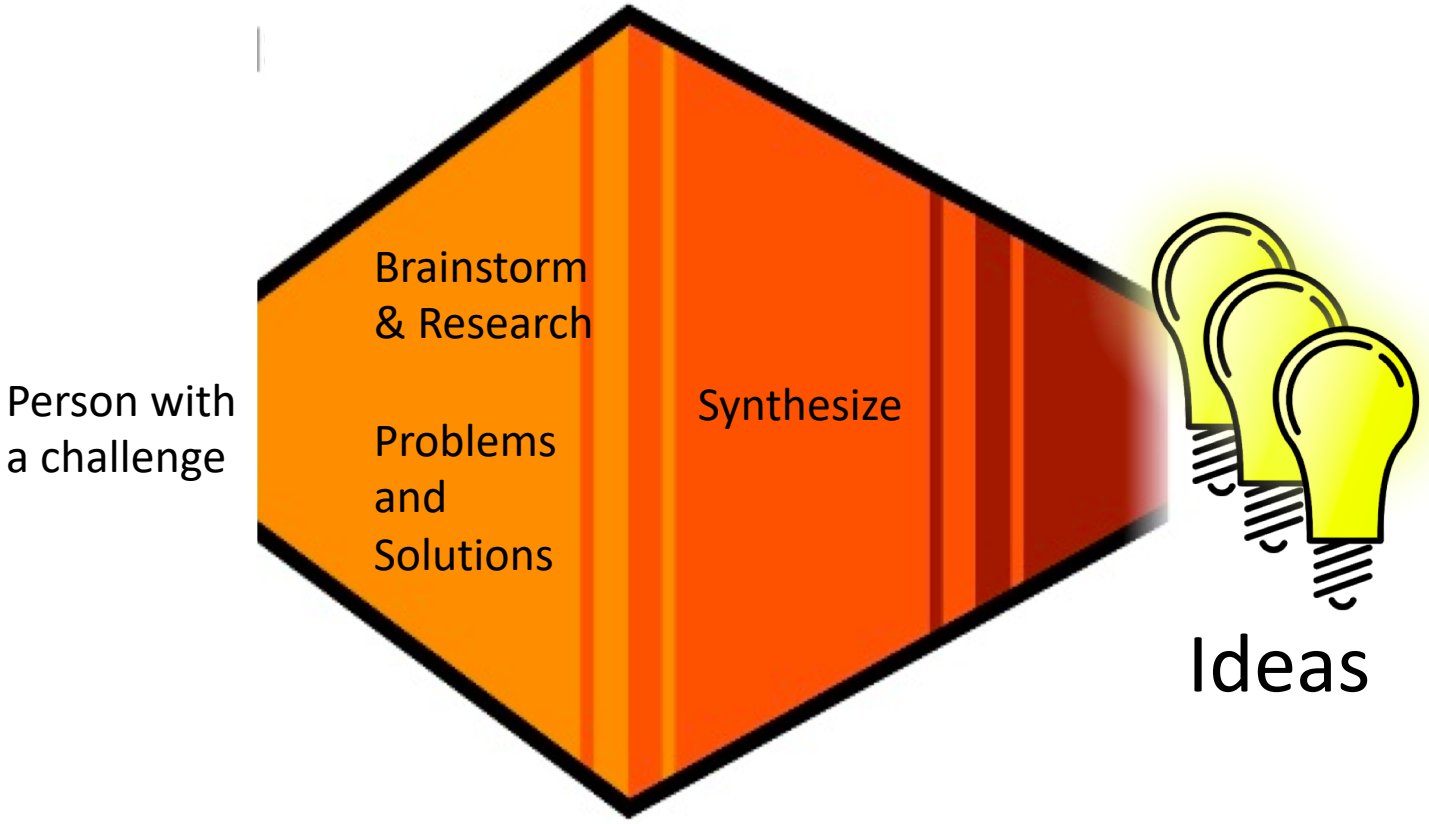
Flare and Focus

The Double Diamond Process



Phase 1: Understand the Problem

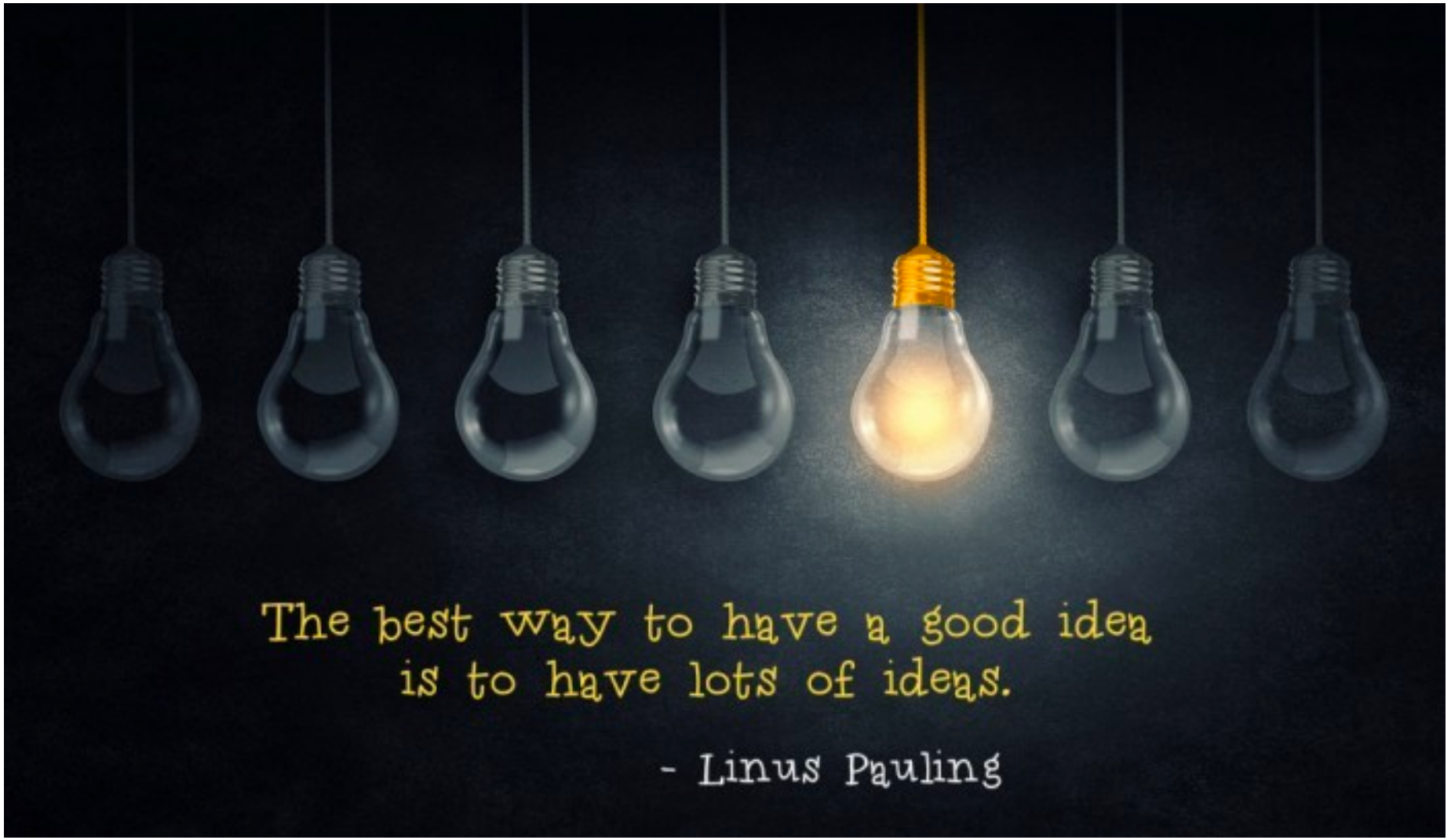
Ideas are a ***potential*** solution for a specific problem.



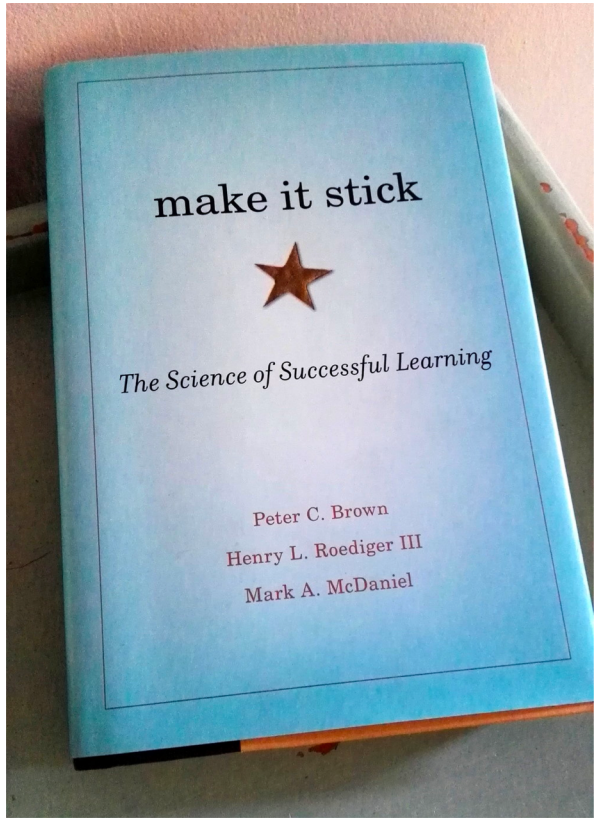
Understand the problem

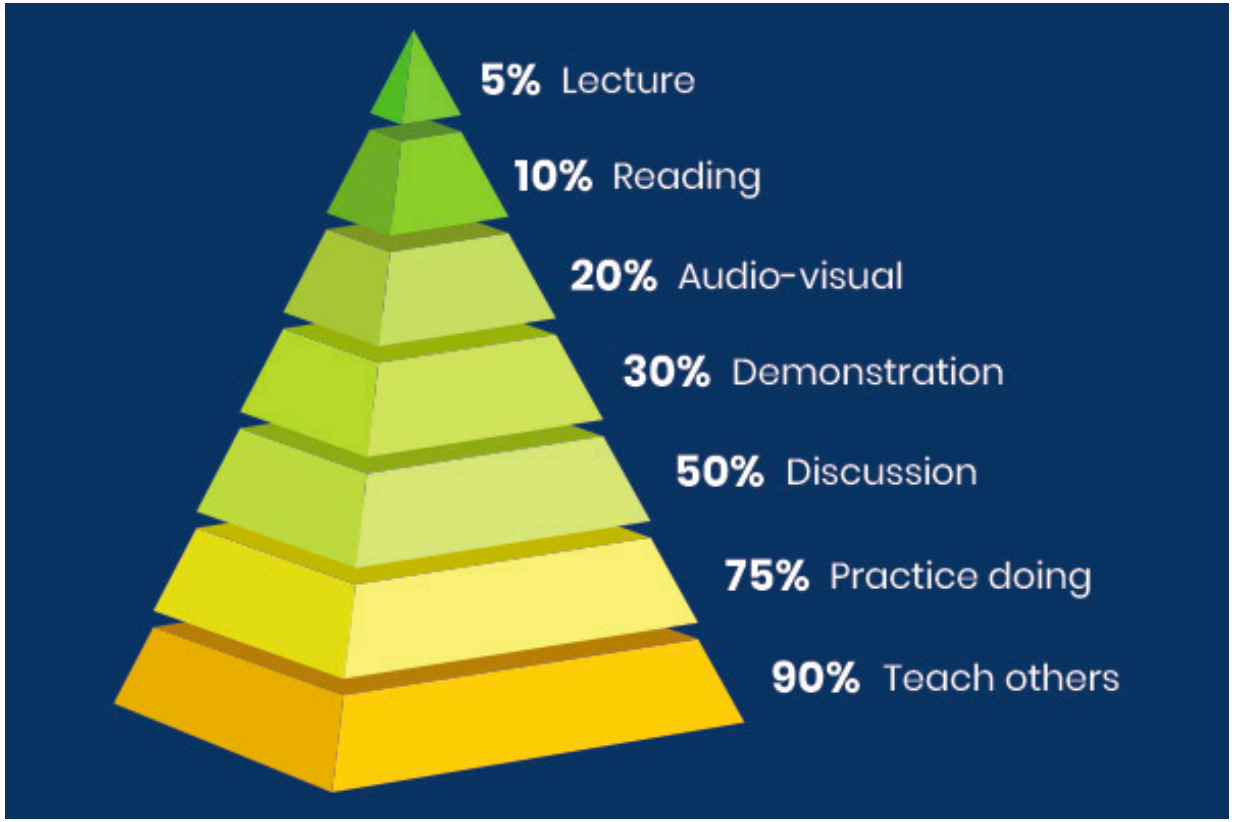
Brainstorm many ideas

(both for domains and specific problems)

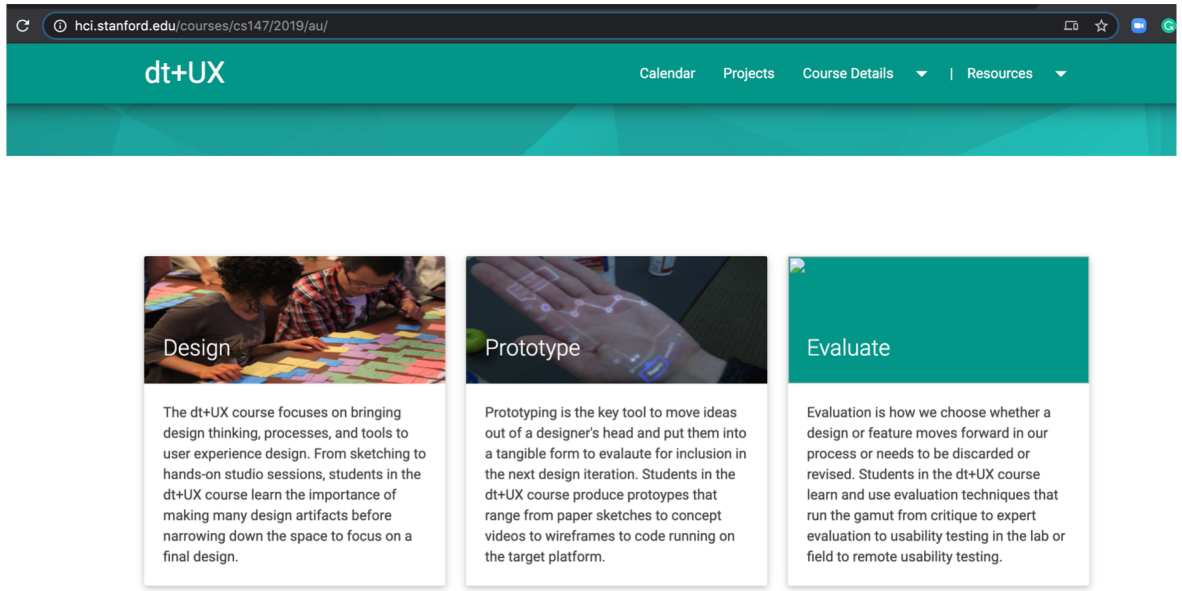


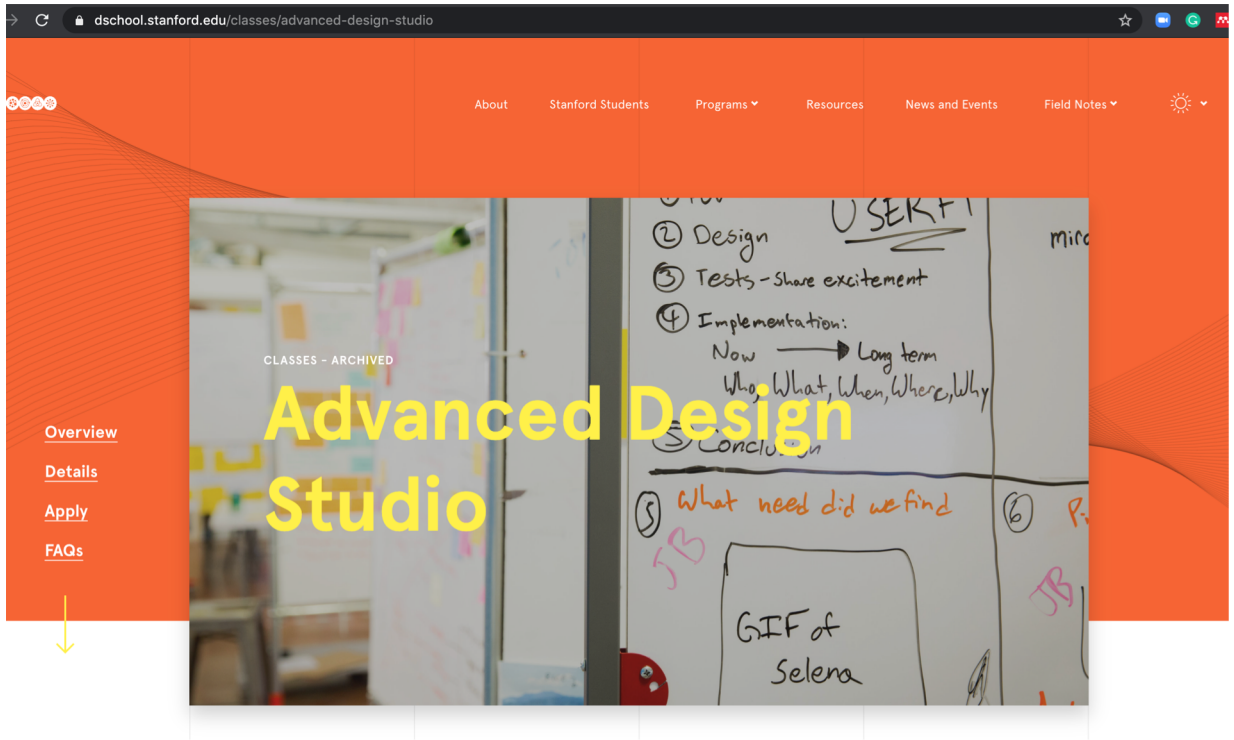
Academic research.
Find theories that guide your idea.





Direct Competitor Research:
Find other solutions to the problem.

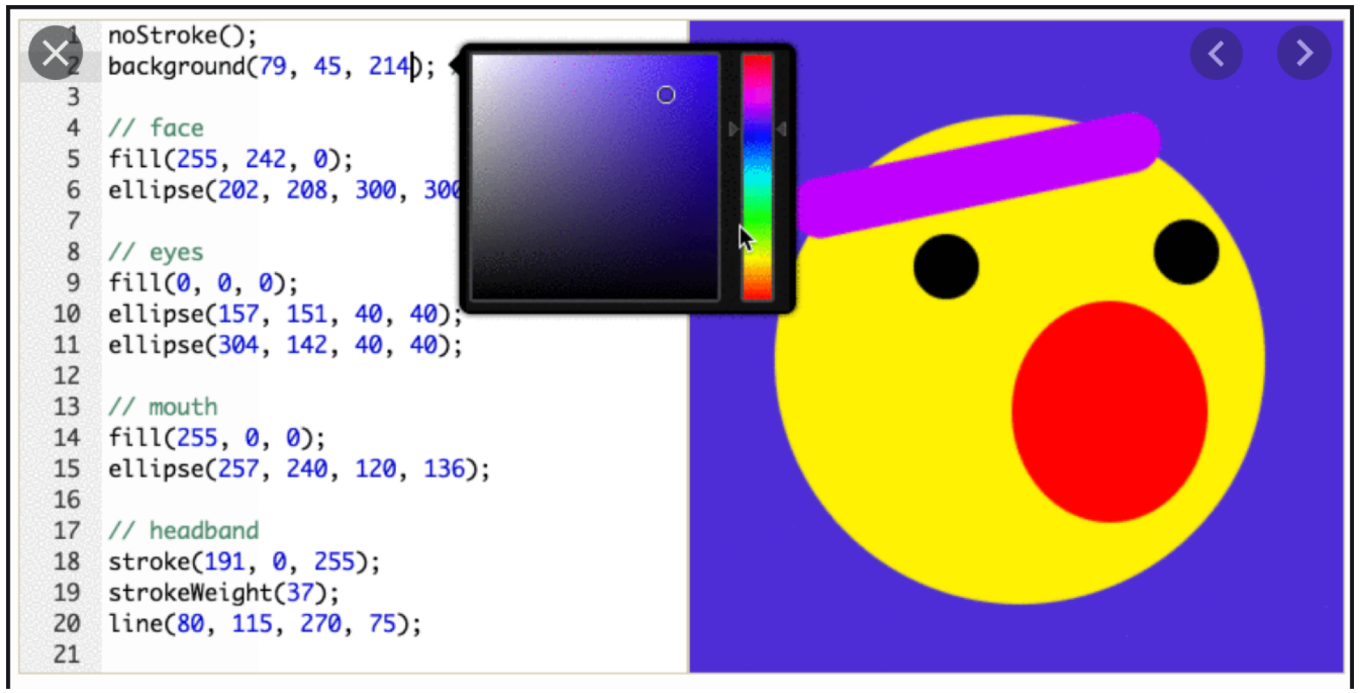




Learn from them.

Indirect Competitor Research
Find solutions to other similar problems

Khan Academy



Steal good ideas

Talk to a user.
Learn about their experience.

Caroline – a student in User Interface design who is shy, but is forced to participate in class and fill out a form after class to record her participation

"Tell me about the last time you participated in class?"

I'm worried my accent won't be understood

I only saw something if I'm 100% sure of the answer. I don't like to guess

I'm so nervous about participating that I don't pay attention

I always forget to fill out the participation form.

I always forget to fill out the participation form.

Homework 7

Challenge

- Brainstorm
- Interview
- Research

Synthesize into insights and ideas

Ideas

- Prototype solutions
- Explore technical options

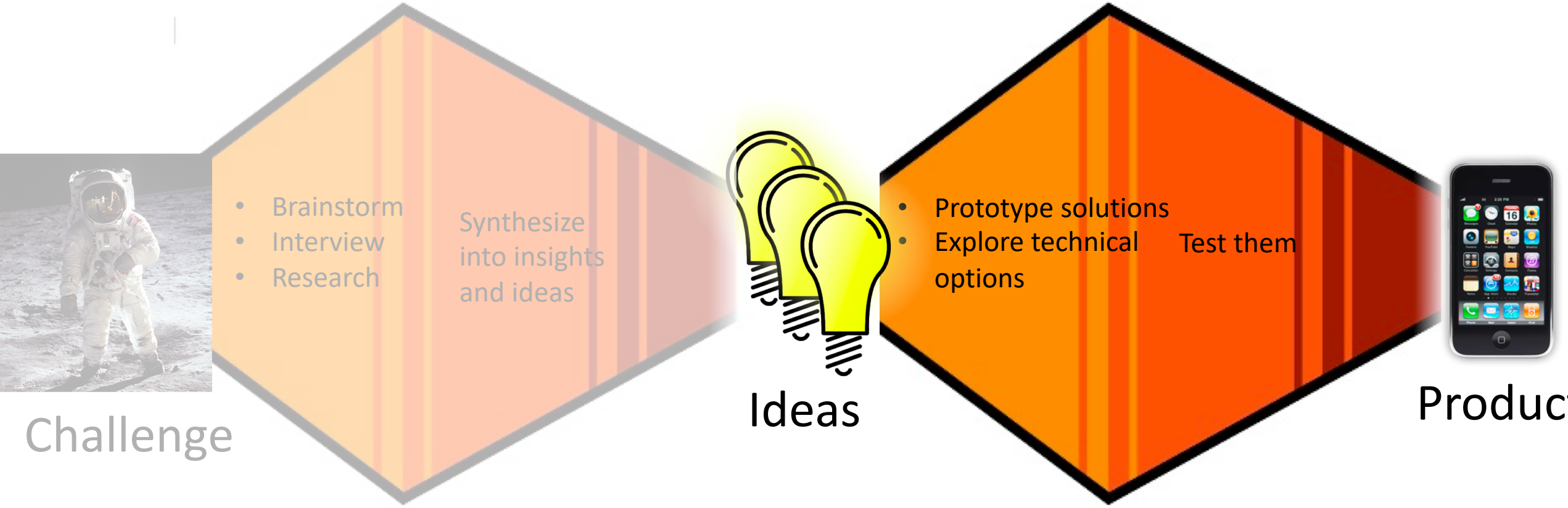
Test them

Product

Understand the problem

Solve the problem

Homeworks 8-12



Phase 2: Solve the Problem

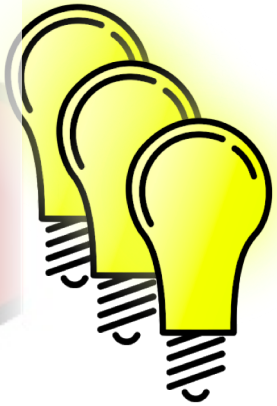
For many years,
software engineers solved problems and made the same mistake over and over again.

Common mistake:
Solving problems linearly.

Challenge

- Brainstorm
- Interview
- Research

Synthesize into insights and ideas



Ideas

Product

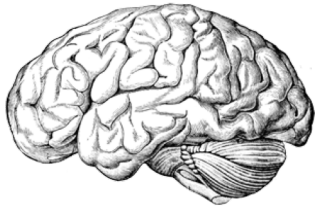
Understand the problem

Solve the problem

Two Design Processes

The waterfall model, and iterative design

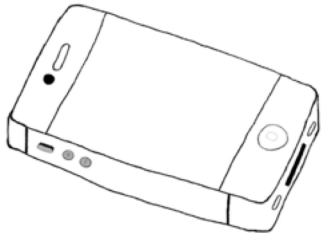
The Waterfall Model



Idea

Requirements

- One button
- Touch screen
- Soft keyboard



Design

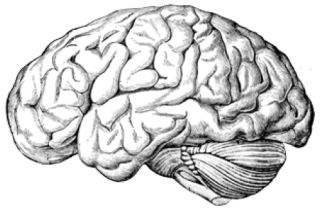
Implement

Fix bugs

Ship it

Product

The Waterfall Model: What's good about it?



Idea

Requirements

- One button
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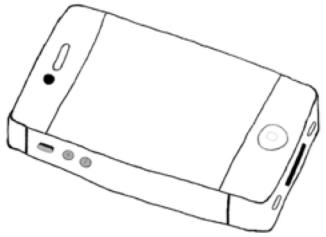


Design

Implement

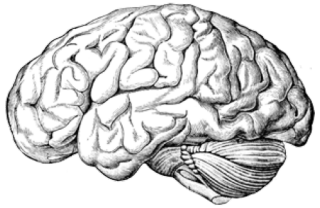
Fix bugs

Ship it

Product

It's simple, linear, and the steps are certain

The Waterfall Model: What could go wrong?



Idea

Requirements

- One button
- Touch screen
- Soft keyboard

Design

What if a touch screen can't be implemented?

Implement

What if this hardware weighs 20 lbs?

Fix bugs

What if this device is so slow it's unusable?

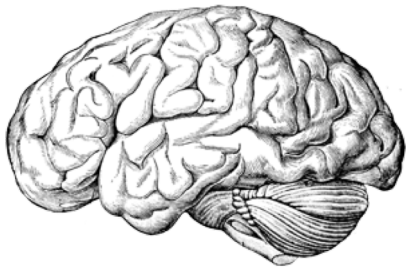
Ship it

How can we keep up with the competition?

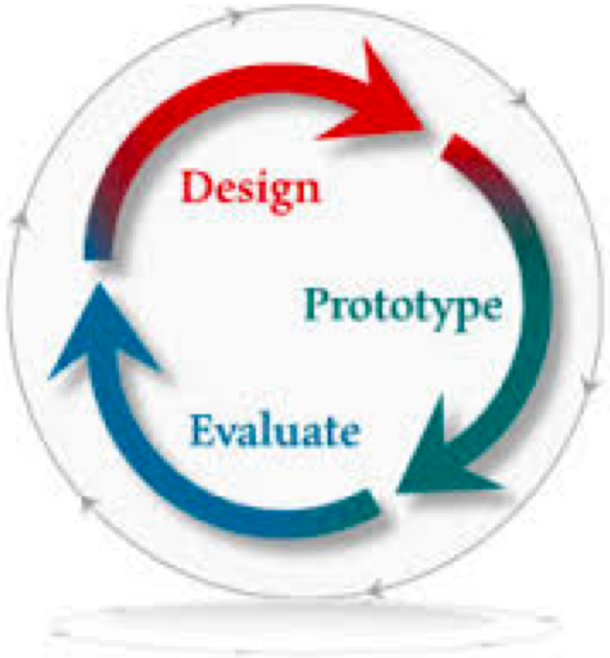
Product

When there are many unknowns,
Design is always iterative –
so you might as well plan for it.

Iterative Design

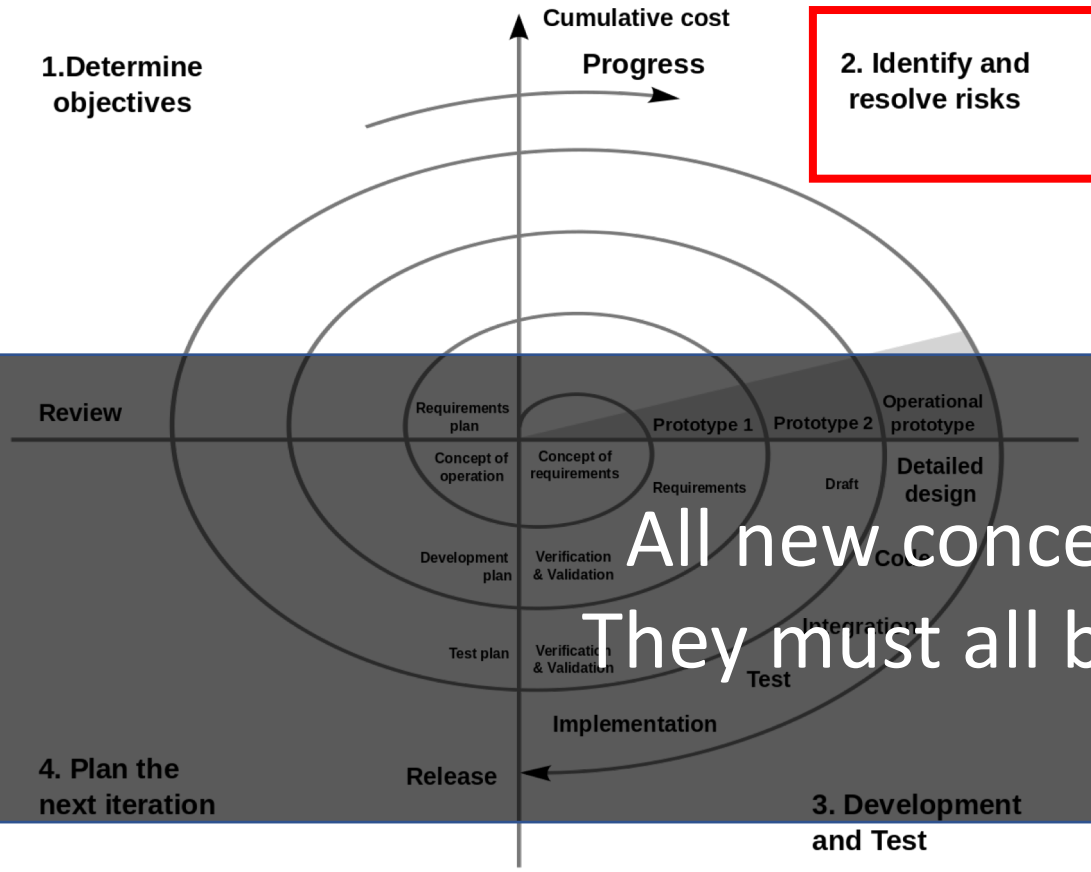


Idea



Product

Iterative Design origins:
Spiral Model of software engineering (Barry Boehm, 1988)

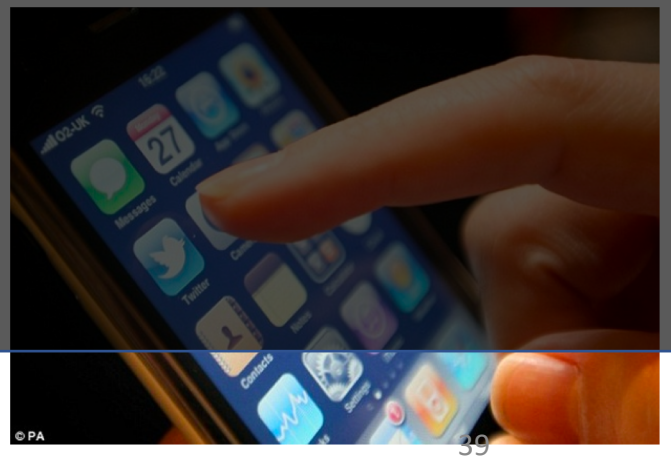


Every iteration should experiment with the next biggest risk.

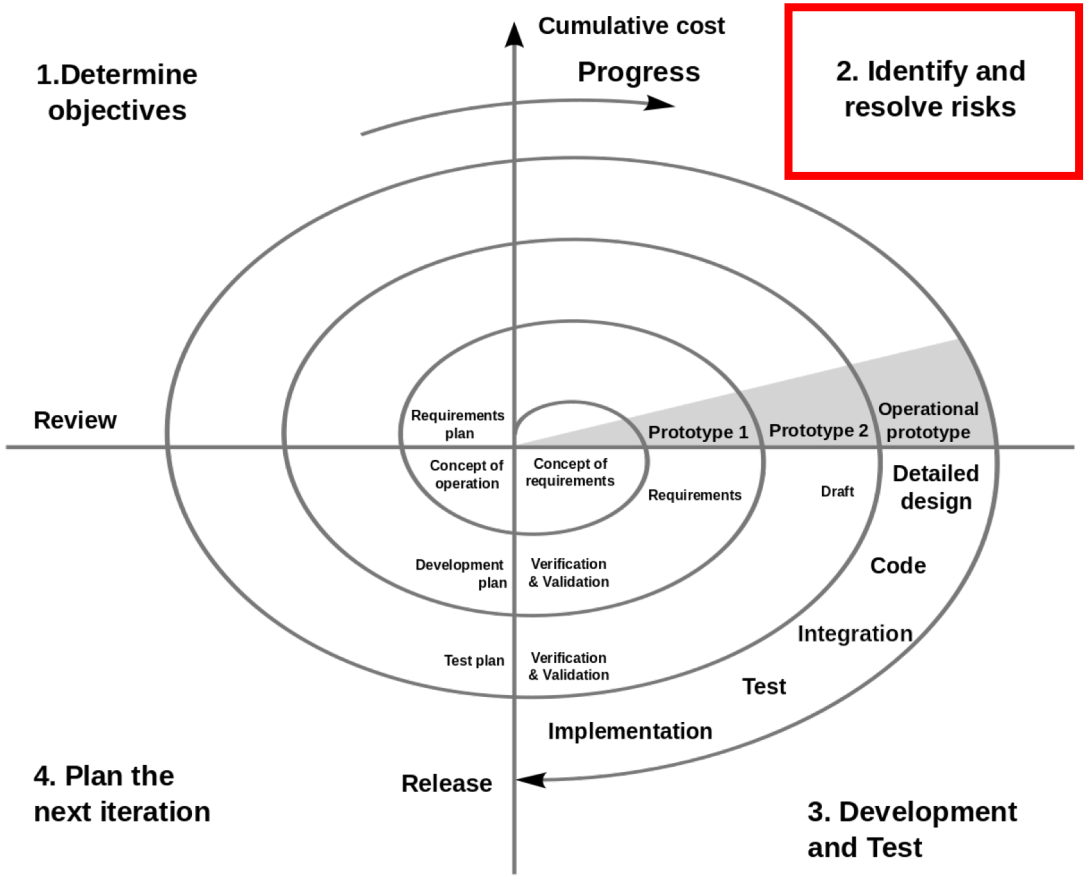
How to achieve the perfect gradient on app icons?

Does touch work?

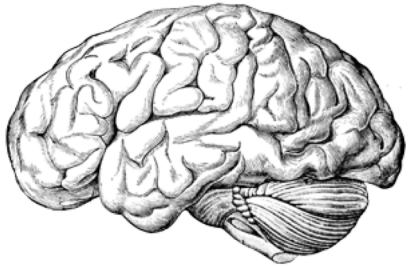
All new concepts are risks.
They must all be prototyped.



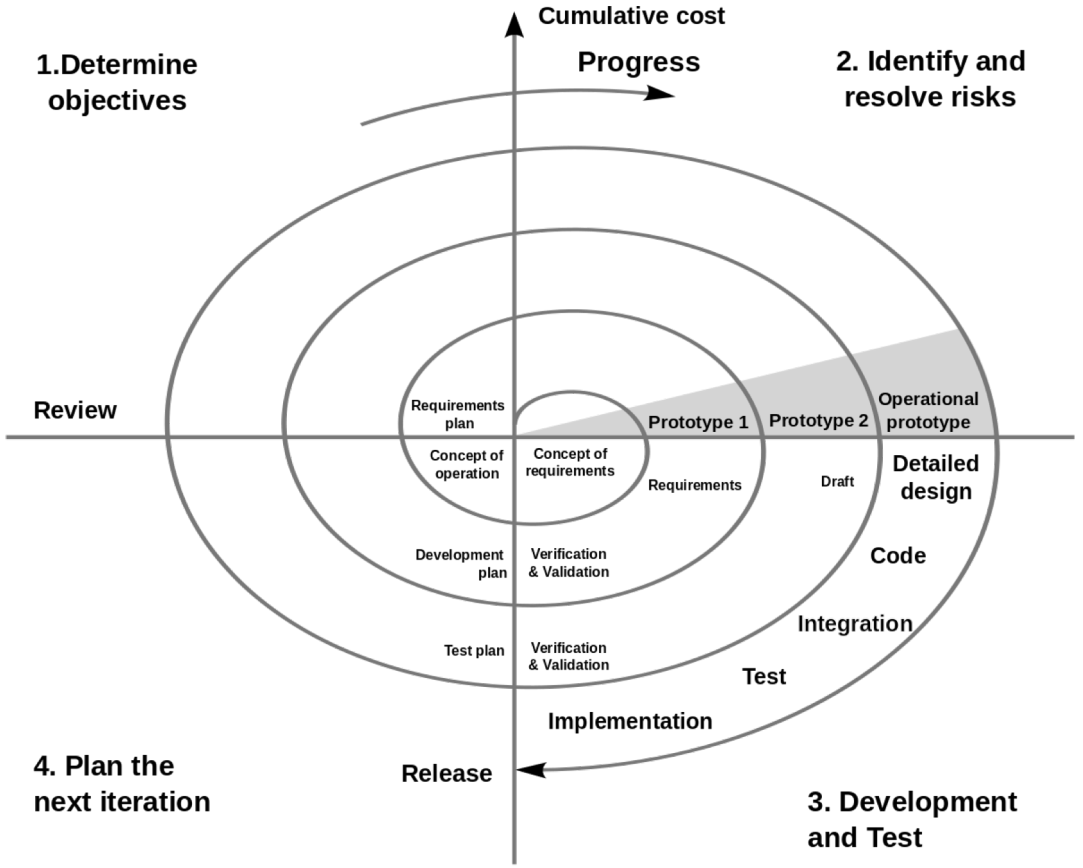
Iterative Design is good because it minimizes risk



Iterative Design: what's hard about it?



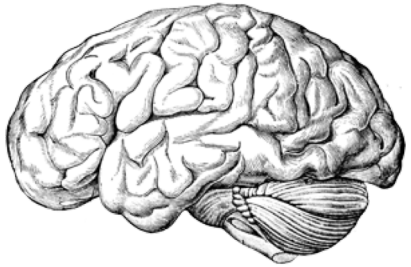
Idea



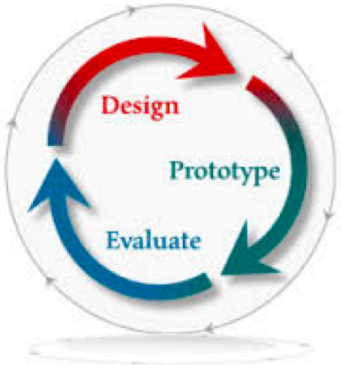
Product

The steps aren't certain from the start.

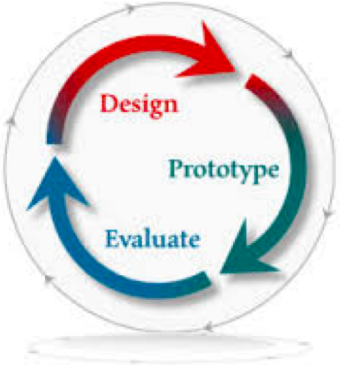
To minimize risk on novel designs, Use iteration on each risky aspect of the design



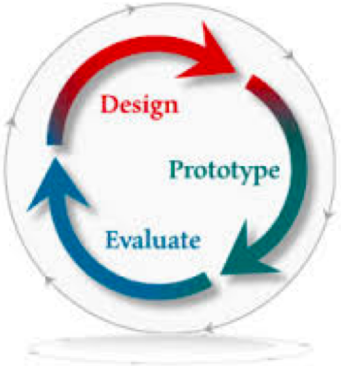
Idea



Touch screen



Soft keyboard

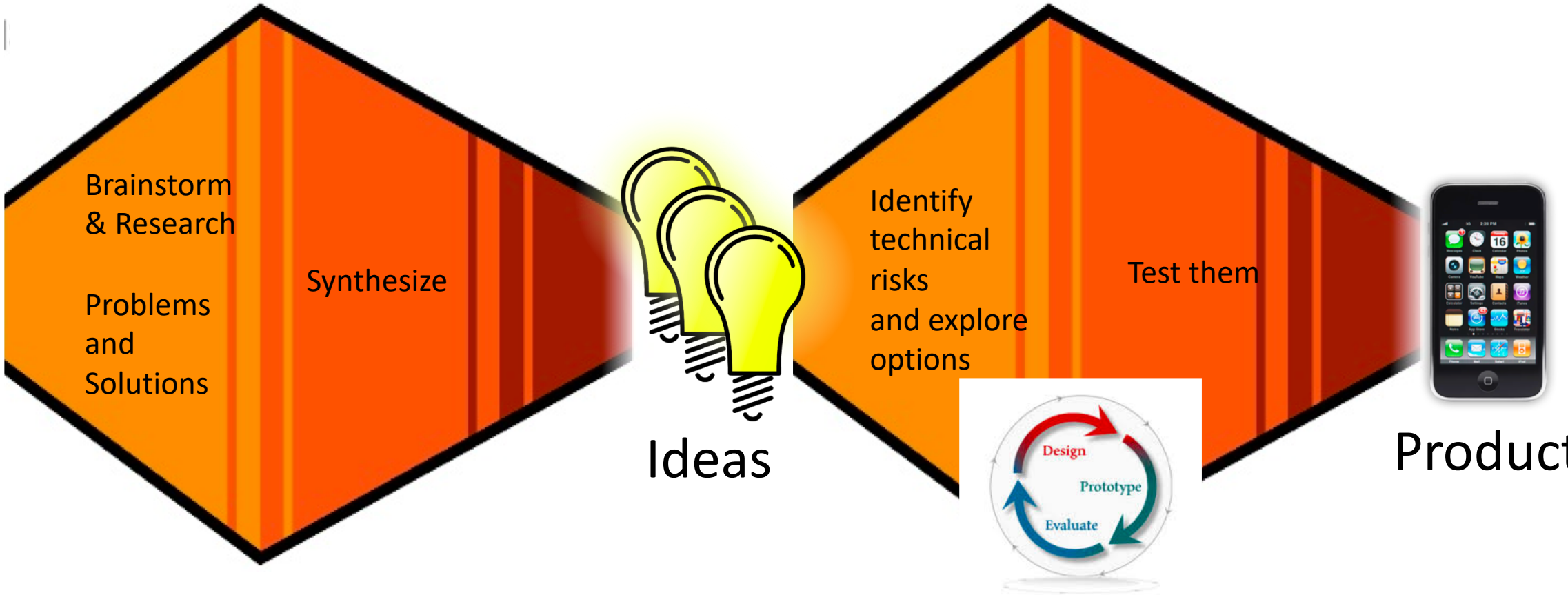


One button

Product

Flare and Focus

The Double Diamond Process

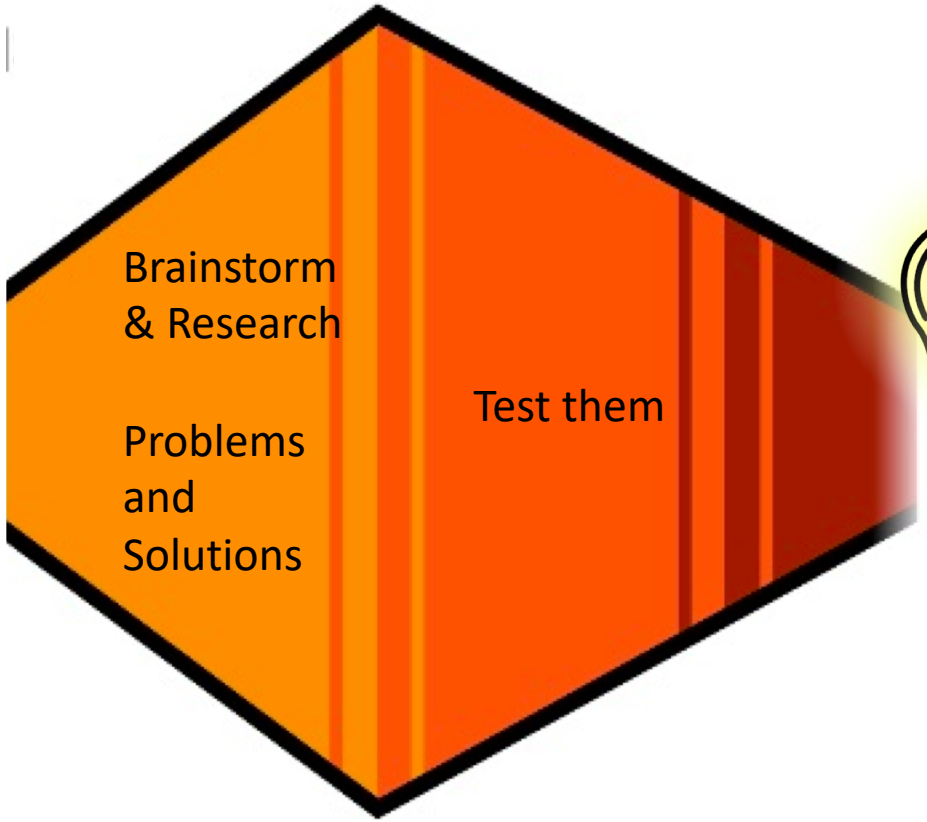


Understand the problem

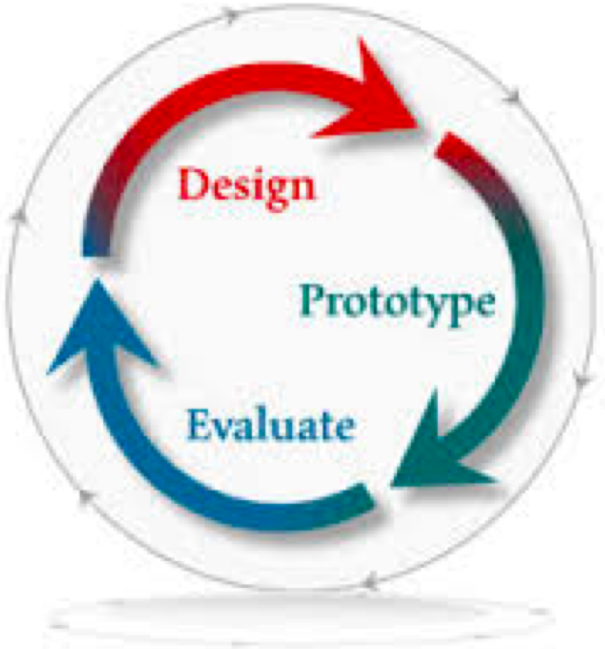
Solve the problem

Implementation is highly iterative.

Person with a challenge



Ideas

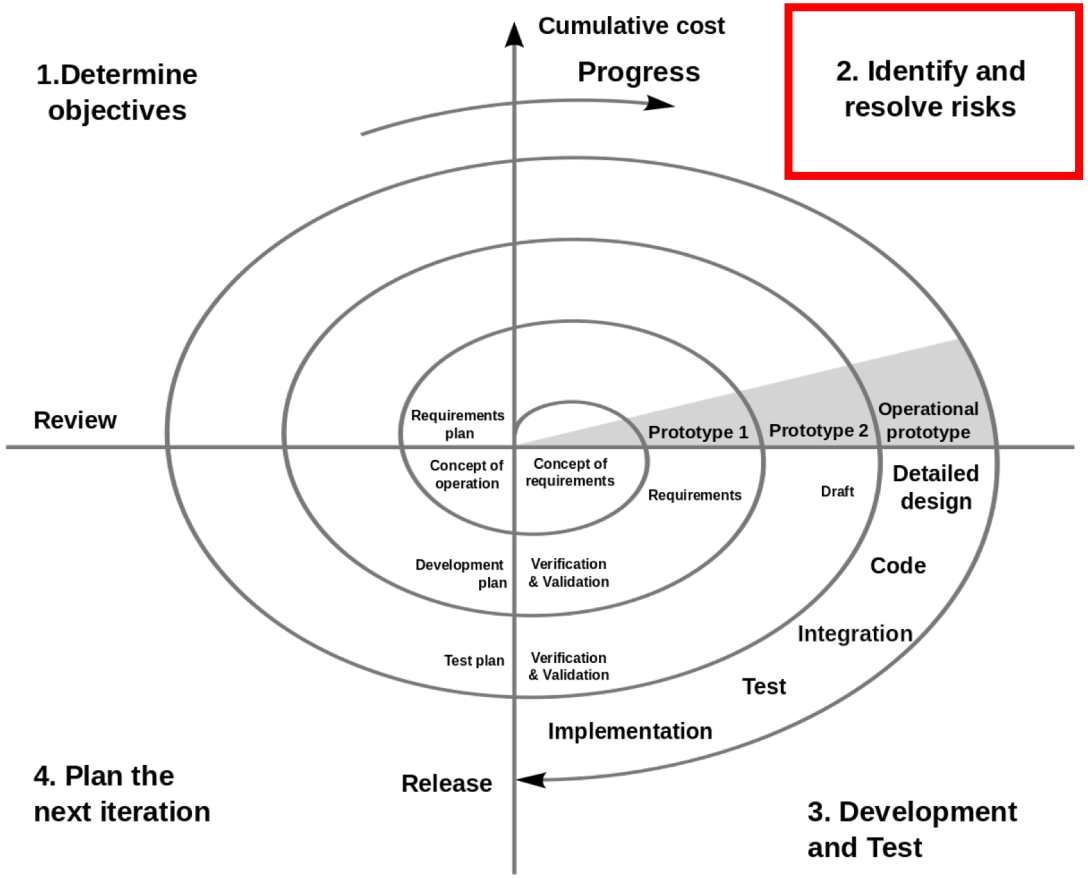


Product

Understand the problem

Solve the problem

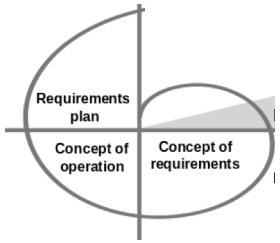
Iterative Design is good because it minimizes risk



The first iteration should be as **low-fidelity** as possible – addressing core concepts

1.Determine objectives

2. Identify and resolve risks

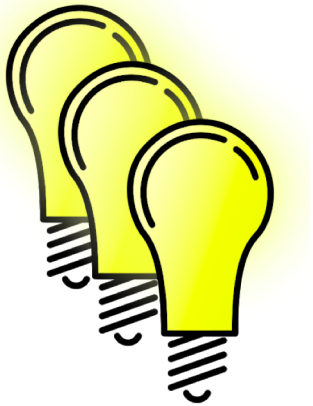


4. Plan the next iteration

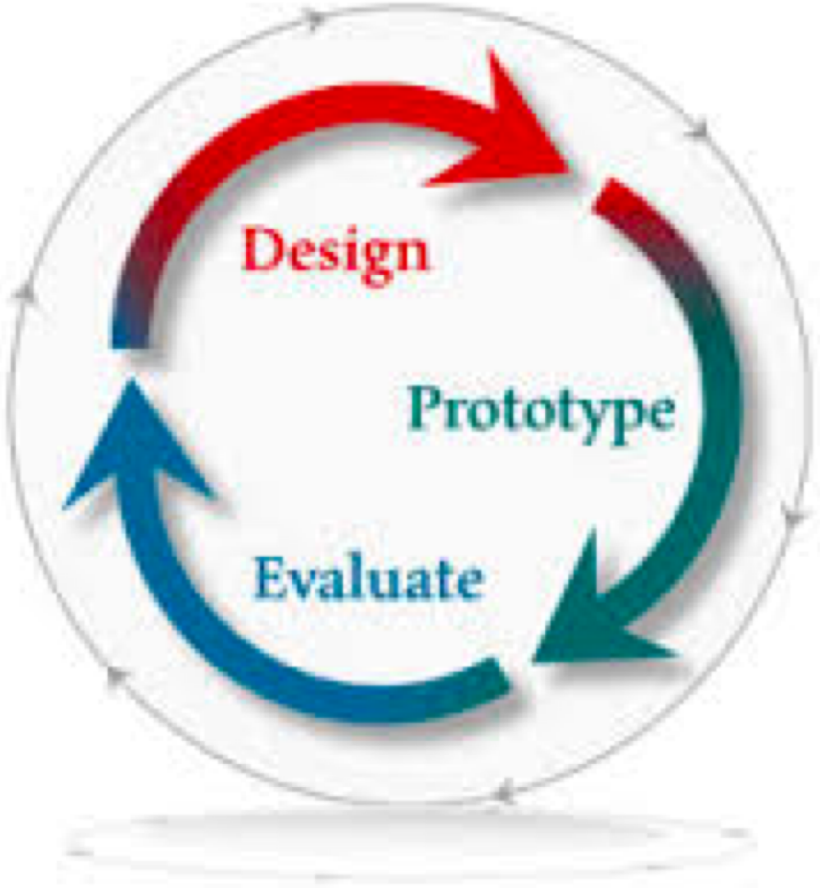
3. Development and Test

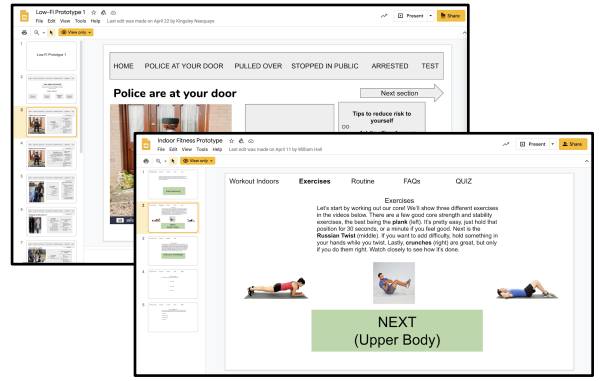
Homework 8: Low-Fi Prototypes

(the first design iteration)



Ideas

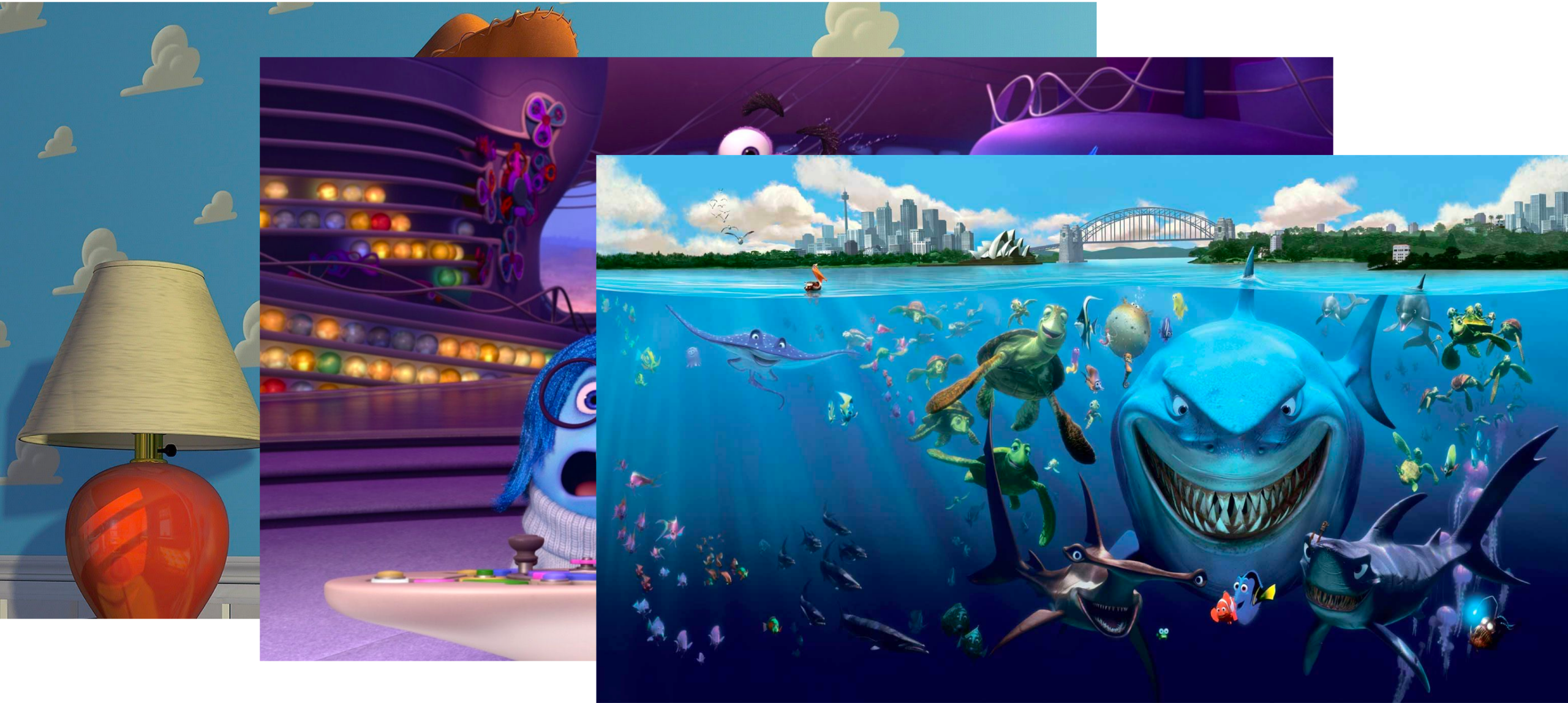




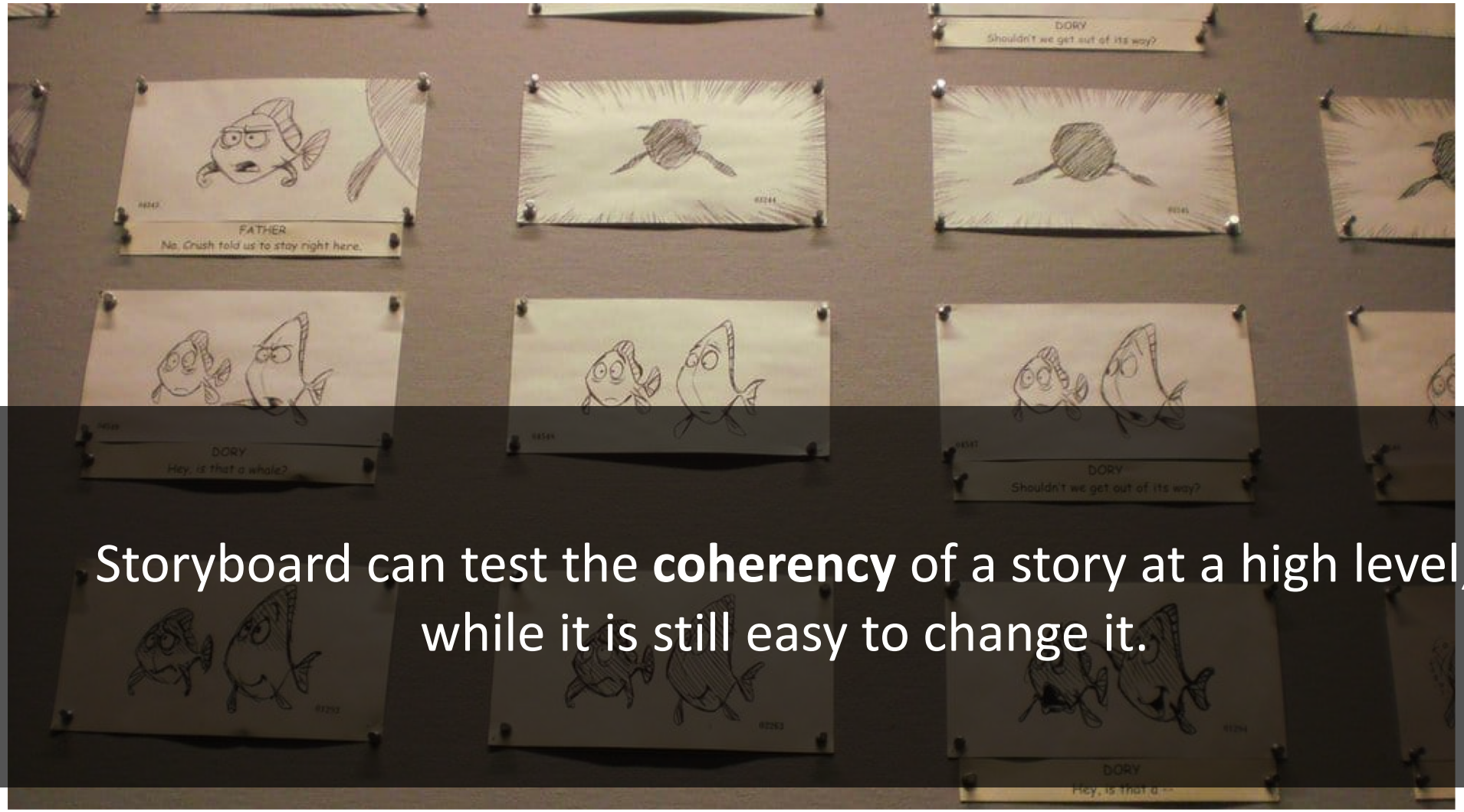
Low-Fi Prototypes

Low-Fidelity Prototypes

Pixar makes detailed and beautiful films

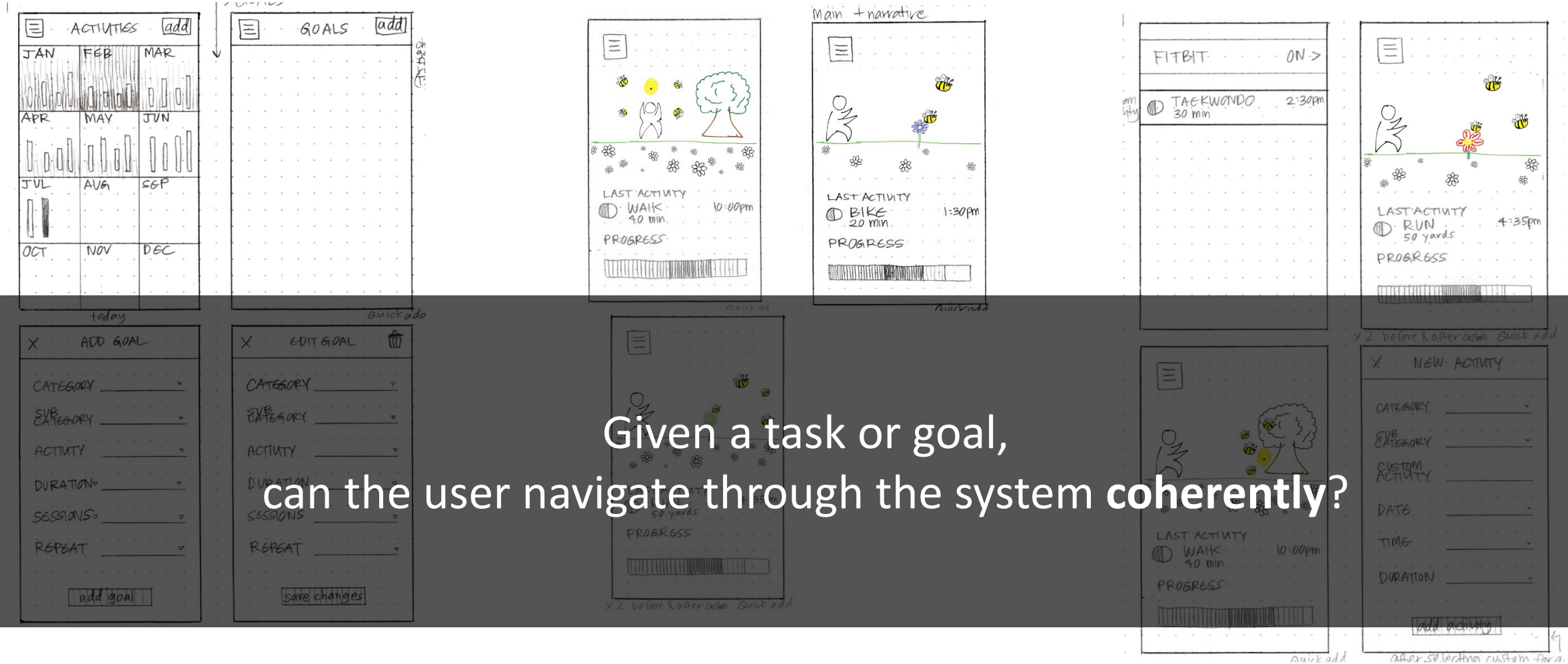


They always start with a **storyboard**. Why?



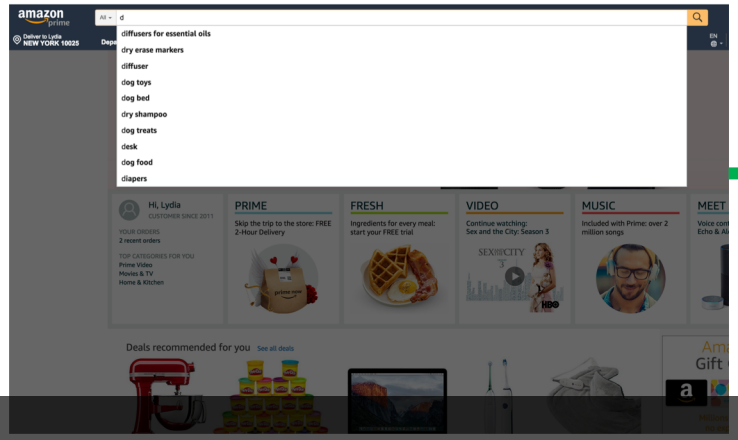
Storyboard can test the **coherency** of a story at a high level, while it is still easy to change it.

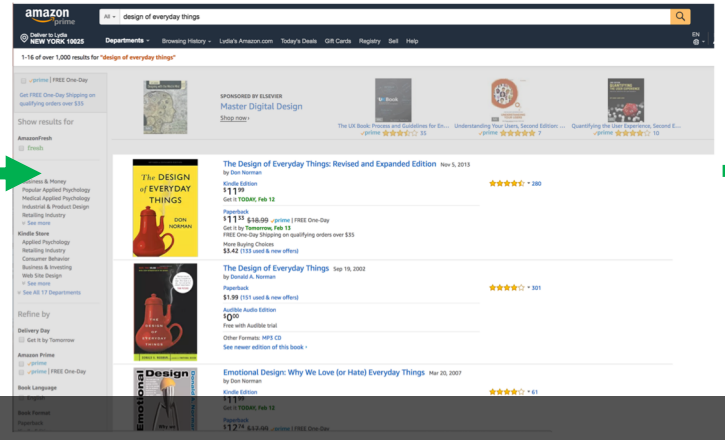
Storyboards are also good for prototyping software interactions

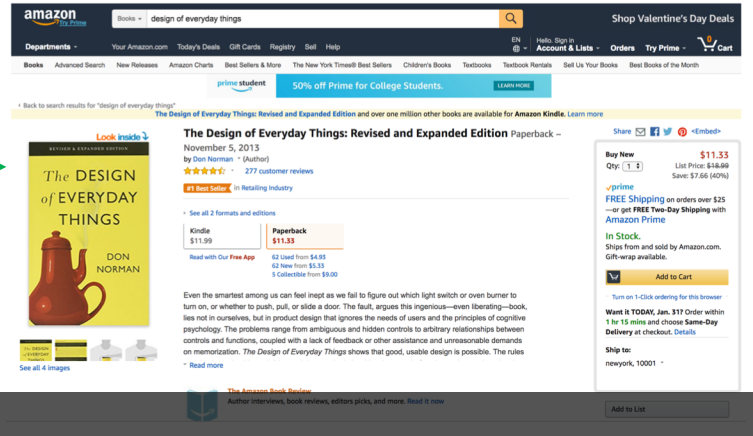


Given a task or goal,
can the user navigate through the system **coherently**?

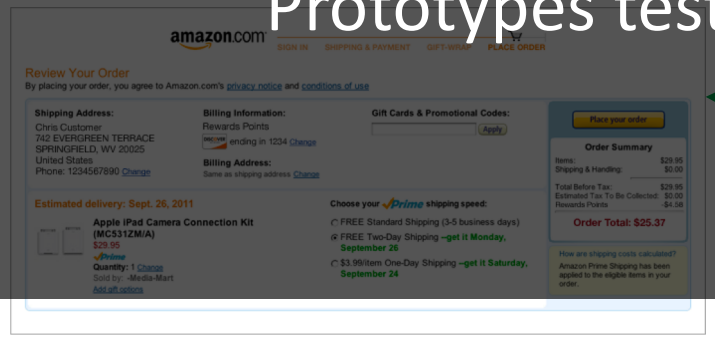
For complex goals, break the task into **states**, **options**, and **transitions** to new states.

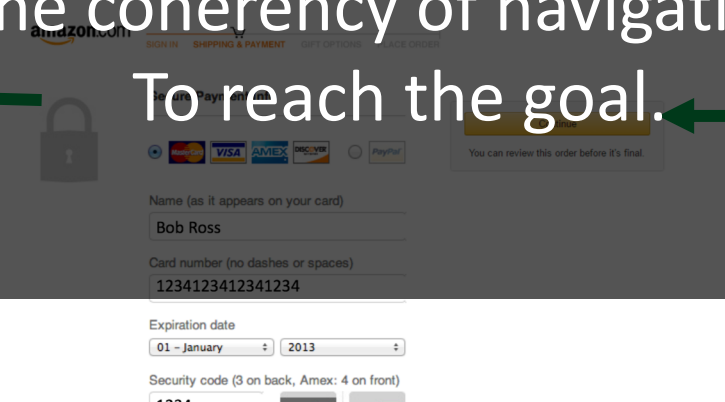


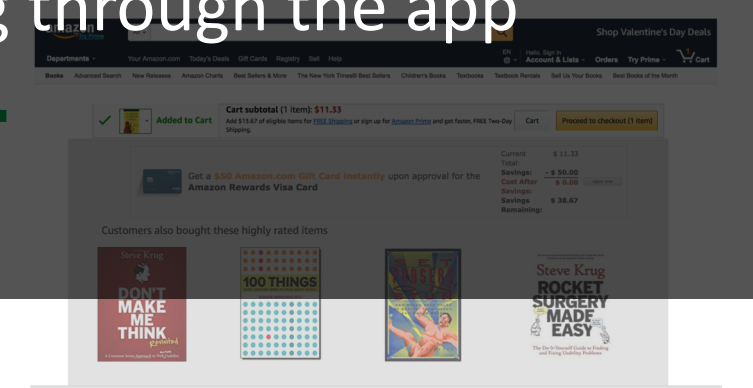




Prototypes test the coherency of navigating through the app
To reach the goal.







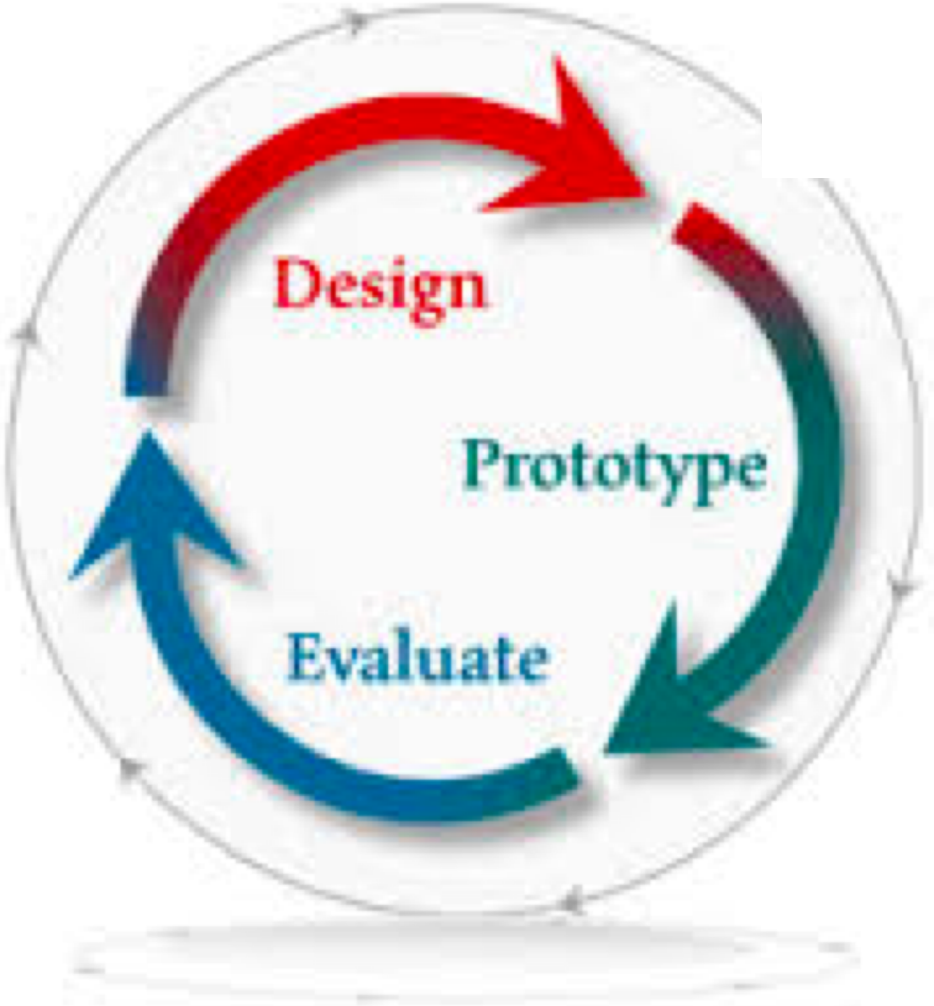
Main Prototype Goal:

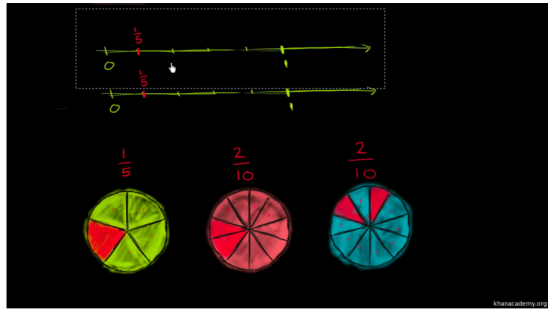
Coherence

Is there a path through the system by which the user can accomplish their goal?

Translating an idea into a prototype is HARD.

Teach fractions by working through problems slowly.

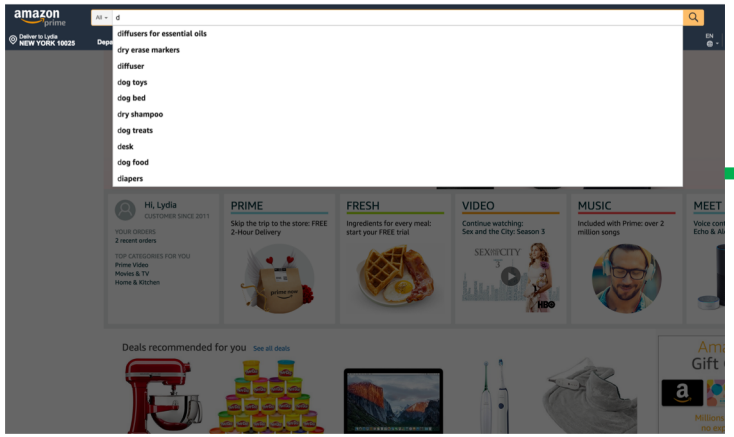


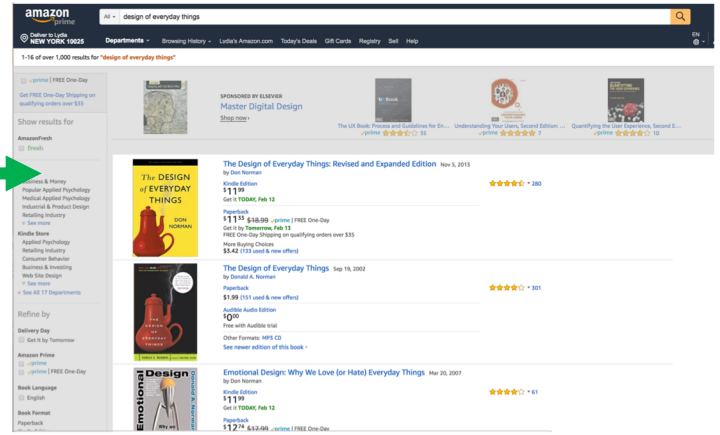


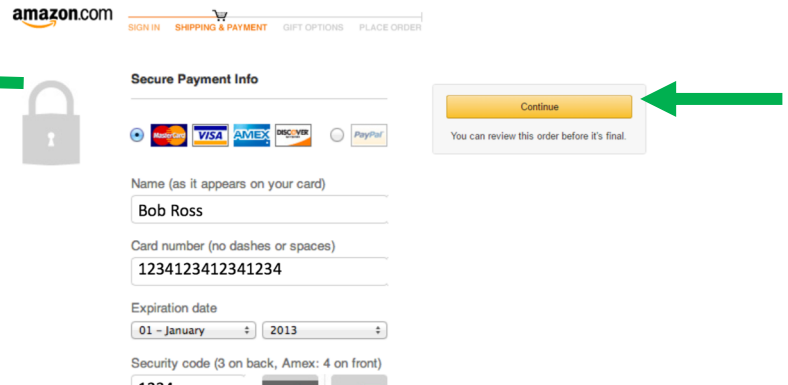
Low-Fi Prototype

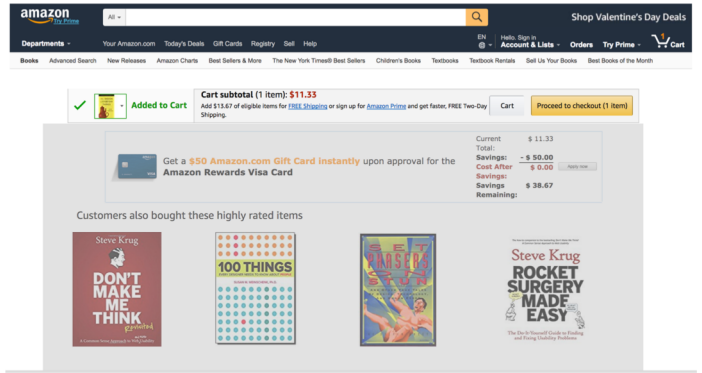
You will probably learn as much from
making the prototype,
as you will from running it.

Focus on breaking the task into **states**, **options**, and **transitions**



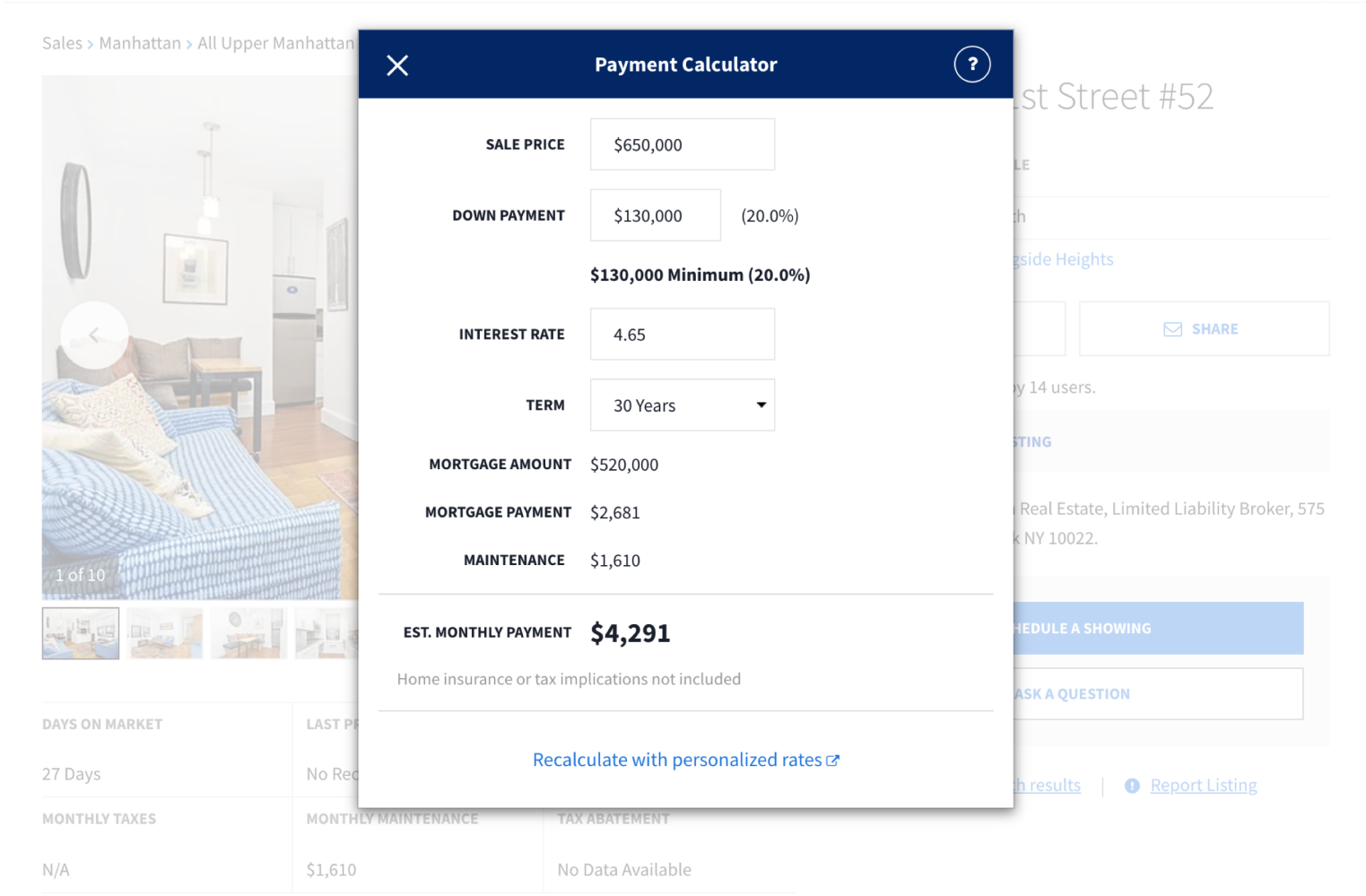




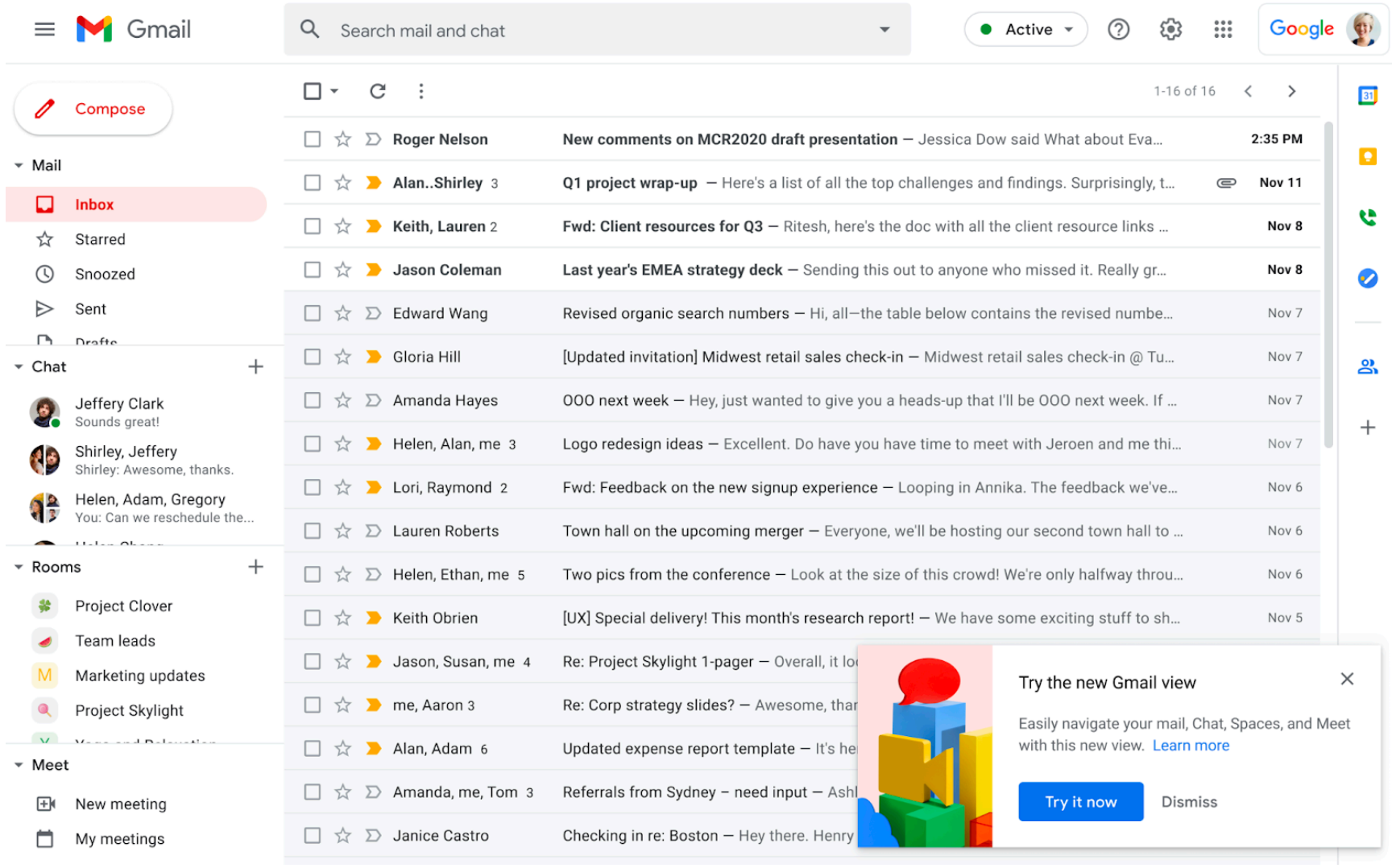


Prevent Errors in Options: Provide good defaults

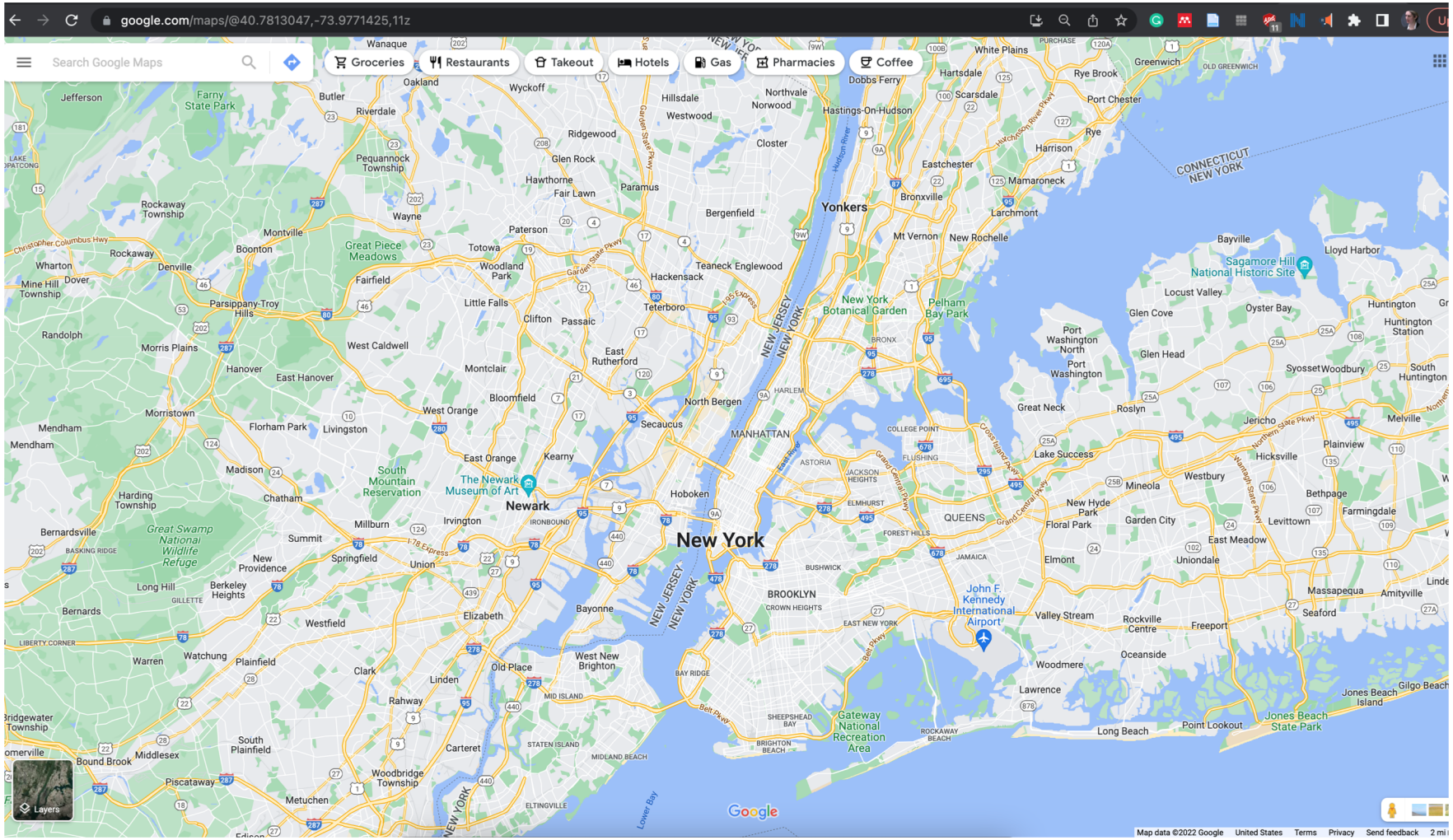
Good defaults will help to guide the user away from making a mistake because they will be given a context to work from.



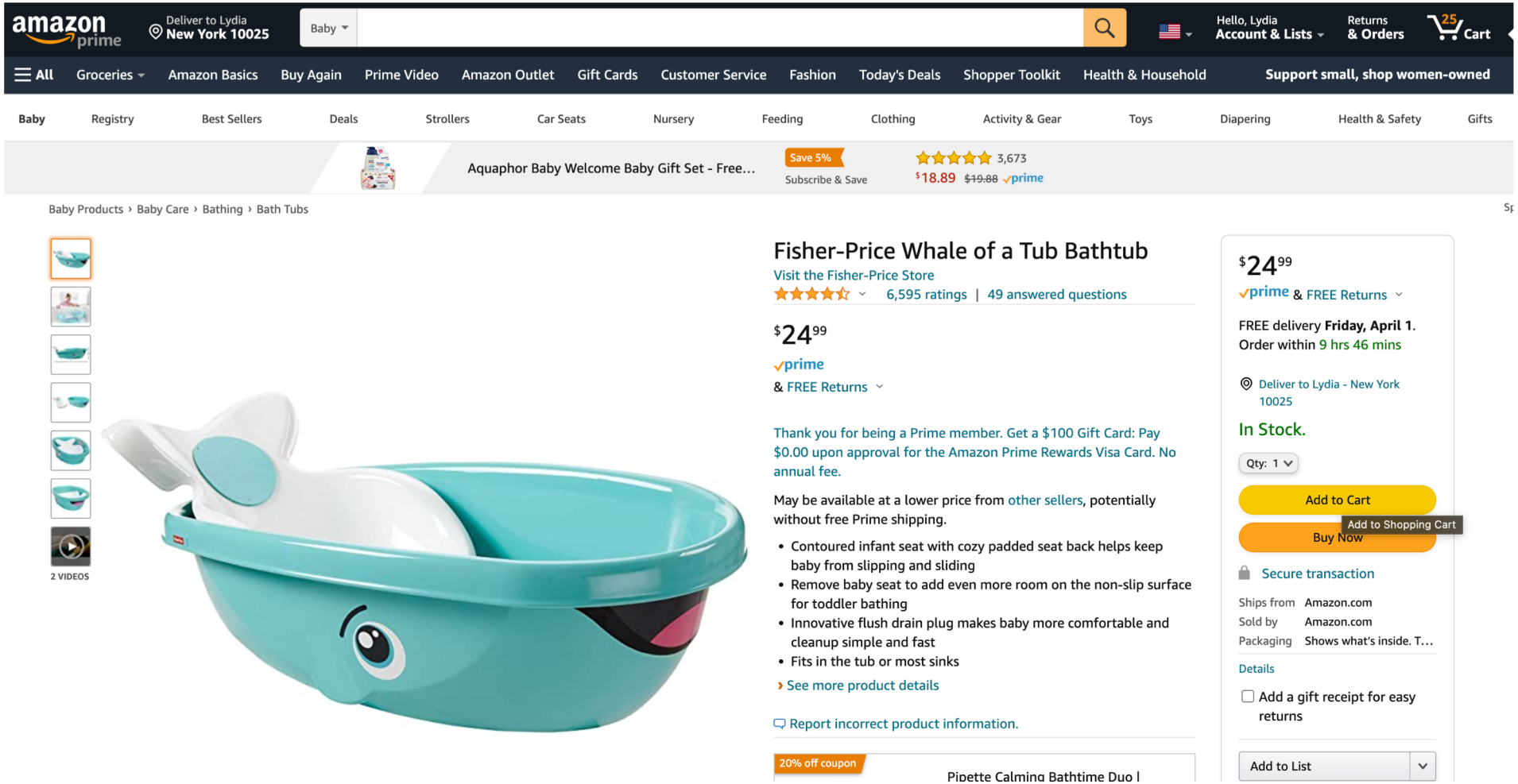
What’s the default way Gmail sorts email?



What’s the default location on Google Maps?


google.com/maps/@40.7813047,-73.9771425,11z
Search Google Maps
Groceries
Restaurants
Takeout
Hotels
Gas
Pharmacies
Coffee
New York
Newark
Yonkers
Jersey City
Hoboken
Bayonne
Elizabeth
Paterson
Clifton
Passaic
Hackensack
Teaneck
Englewood
Fort Lee
Secaucus
North Bergen
Union City
Weehawken
West New York
Guttenberg
Edgewater
Cliffside Park
Fairview
Ridgefield
Ridgefield Park
Little Ferry
Moonachie
Carlstadt
East Rutherford
Rutherford
Lyndhurst
Kearny
Harrison
Belleville
Nutley
Bloomfield
Glen Ridge
Montclair
West Orange
East Orange
Orange
Irvington
Maplewood
South Orange
Millburn
Short Hills
Summit
Springfield
New Providence
Berkeley Heights
Long Hill
Chatham
Madison
Florham Park
Morristown
Morris Plains
Parsippany-Troy Hills
Randolph
Mendham
Harding Township
Bernardsville
Bernards
Warren
Watchung
Plainfield
North Plainfield
Dunellen
Fanwood
Scotch Plains
Westfield
Clark
Linden
Rahway
Carteret
Woodbridge Township
Old Bridge
Sayreville
South River
Metuchen
Edison
Piscataway
Bound Brook
Middlesex
Somerville
Bridgewater Township
Hillsborough
Manville
Hillsdale
Northvale
Norwood
Closter
Tenafly
Englewood Cliffs
Alpine
Demarest
Cresskill
Dumont
Haworth
Oradell
New Milford
Bogota
Teterboro
Hasbrouck Heights
Wood-Ridge
Lodi
Saddle Brook
Rochelle Park
Maywood
Garfield
Clifton
Passaic
Wayne
Pequannock Township
Riverdale
Butler
Kinnelon
Boonton
Rockaway
Rockaway Township
Wharton
Mine Hill Township
Dover
Denville
Jefferson
Farny State Park
Oakland
Wyckoff
Ridgewood
Glen Rock
Hawthorne
Fair Lawn
Paramus
Bergenfield
Great Piece Meadows
Totowa
Woodland Park
Fairfield
Little Falls
Teaneck
Englewood
Hackensack
Teterboro
Clifton
Passaic
East Rutherford
Montclair
Bloomfield
West Orange
East Orange
Kearny
Secaucus
North Bergen
Union City
Weehawken
West New York
Guttenberg
Edgewater
Cliffside Park
Fairview
Ridgefield
Ridgefield Park
Little Ferry
Moonachie
Carlstadt
Lyndhurst
Harrison
Belleville
Nutley
Glen Ridge
Maplewood
South Orange
Short Hills
Millburn
Irvington
Union
Springfield
Summit

What’s the default number of bathtubs to buy?



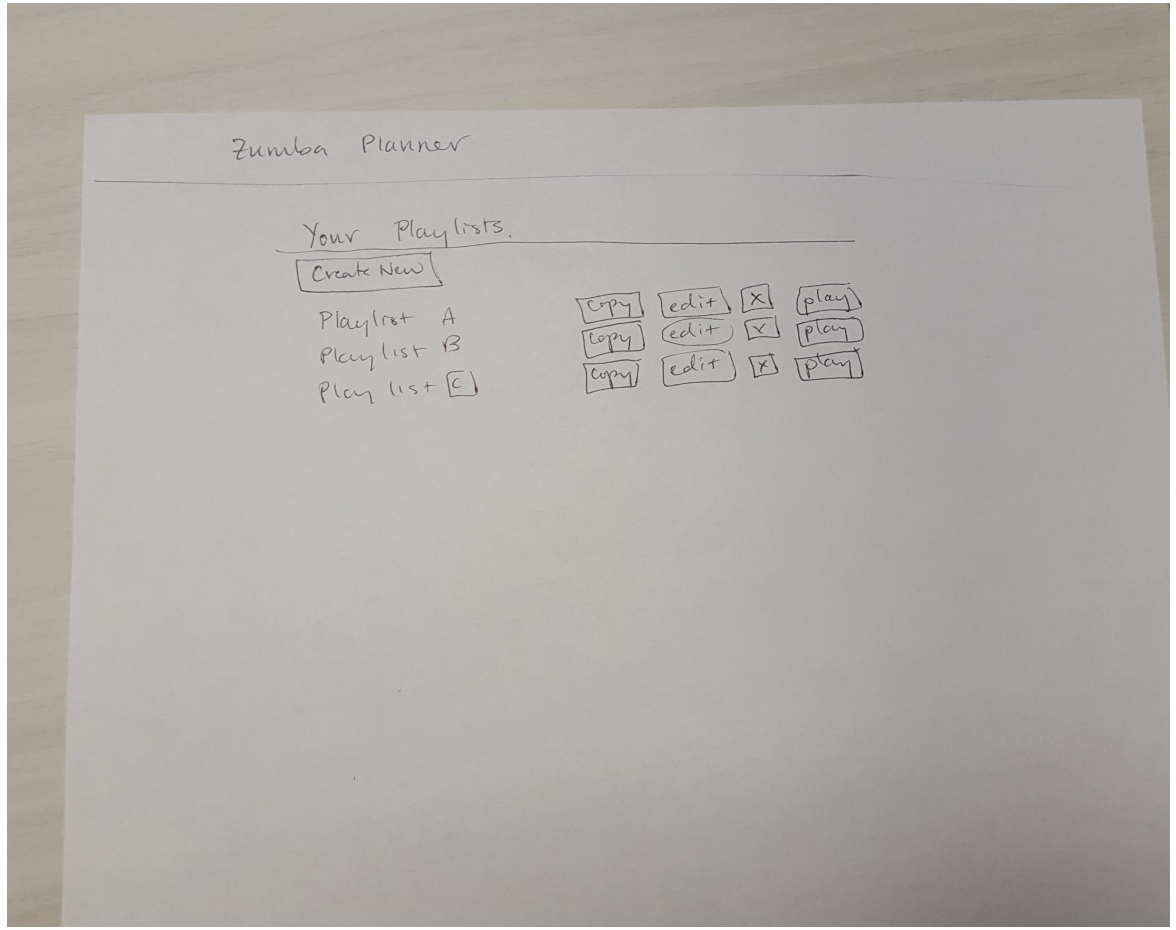
Paper Prototype Example

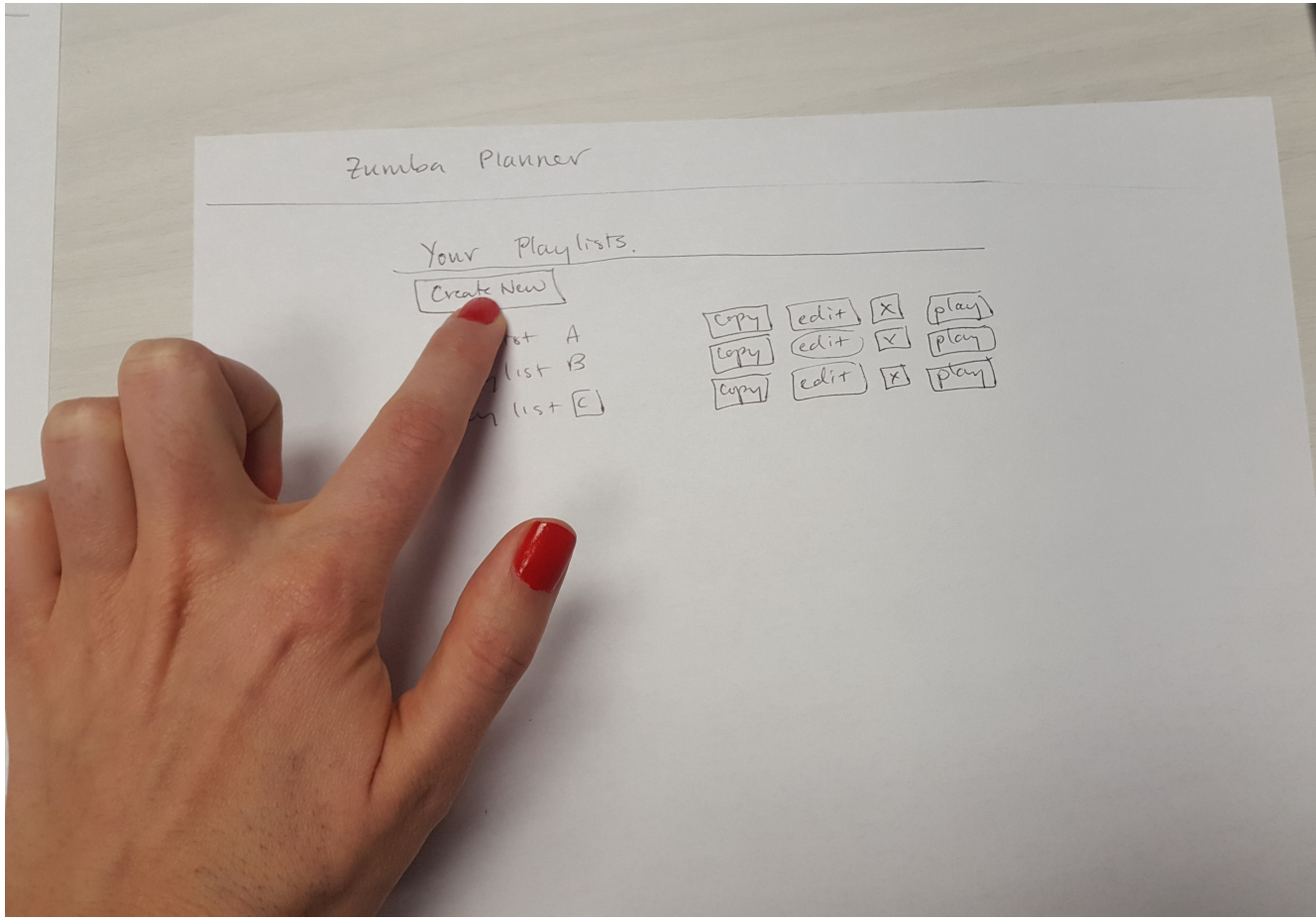
Write down a Persona:
Person, a high level Goal, 4 or 5 subgoals

- **Idea**: Zumba playlist maker
  - **Person**:
    - You are Katie - a Zumba instructor in New York City.
  - **Goal**
    - Your goal is make a playlist of dance songs that last 20 minutes (at least 19 minutes and at most 21 minutes)
  - **Subgoals**:
    - 1. Create a new playlist
    - 2. Add a song to the playlist
    - 3. Add songs to the playlist until the play list is at least 20 minutes long
    - 4. If the playlist is too long, remove a song
    - 5. Play the playlist

Subgoal 1:

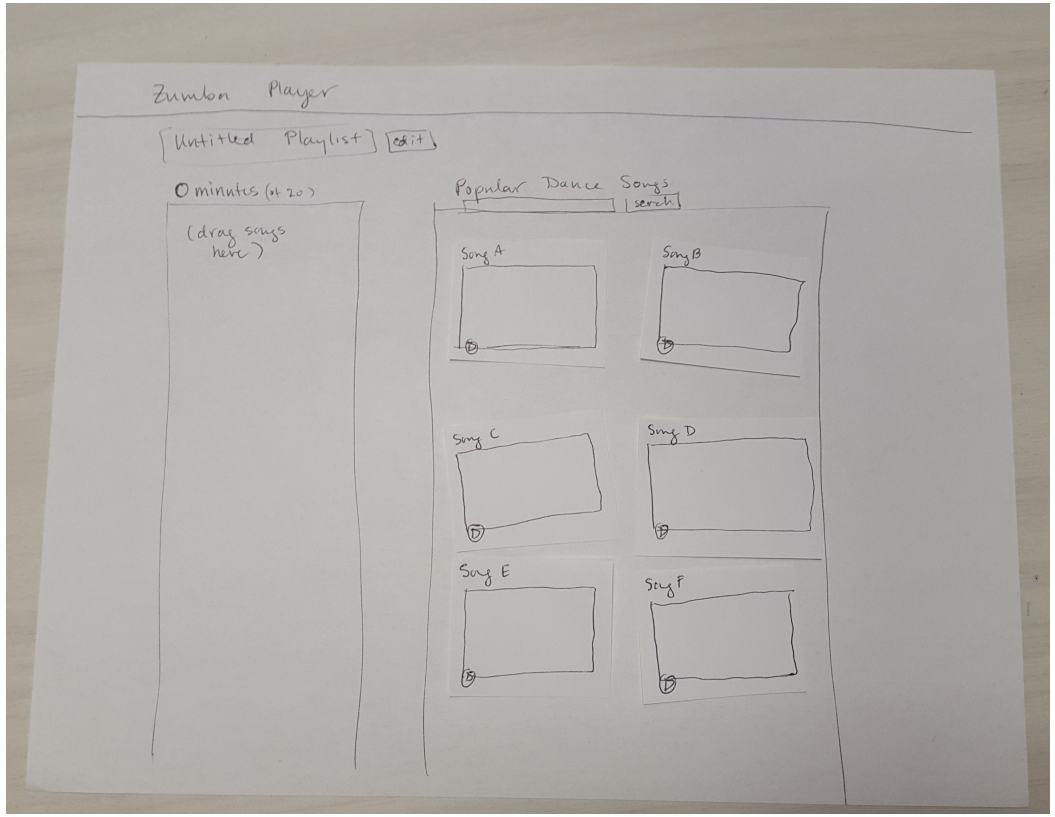
Create a new playlist

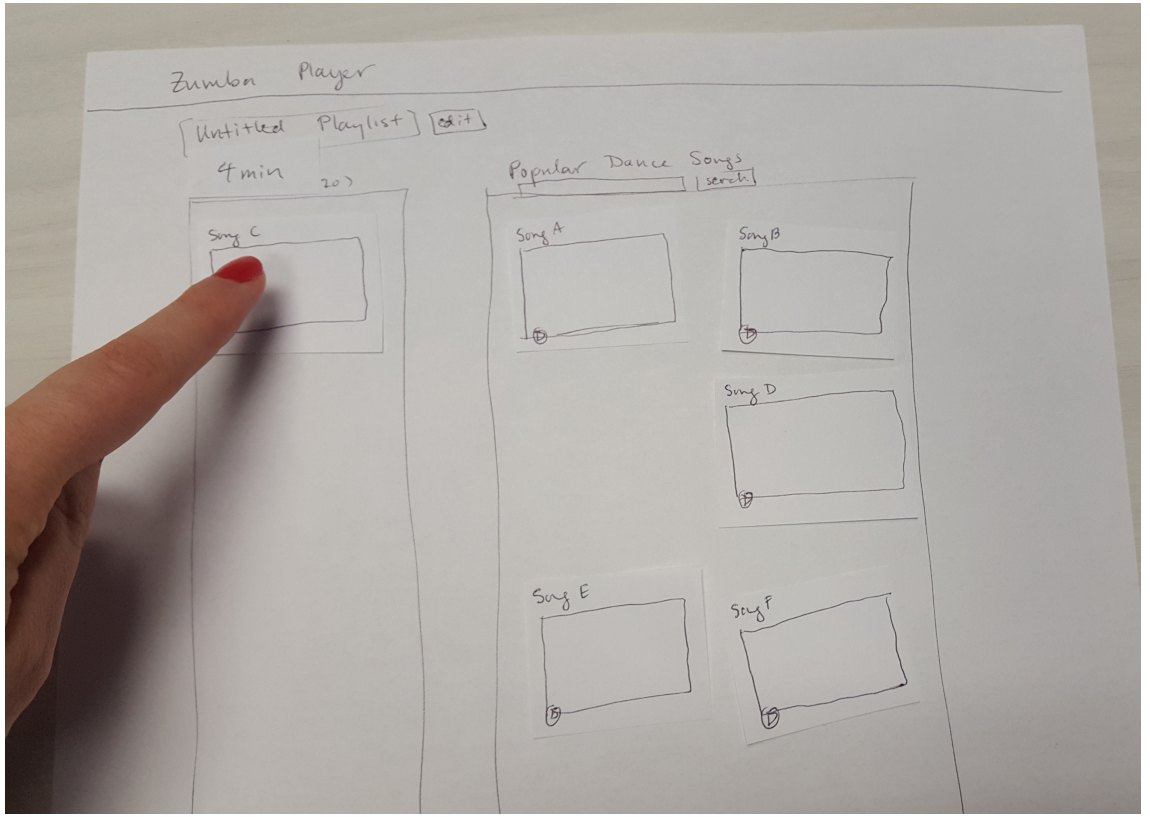




Subgoal 2:

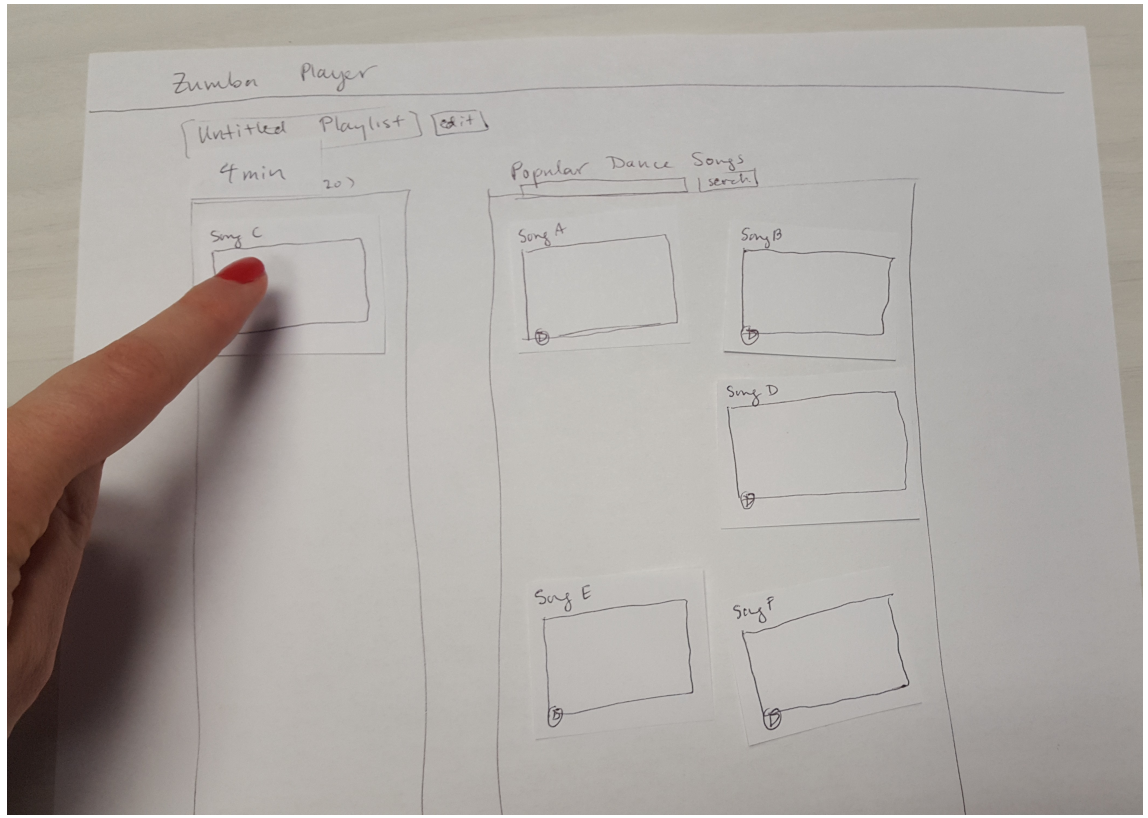
Add the first song to the playlist

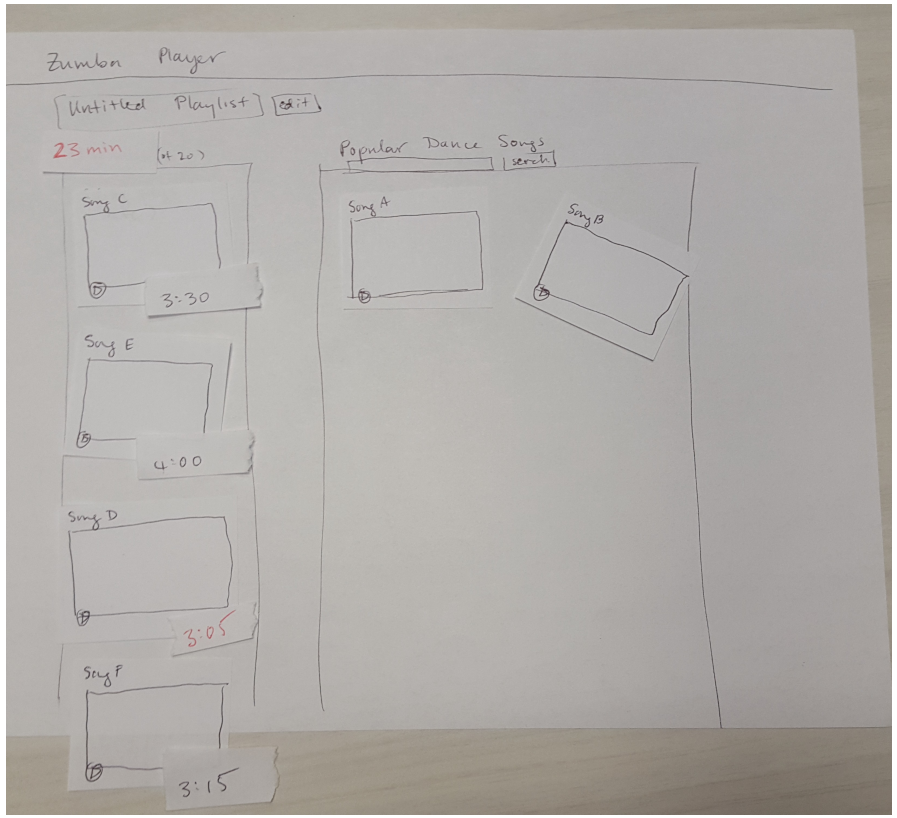




Subgoal 3:

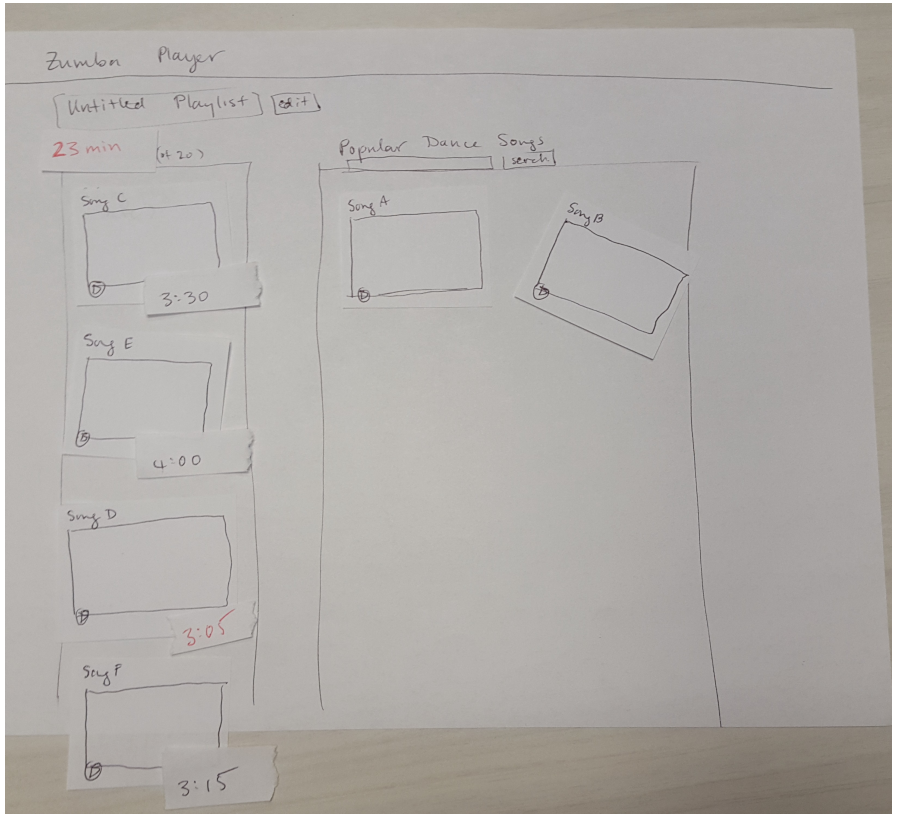
Add songs until the playlist is at least 20 minutes.

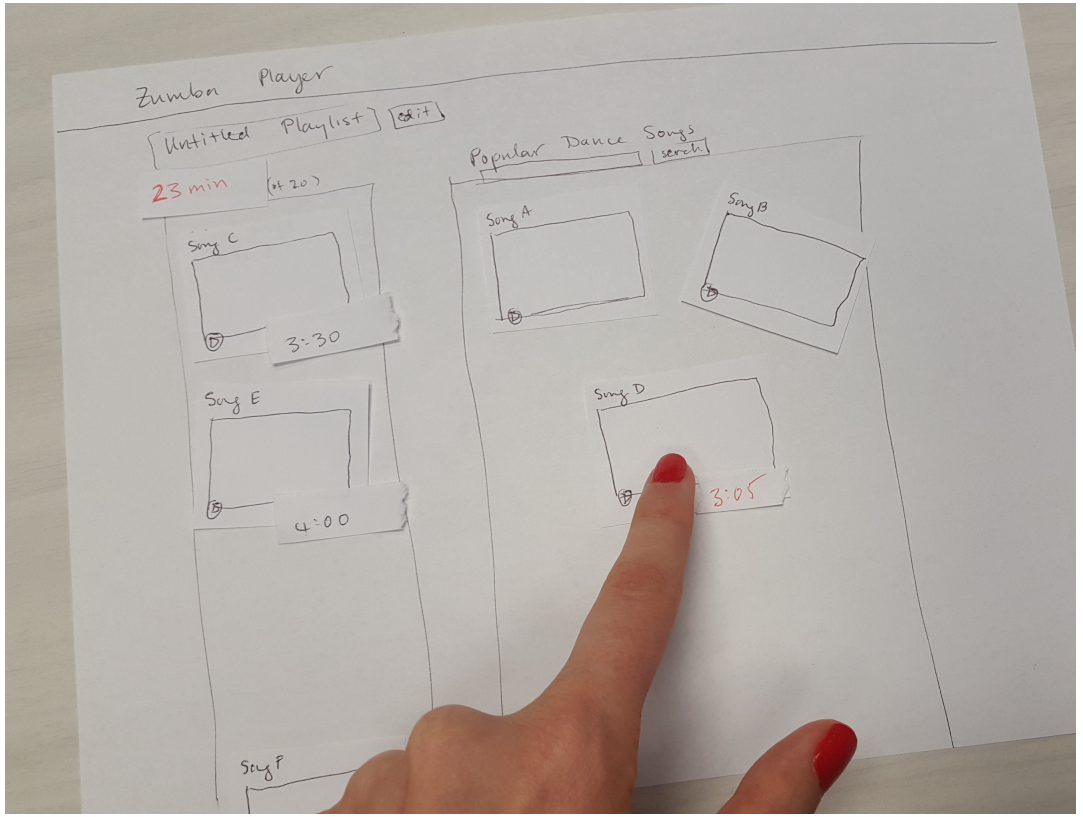




Subgoal 3:

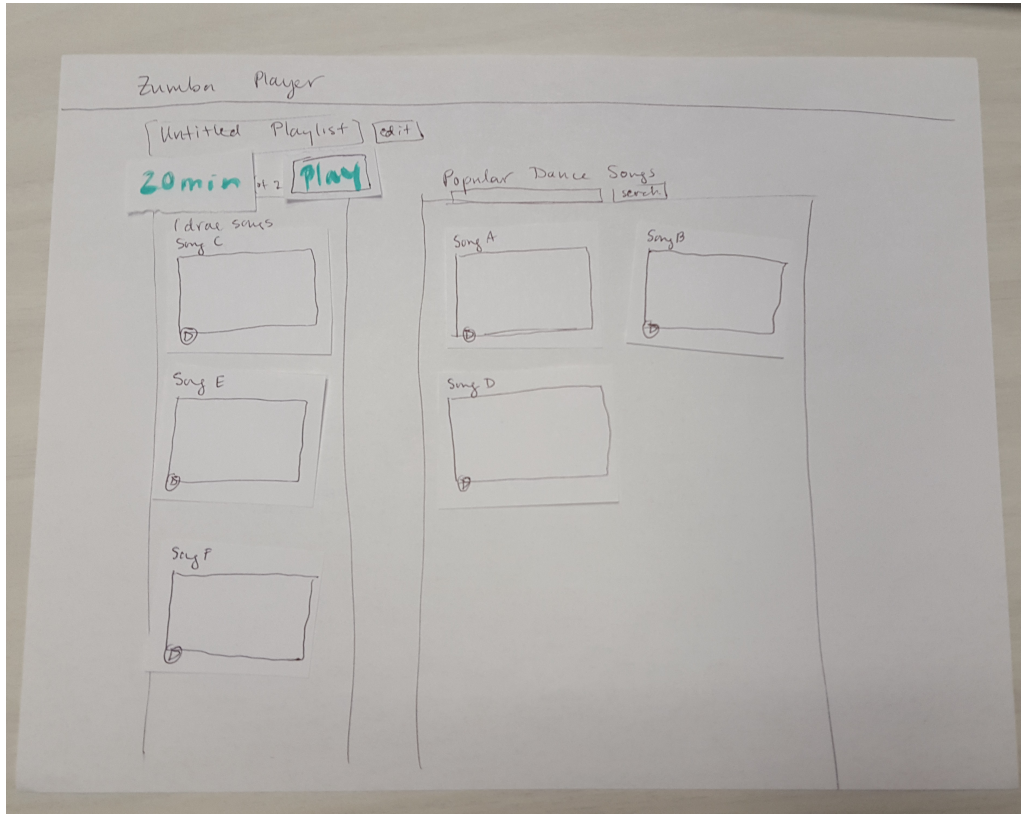
Remove songs until the playlist is 19-21 min

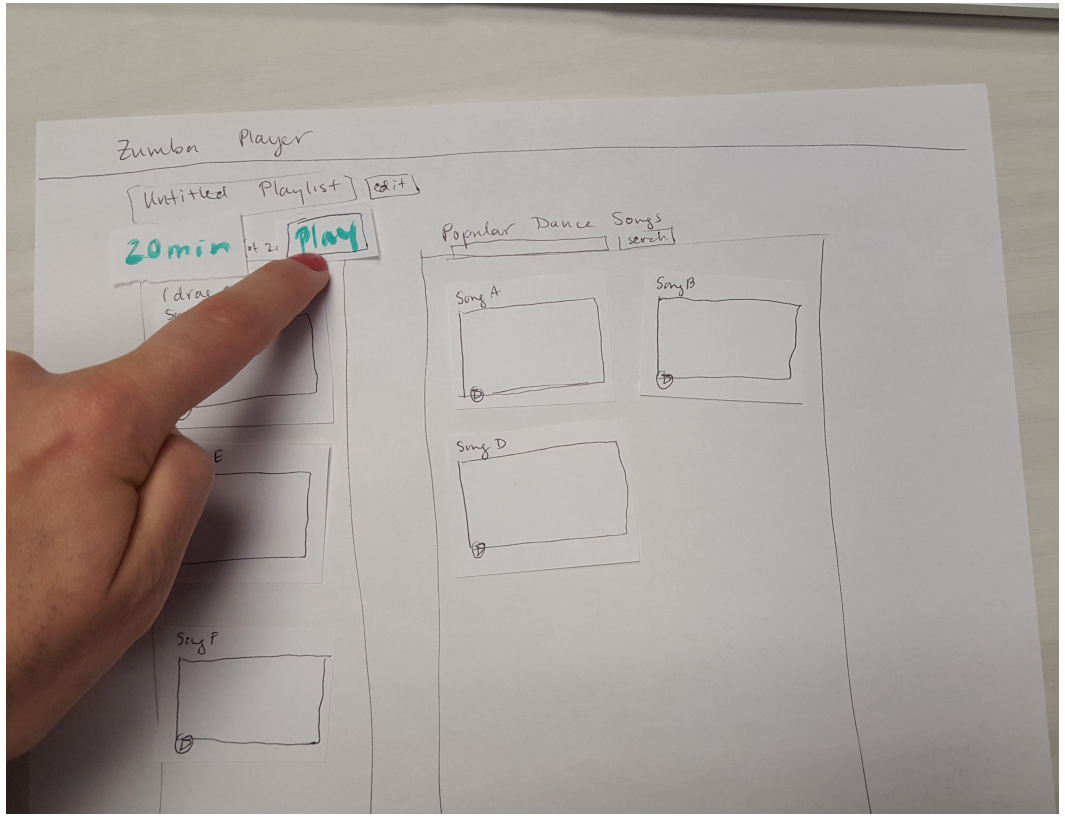




Subgoal 5:

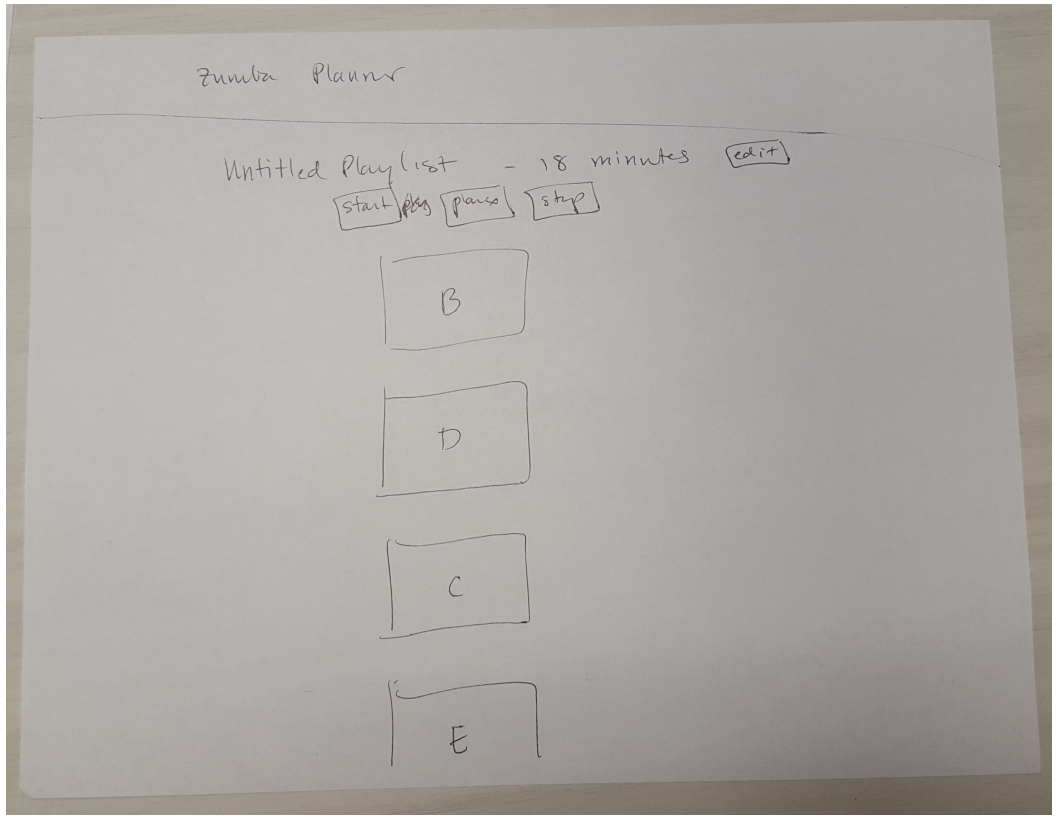
Play the playlist (part 1)

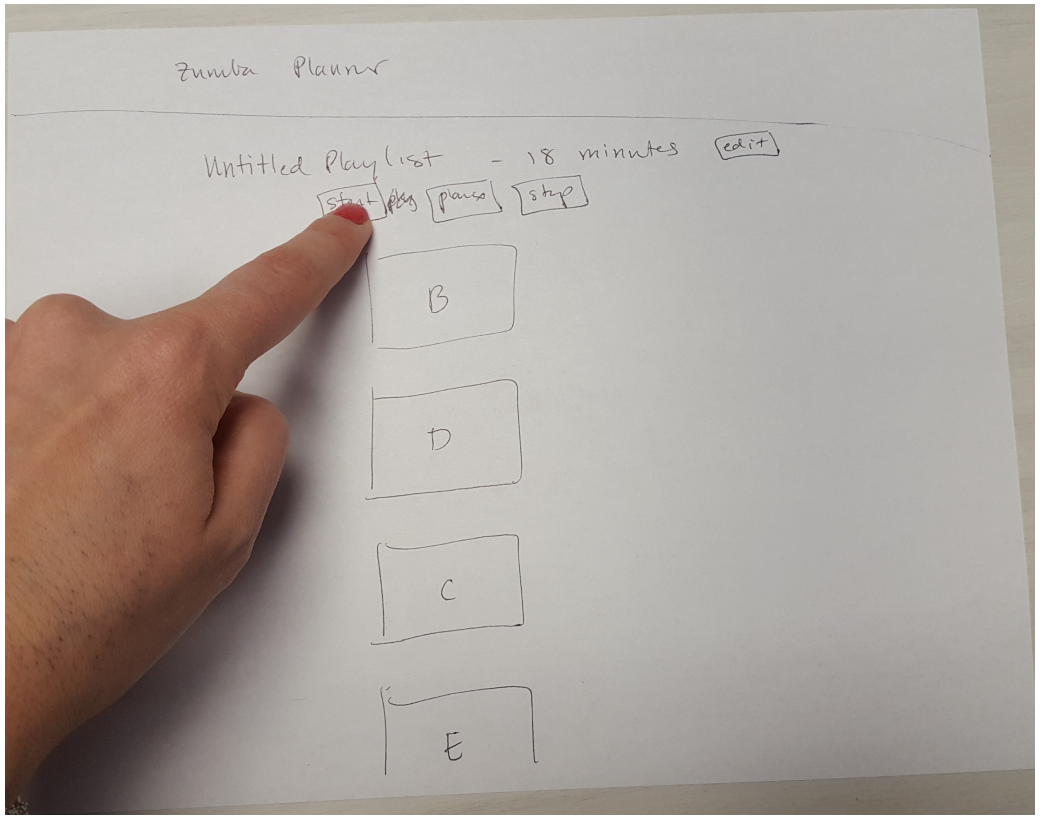




Subgoal 5:

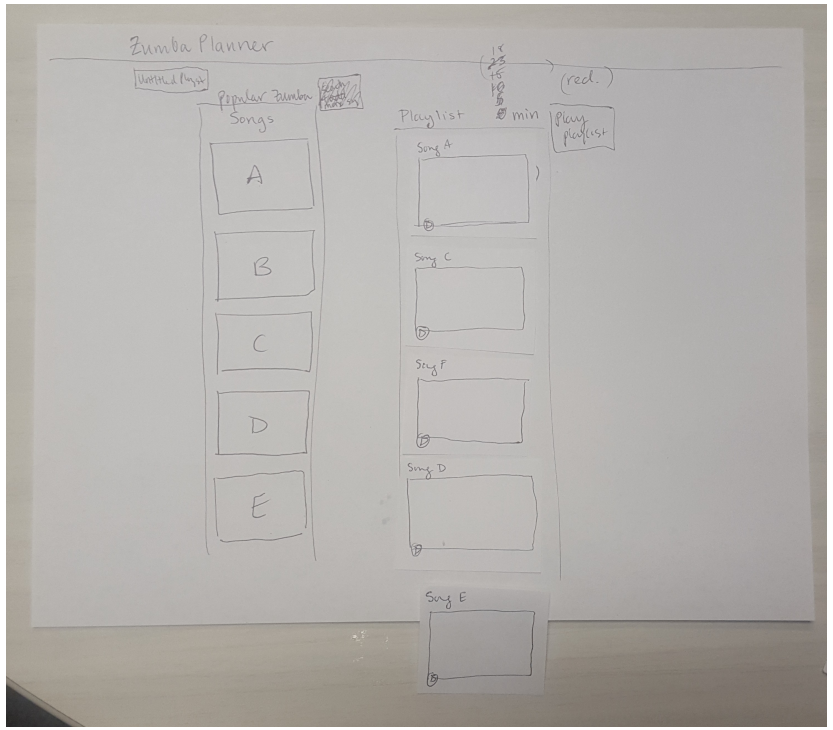
Play the playlist (part 2)

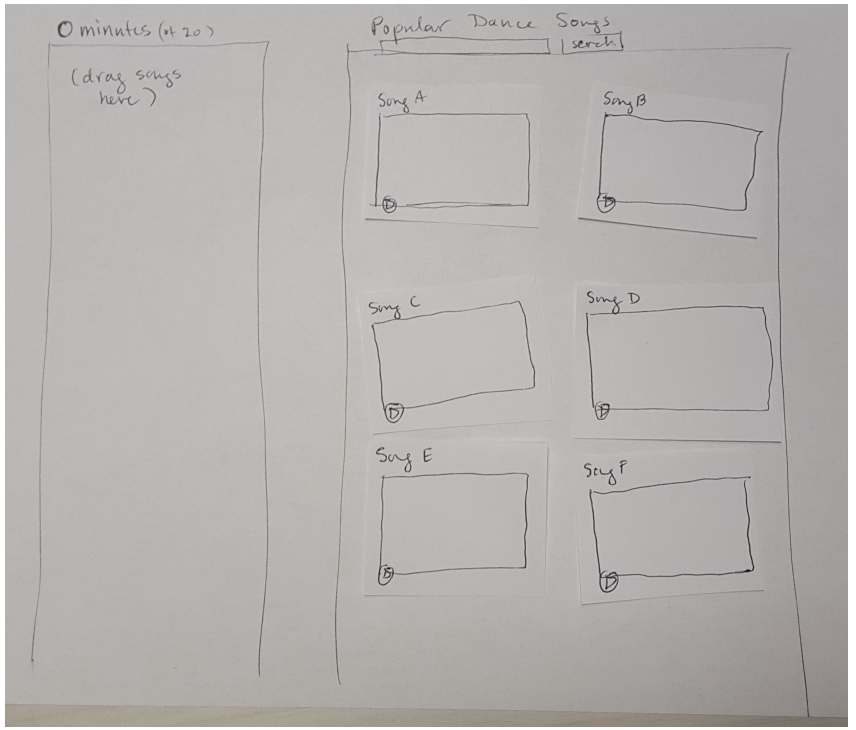




You will probably learn as much from
making the prototype,
as you will from running it.

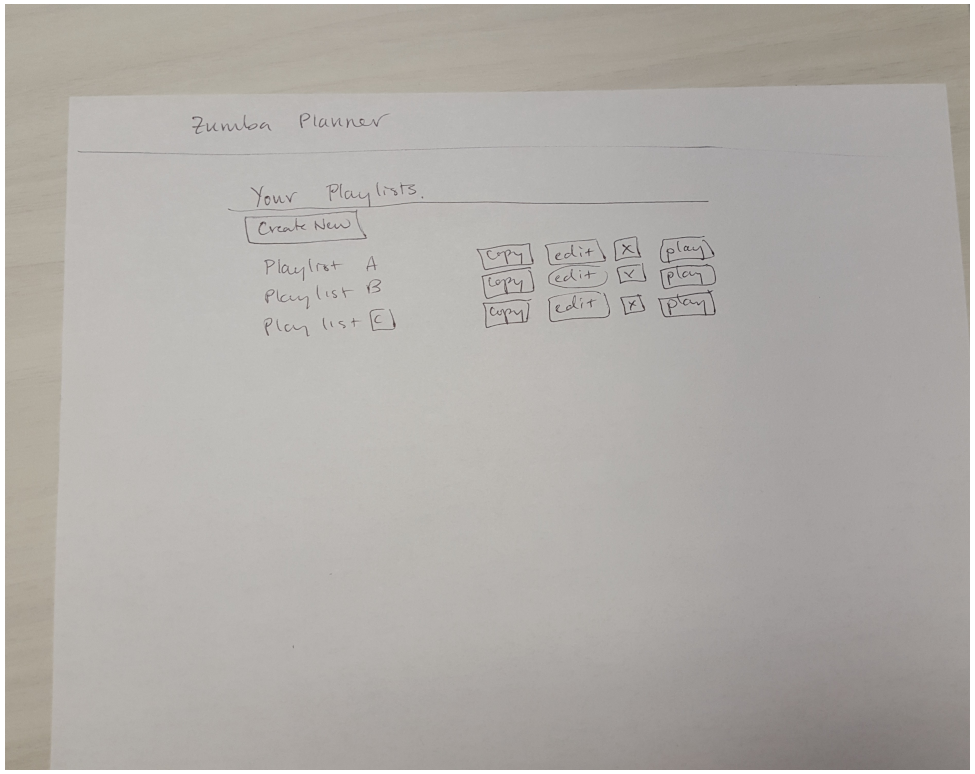
I started with the the playlist drag interface…

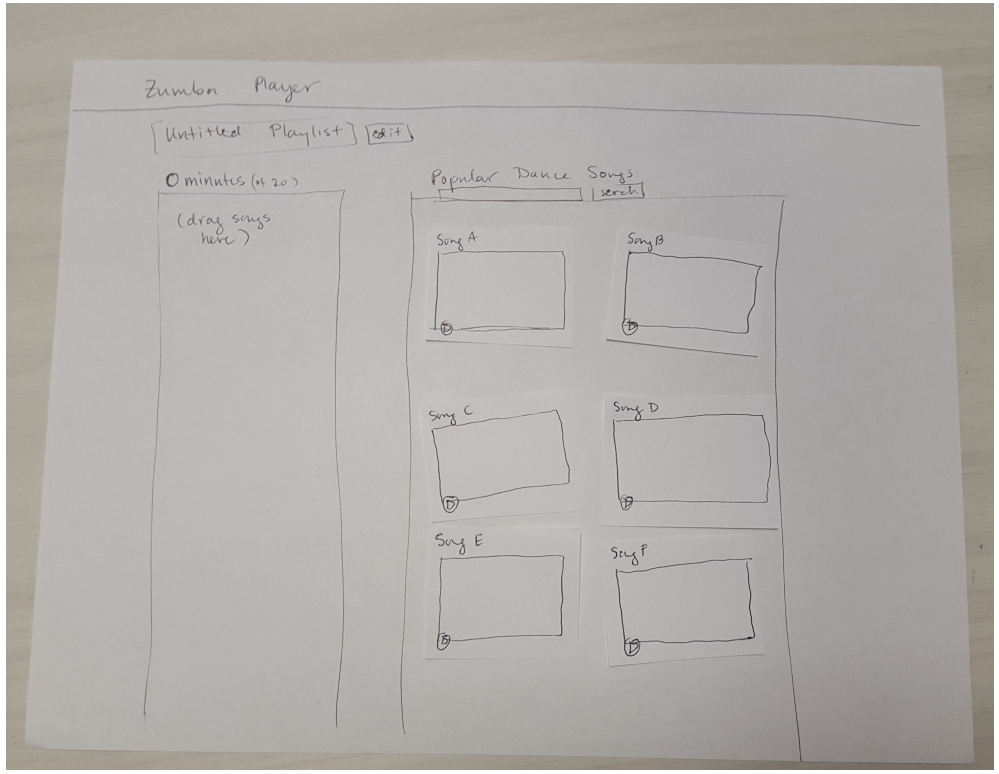




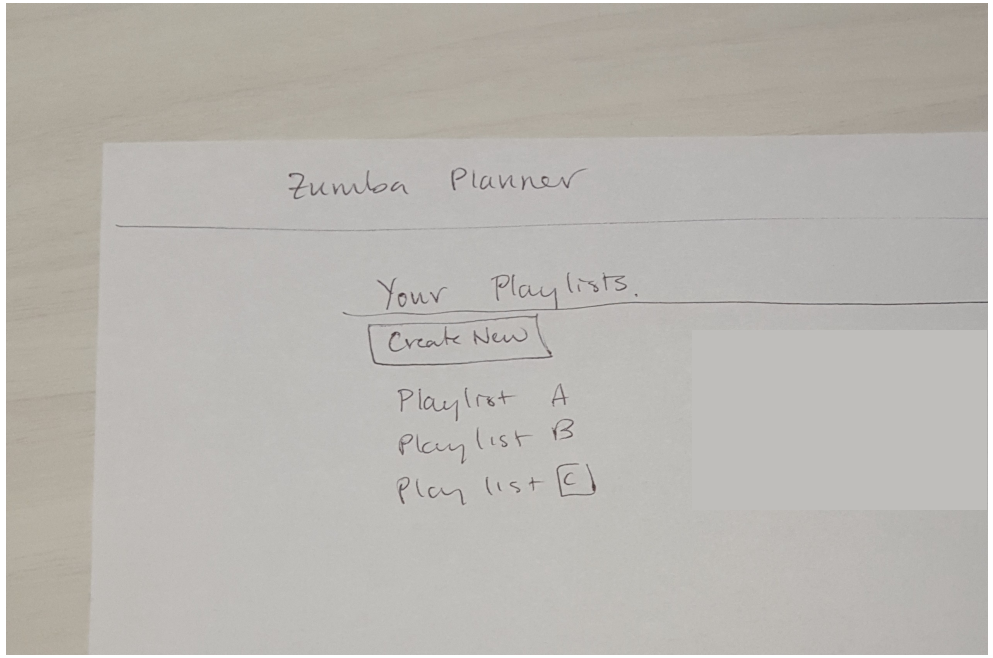
And I realized I needed more songs to pick from, so I made the songs to pick from 2 columns.

I learned that playlists need names





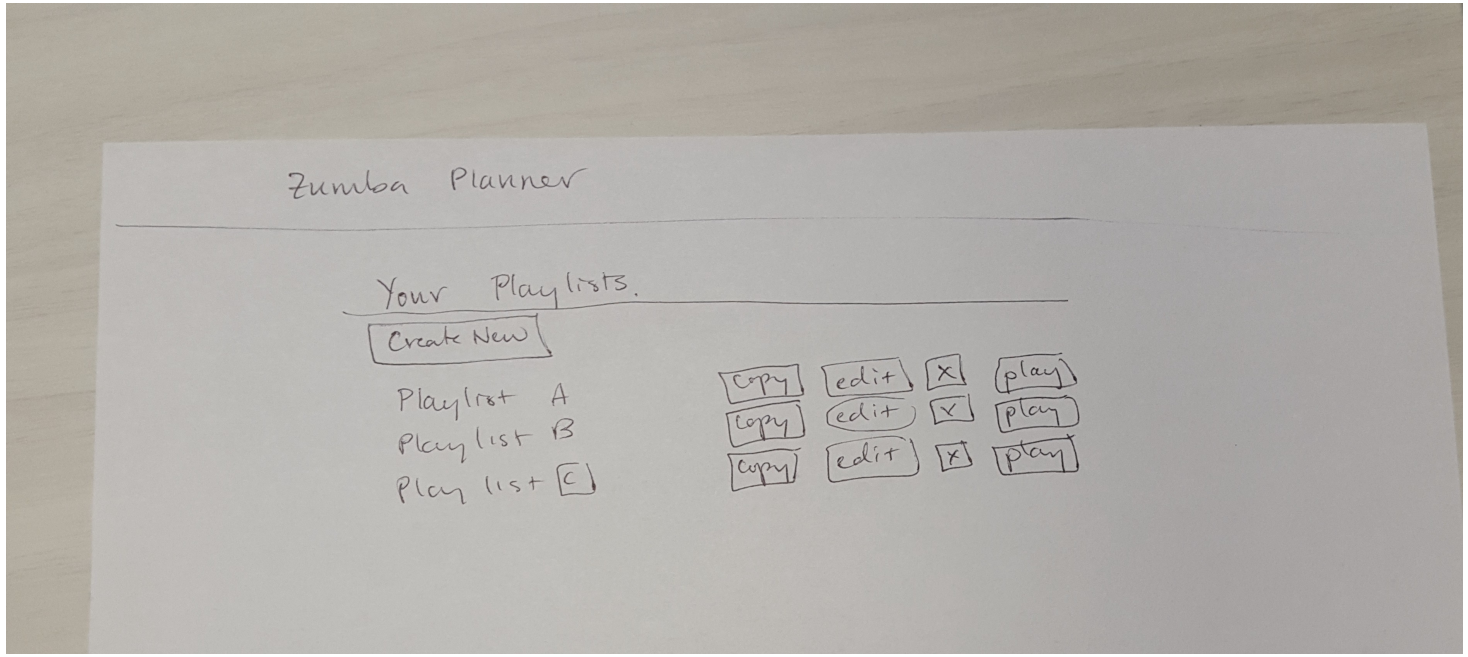
I realized I needed a homepage to create playlists from…. And also probably list the previous ones.



I realized I'd need CRUD operations

(create, read, update and delete)

on the list of playlists

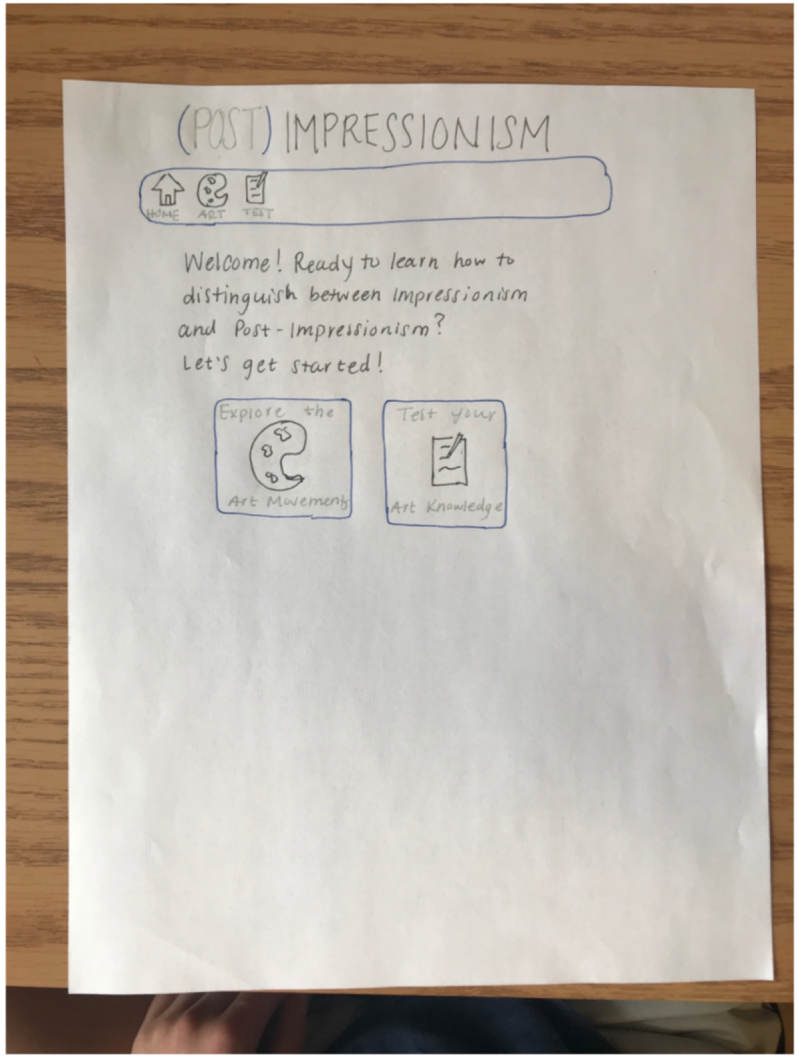


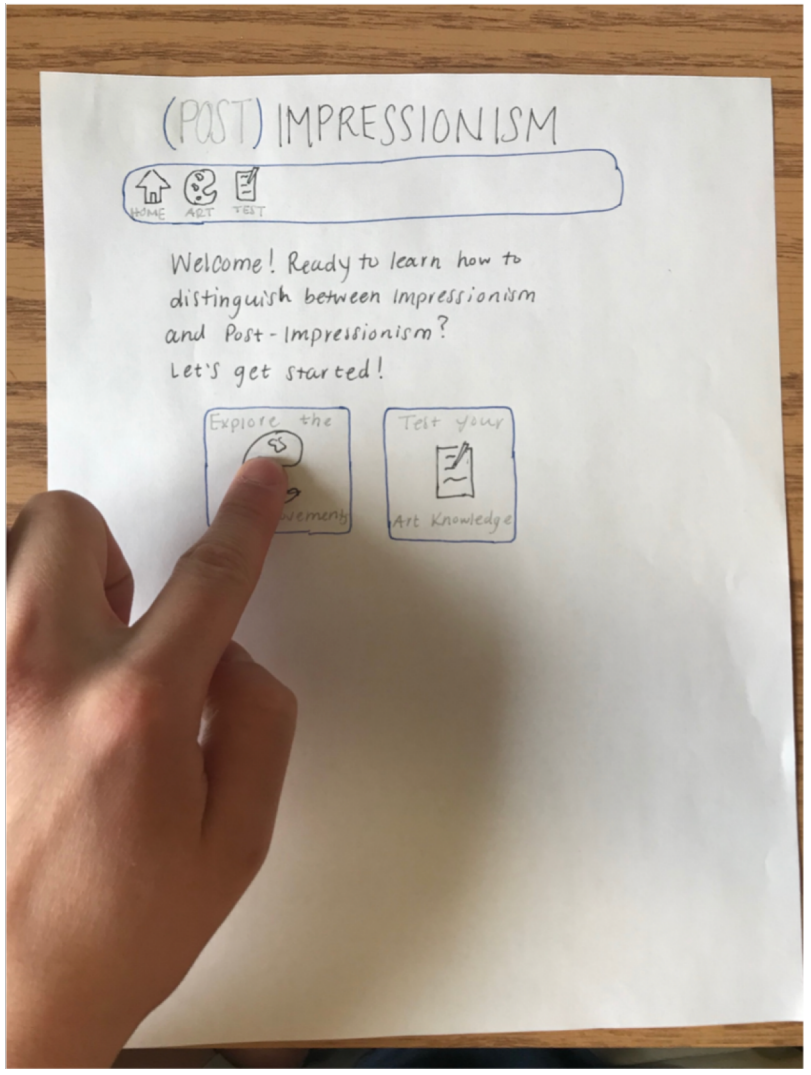
Sam’s Paper Prototype

Person, a goal, 4 or 5 subgoals

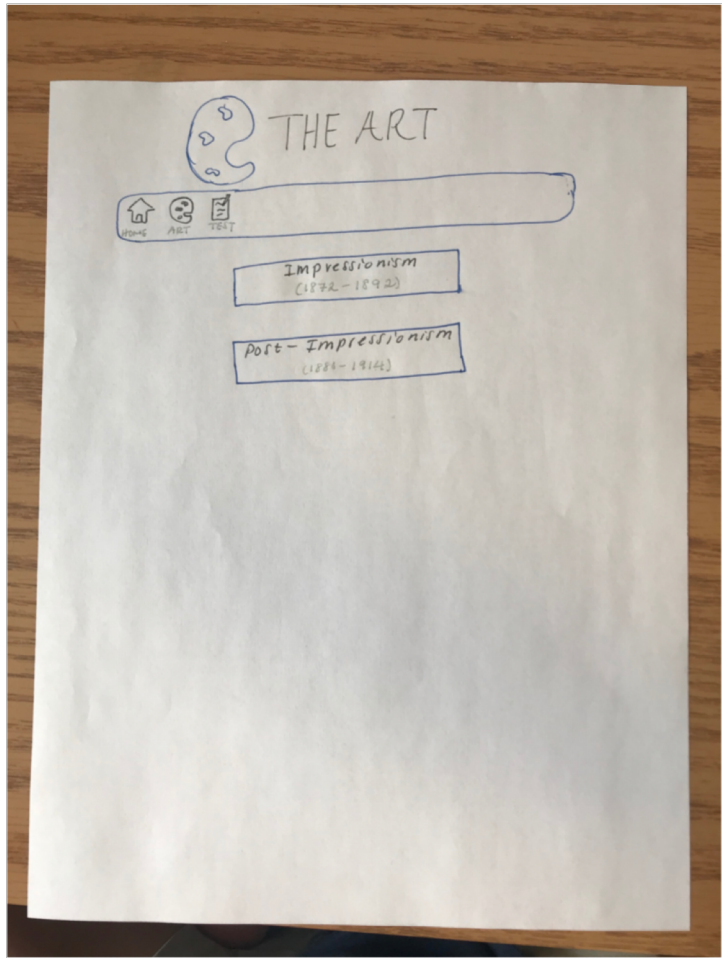
- **Idea**: Learn to tell the difference between impressionism and post-impressionism
  - **Person**:
    - You are David – a Columbia Student new to NYC who loves museums. He likes art but would like to know more about the modern movements which seems confusingly similar to him.
  - **Goal**
    - Be able to determine whether a paining is impressionist or post-impressionist and say why.
  - **Subgoals**:
    - 1. Learn the major hallmarks of impressionism
    - 2. Learn the major hallmarks of post-impressionism
    - 3. Take a quiz with 10

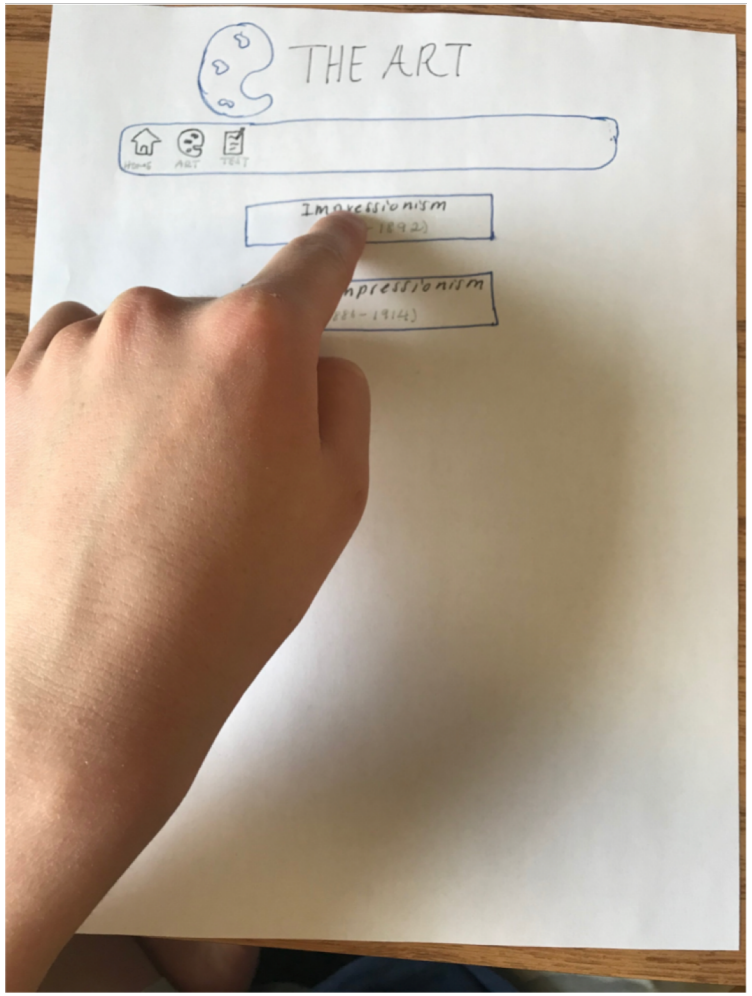
1. Home Screen





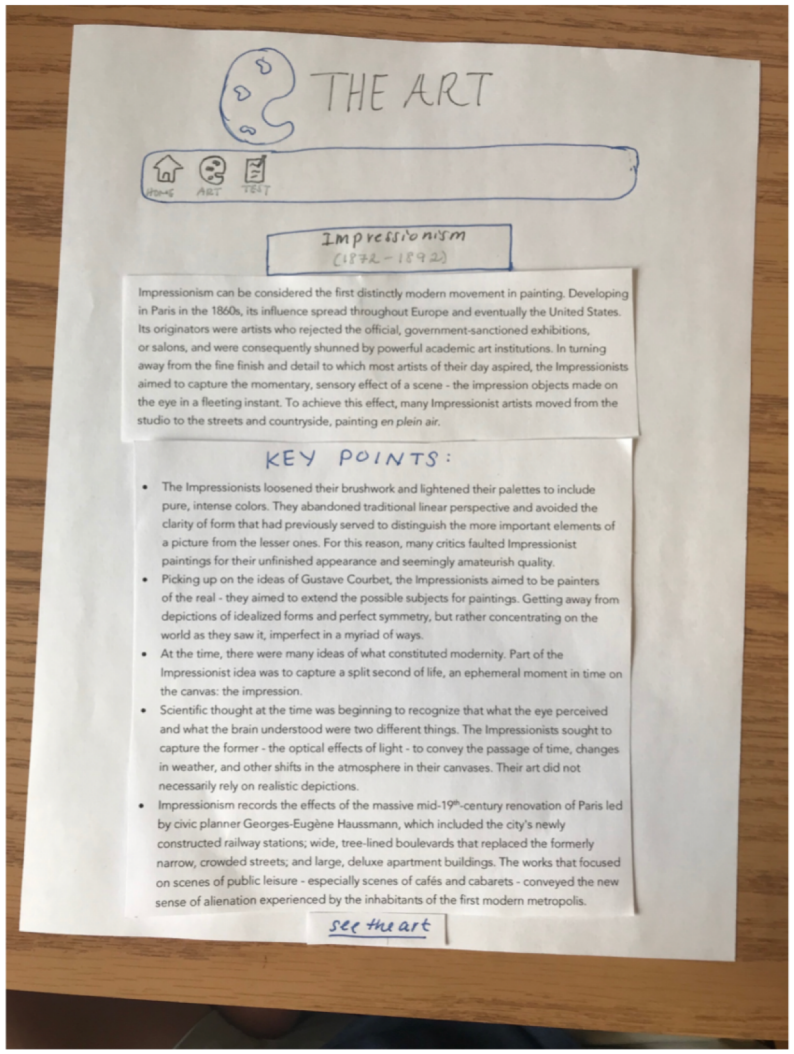
Select a lesson

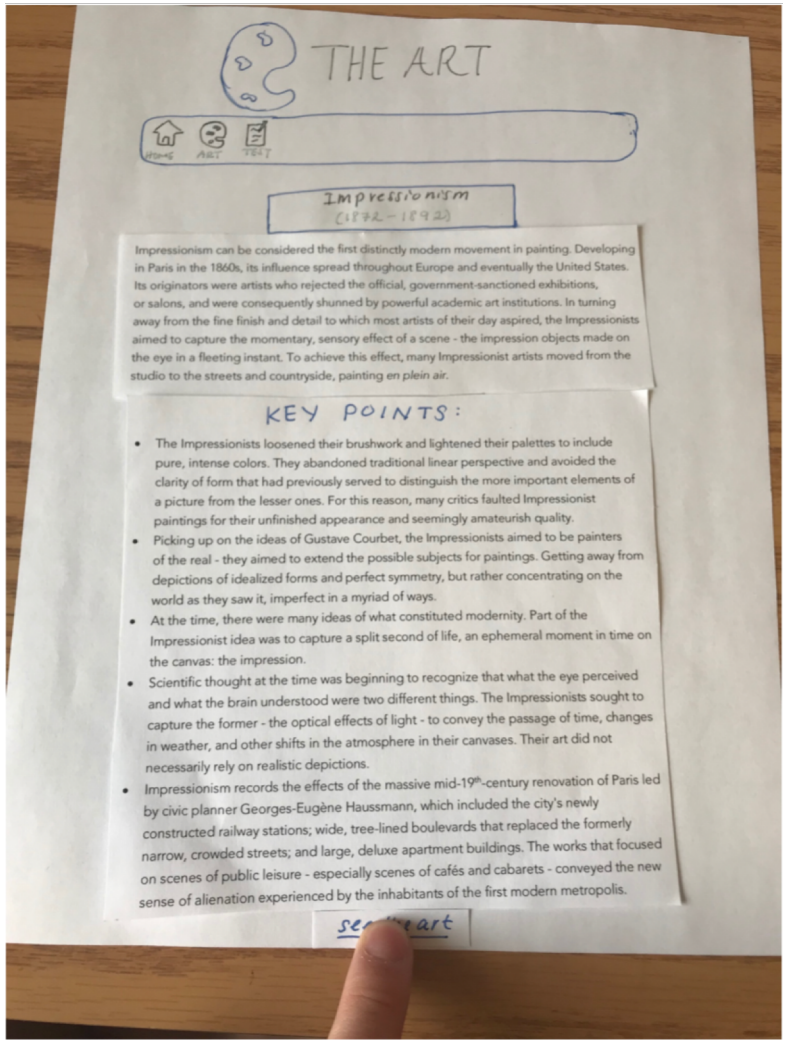




Note: this page is weirdly sparse

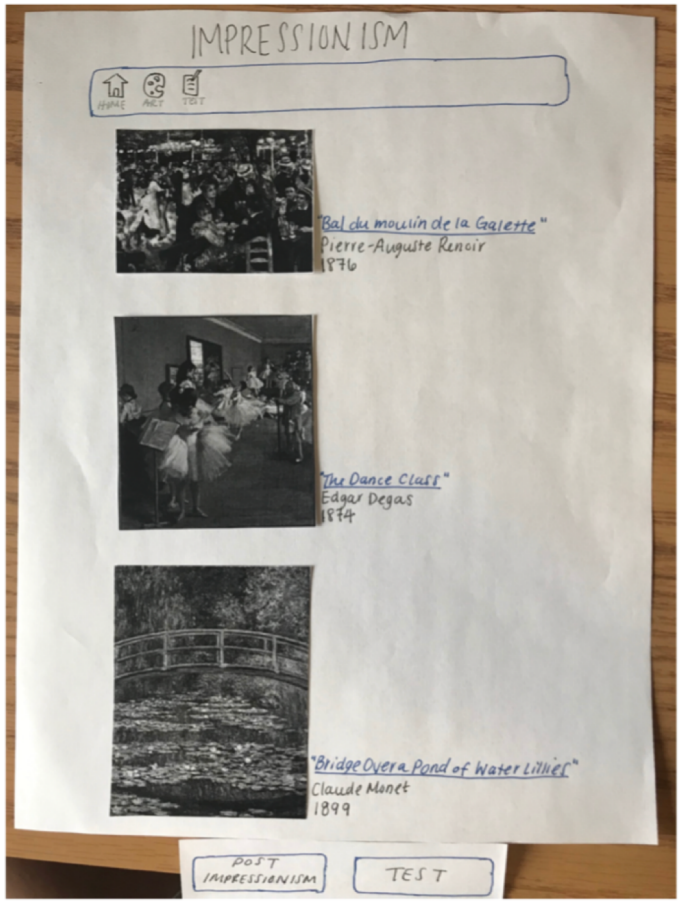
Learn Impressionism

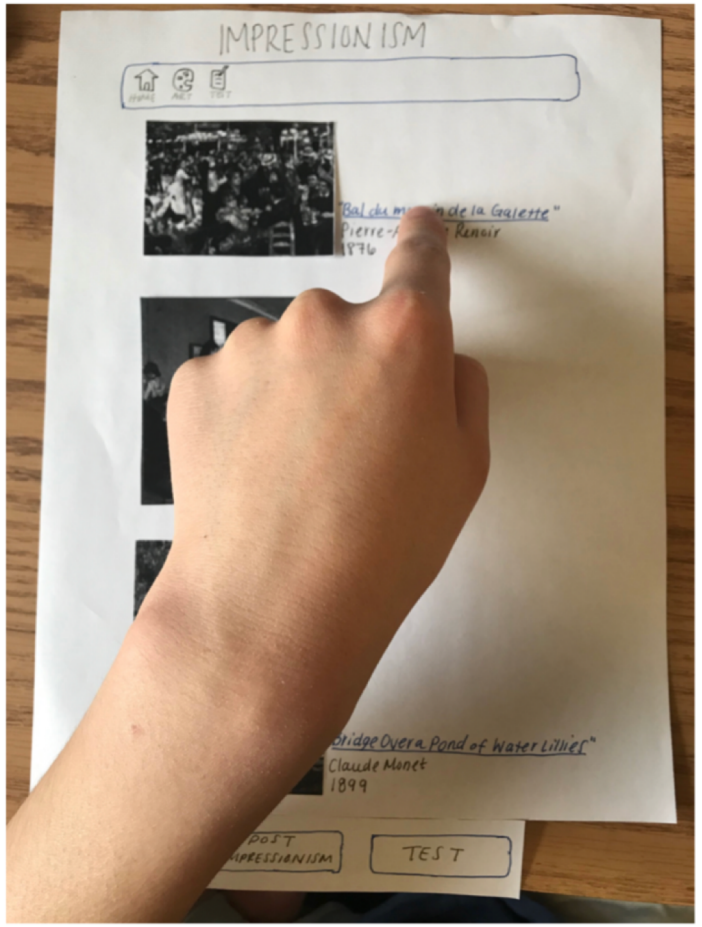


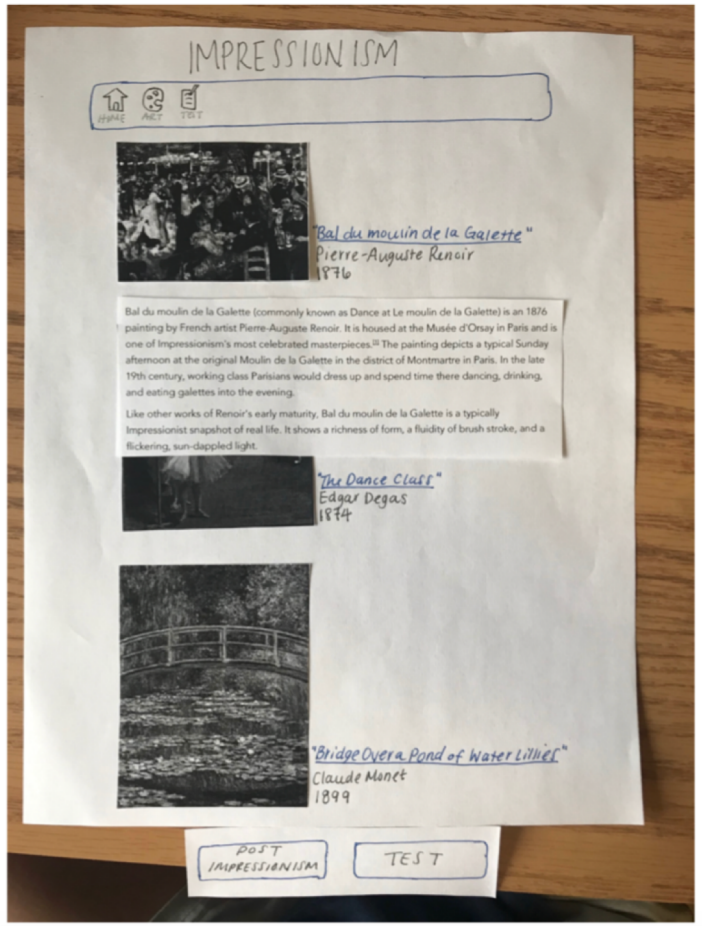


Hmm.. People aren't really reading this… maybe they need to see art as they read

See art examples

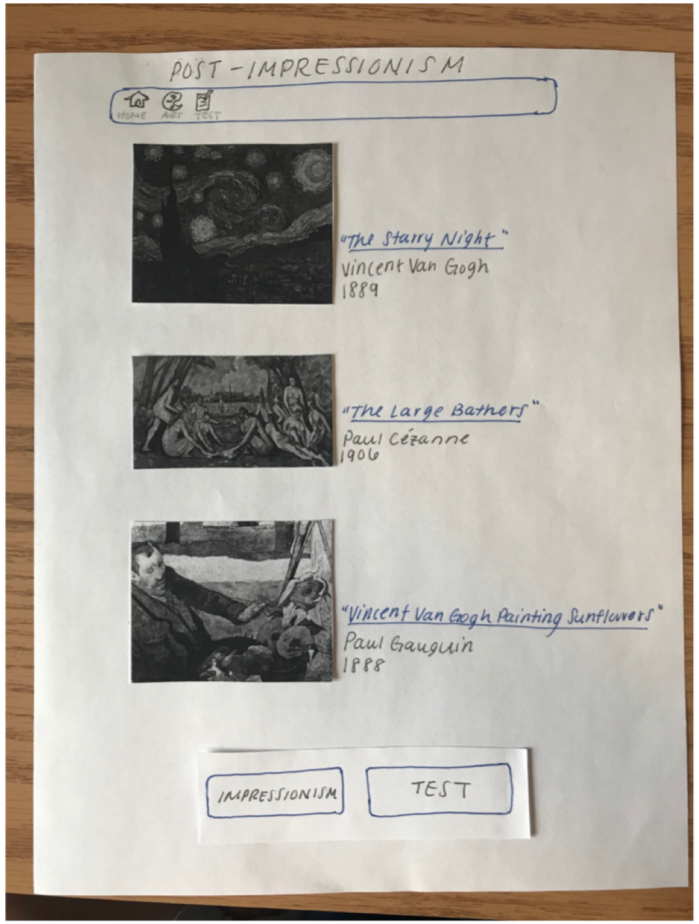


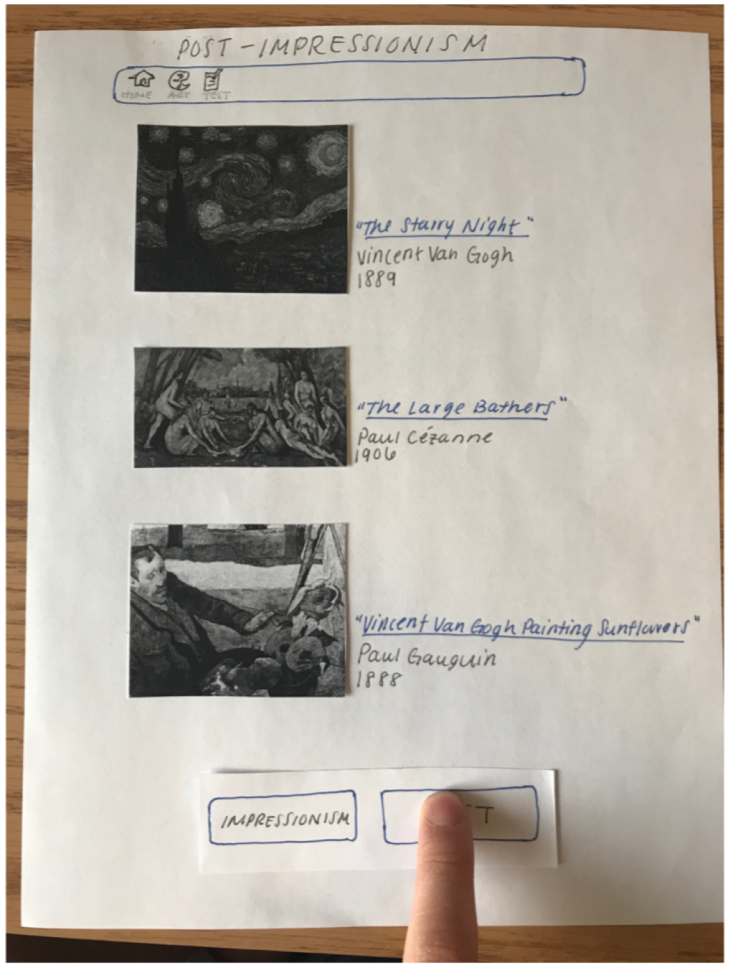




I didn't know you could click that!

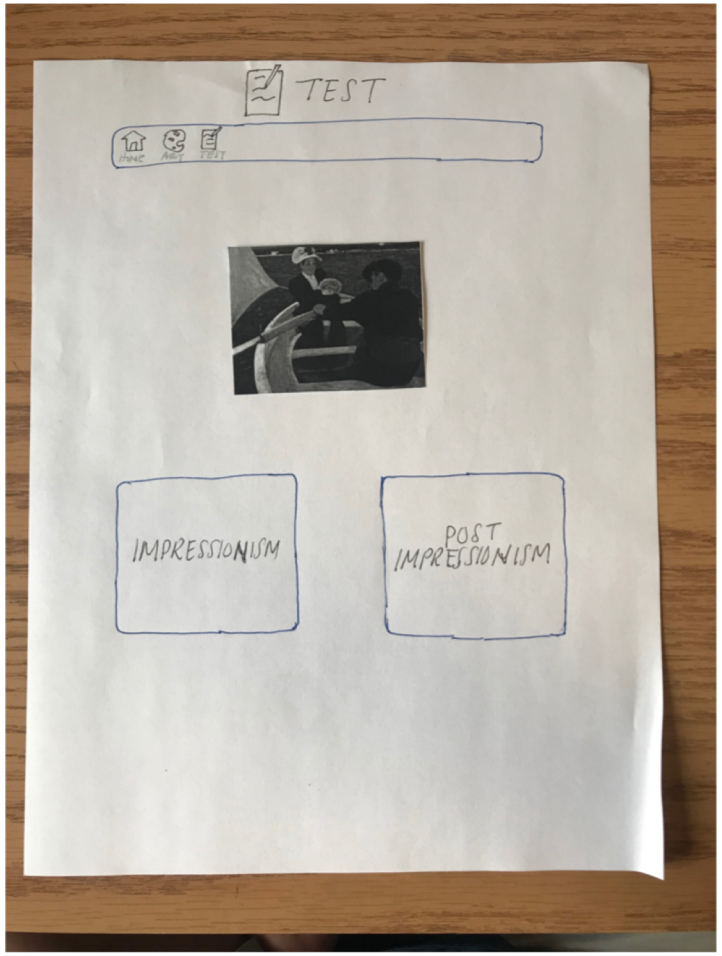
Learn post-impressionism

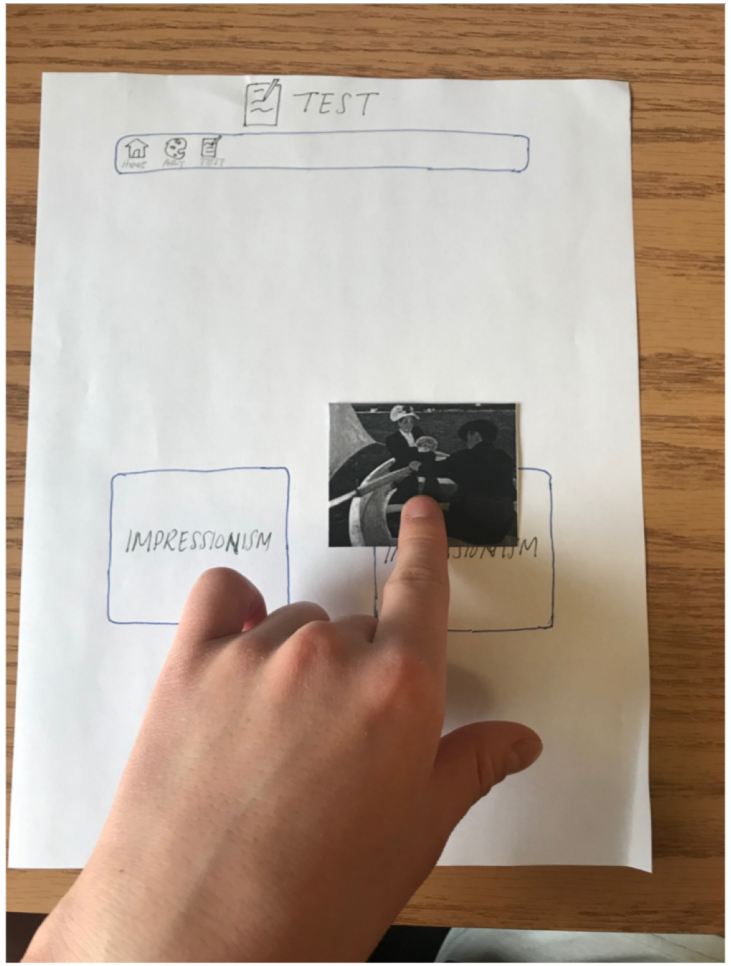




Oh shit! I forgot the overview!

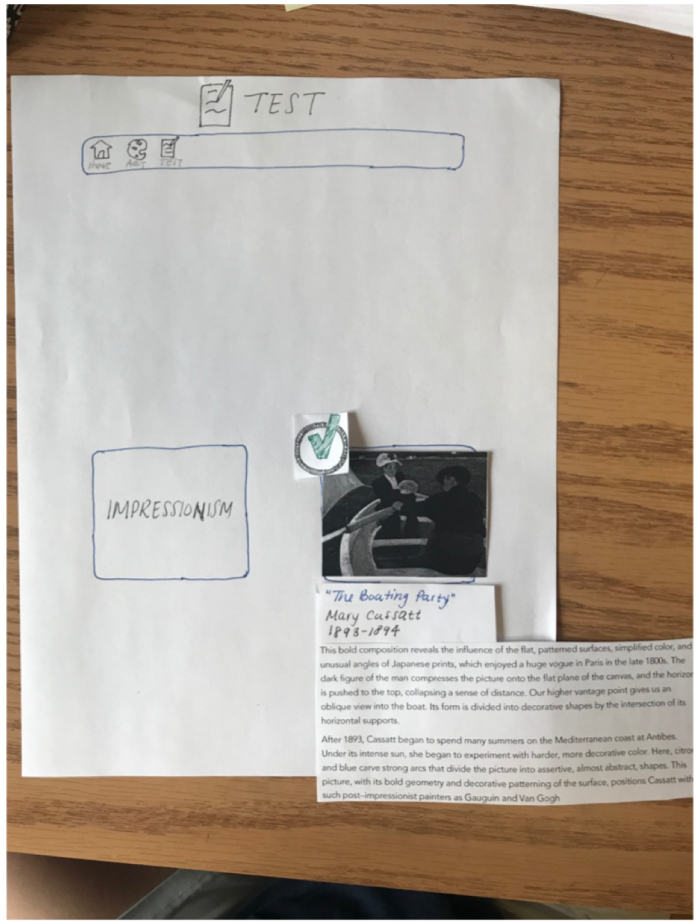
First Quiz Question





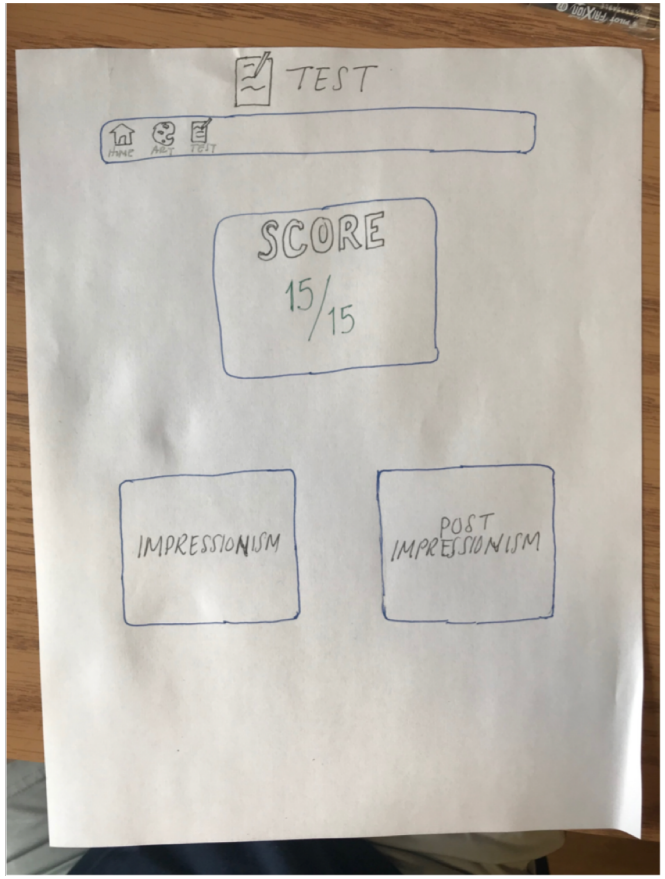
People like dragging!

Feedback



People like immediate feedback, but don’t read the text

Feedback.

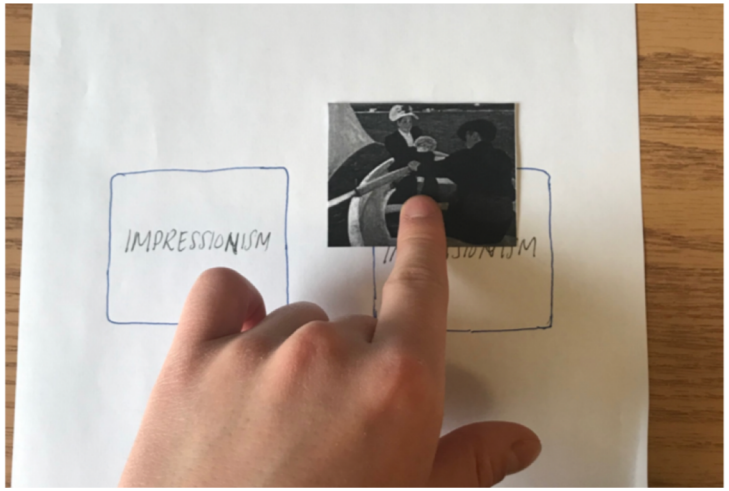


Where do I go next?

Feedback summary: what did he learn?

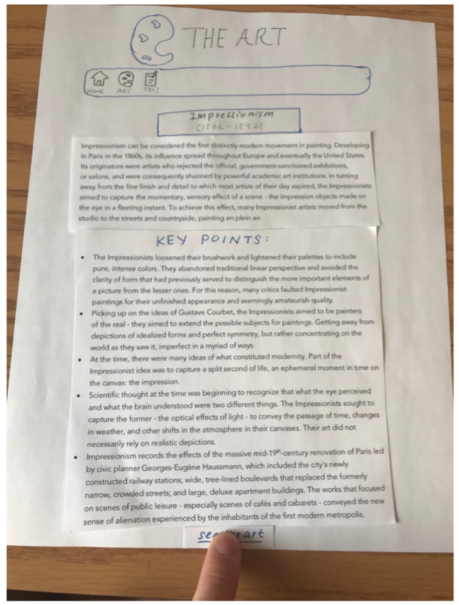
Good:

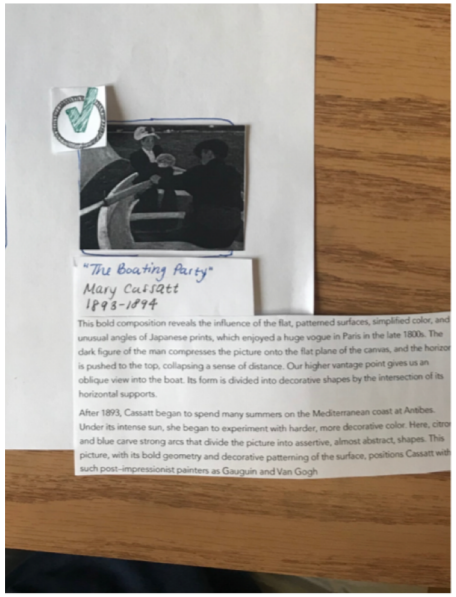
- People like the quiz. Drag and drop was easy and fun.



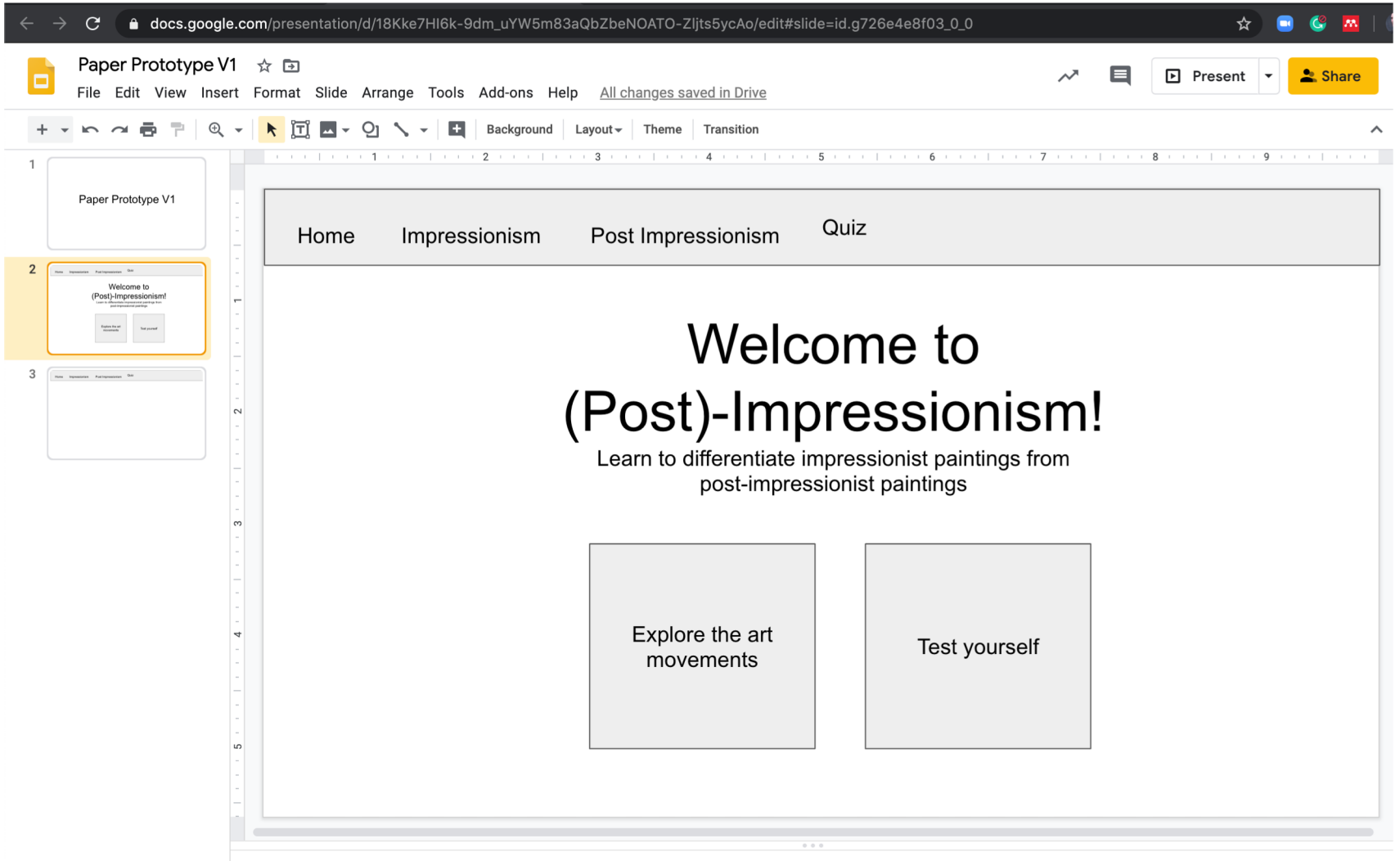
Bad:

- People don't read long blocks of text.

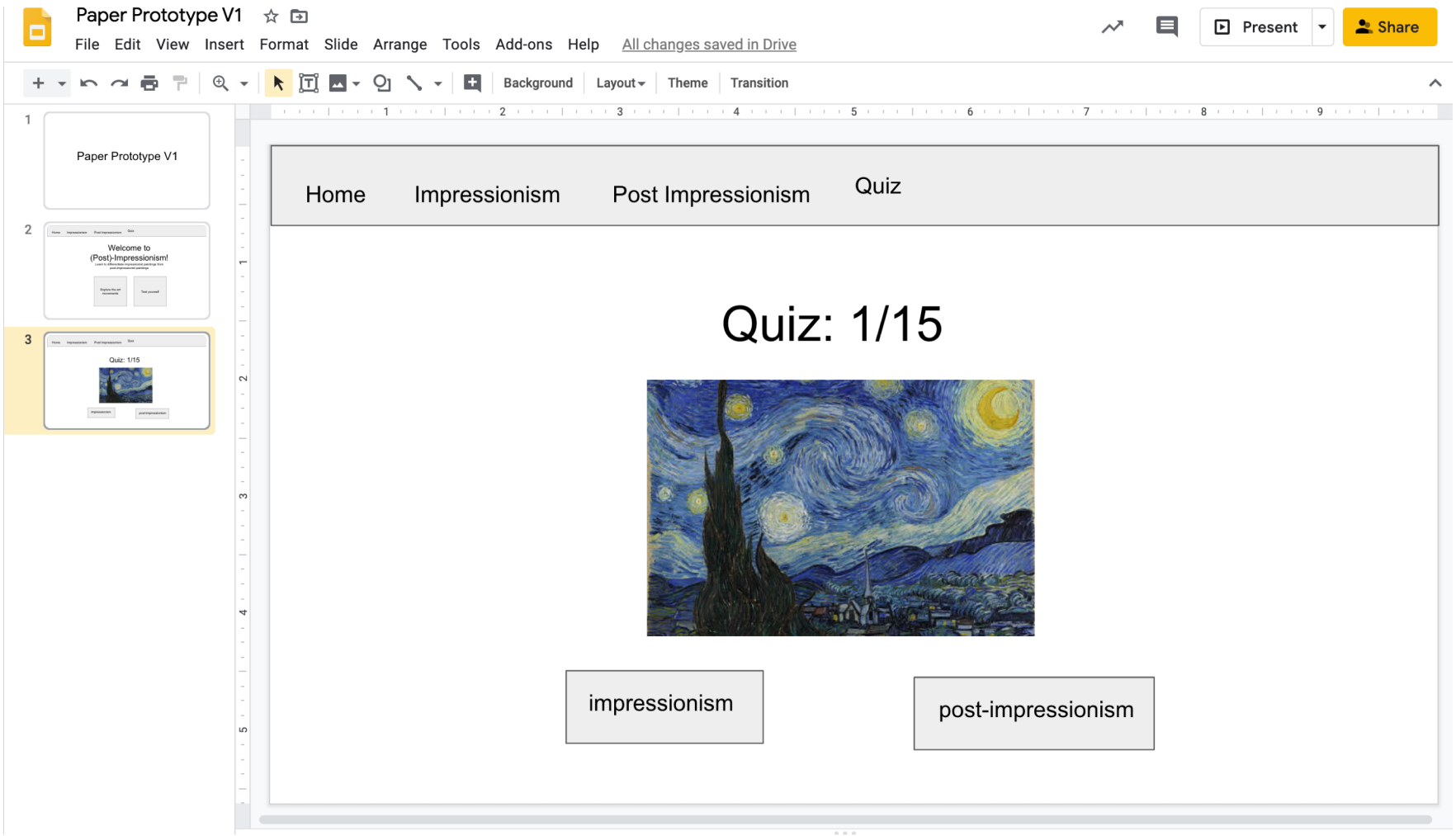




In this class, instead of a paper prototype, we will use a Google Slides prototype

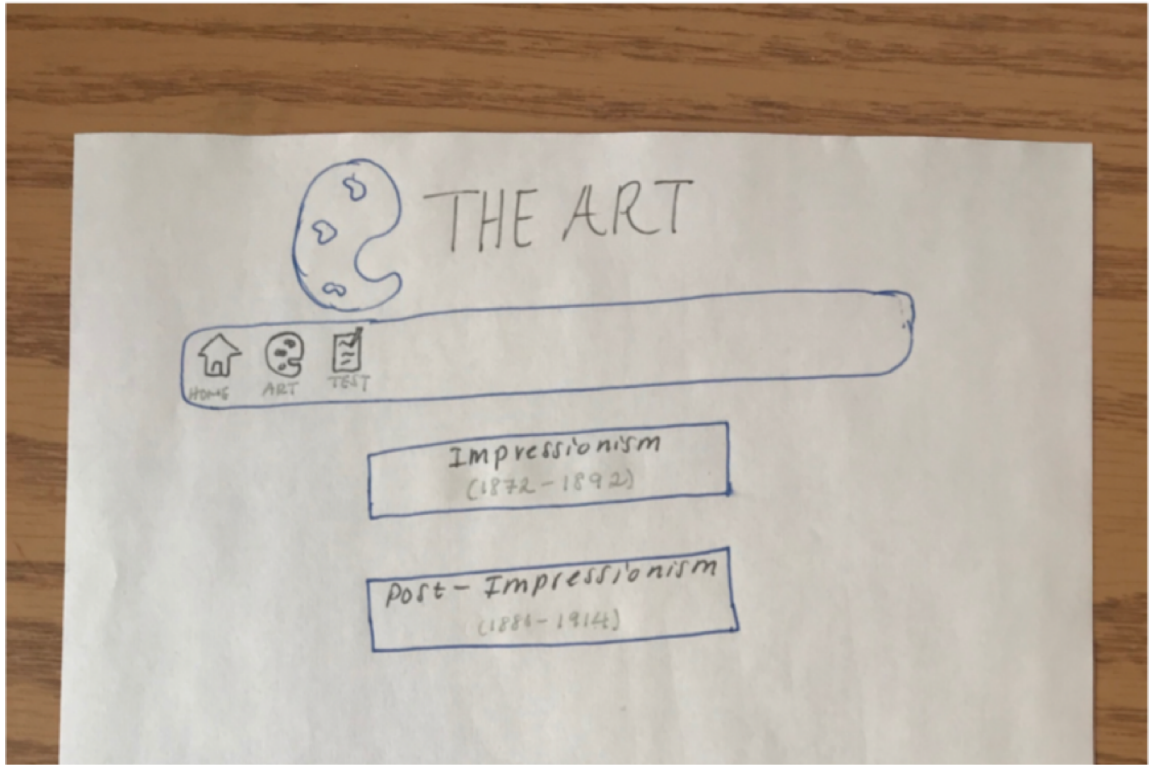


Use real examples of media in your Google Slides Prototype



Setting Good defaults.

What should be the default art to learn first: Impressionism or Post-Impressionism?

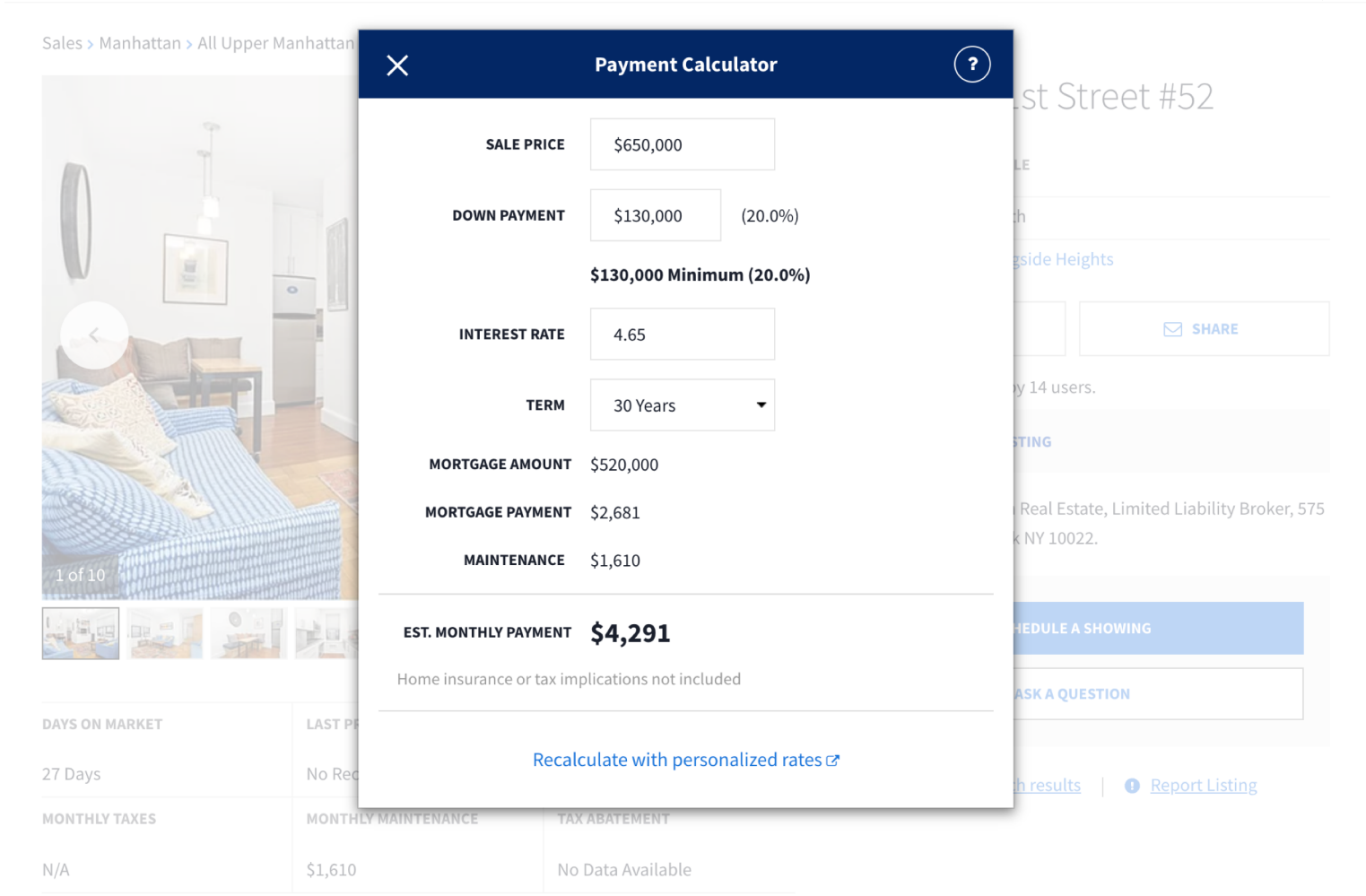


Bad: I don't know, so… let's let the user choose.

Good: Impressionism. For most users, I think they're going to learn the most from contrasting post-impression with impressionism. Thus, it's best if they need to introduce **impressionism first**.

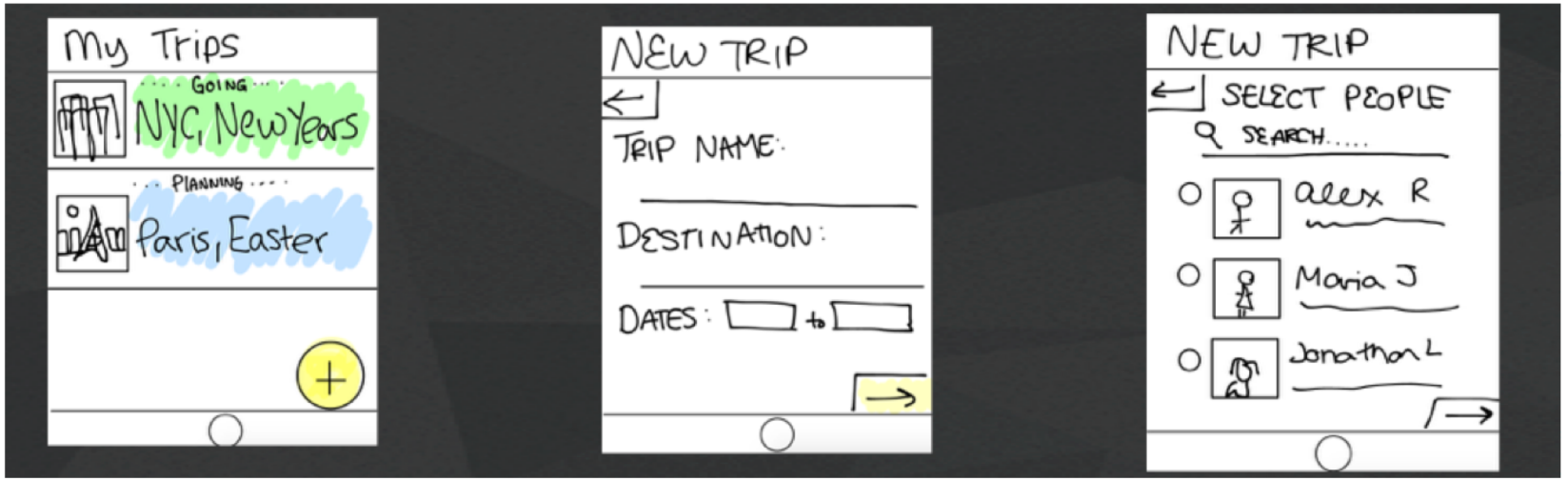
Prevent Errors in Options: Provide good defaults

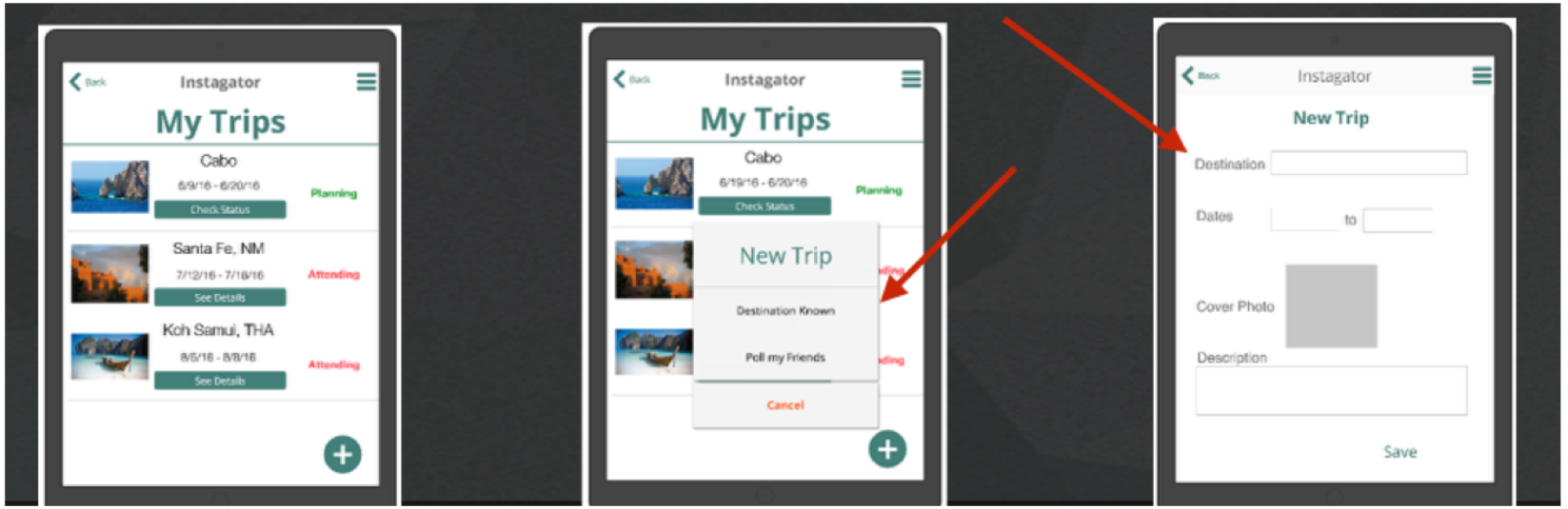
Good defaults will help to guide the user away from making a mistake because they will be given a context to work from.



Why is low-fidelity better than hi-fidelity at early stages?

What if the prototype is too polished?





1. It takes too long to make.

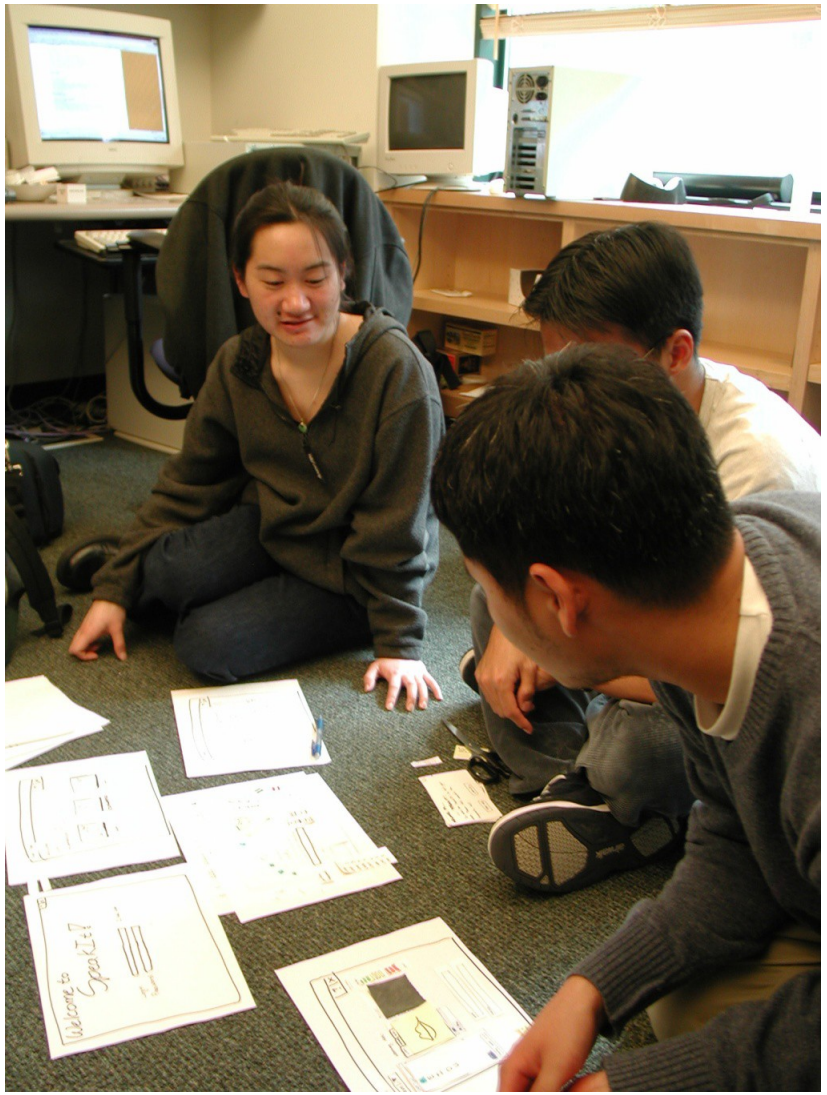
2.Designers become attached to designs the spent to most time on.

3.You get feedback on the wrong thing:

- **color,**
- **Images**
- **fonts,**
- **wording**

Running a Prototype

Running Prototypes



- Put your low-fi prototype in front of users.
- Read them their goal, and ask them to
- Ask them to think out loud as they do the task
- Don’t interrupt them.
- Don’t lead them.
- Observe **“critical incidents”**
  - Times they are unsure
  - Times they did something you did not intend
- Write it down, take screen shots.

You get the best feedback when you are observing and listening. Not instructing:

- Give the user a **goal**:
  - “Create a playlist”
  - “Learn about the difference between impressionism and post-impressionism”
- **Observe** what they do
  - Encourage people to think-aloud
  - Look for “critical incidents.”
    - Times were users are unsure what to do, do the wrong thing
  - Resist the temptation to “rescue” them or tell them what to do.

Your role when running a prototype:

Listen.

And take notes.

Don’t explain your prototype.

Don’t guide the user.

Don’t help the user (unless they are truly stuck).

Learn all the things you did right and wrong.

Pretend you’re the TA using a prototype…

What you’re experience (and what is your feedback)?

Prototype 1:
Learn the Arabic Alphabet

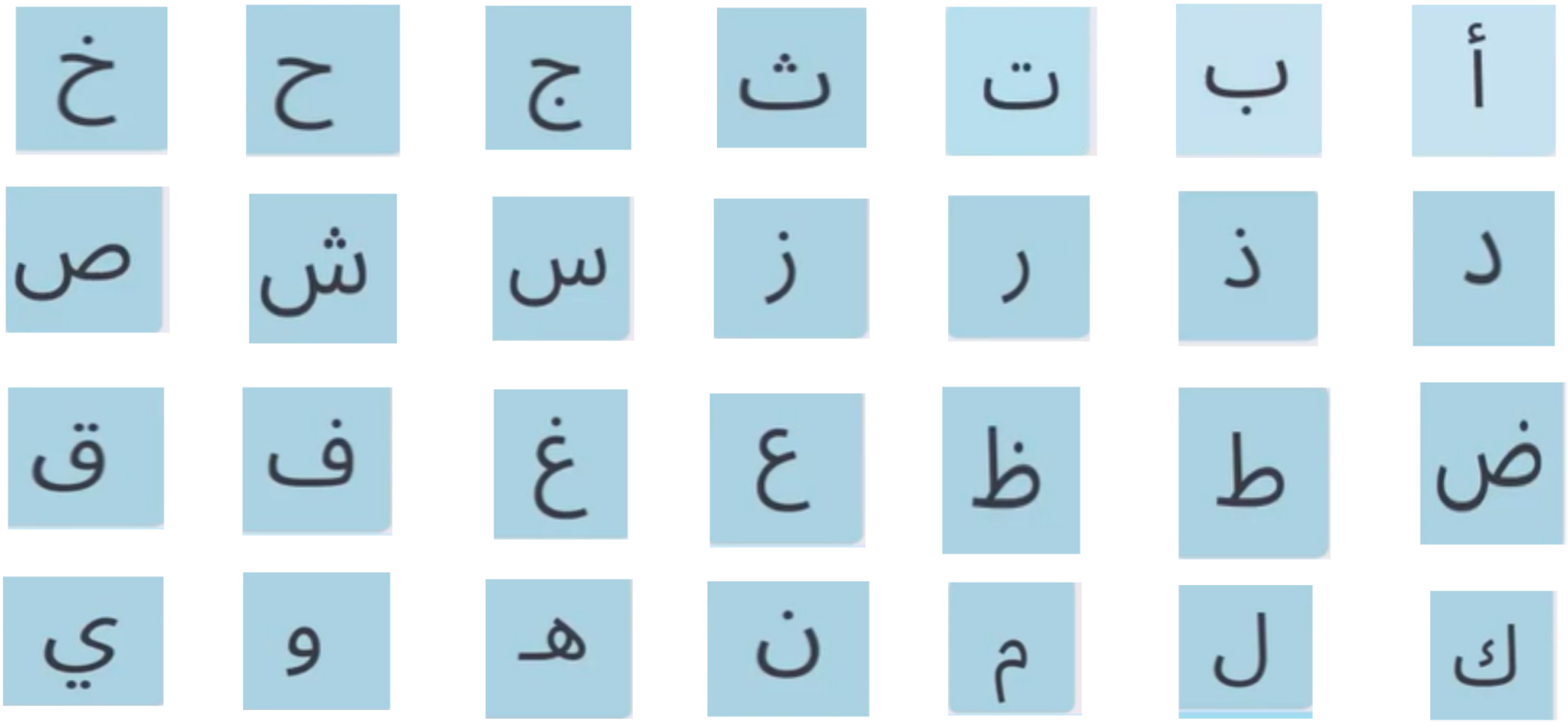
Pronounce the Arabic Alphabet

With **28 letters** each letter has **3 Pronunciations**

Arabic is read
from **right** to **left**

Start Learning Now

Home Alphabet Quiz



Click a **letter** to start

Alif

The letter is pronounced "ah"

Back to Alphabet

Next Letter

Home Alphabet Quiz

Alif

The letter is pronounced "oh"

Back to Alphabet

Next Letter

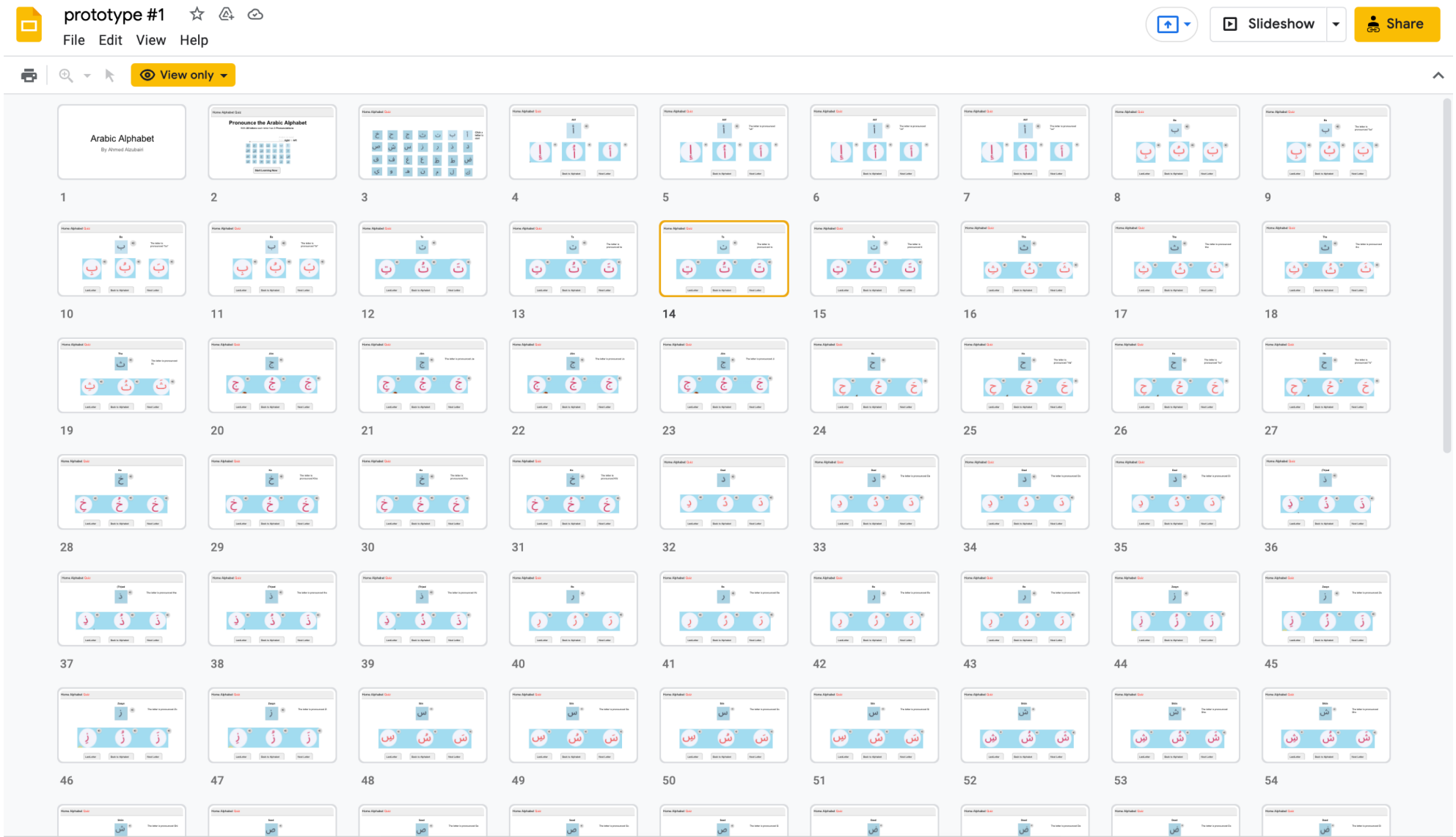
Alif

The letter is pronounced "ee"

Back to Alphabet

Next Letter

How many of these are there?



Drag and Drop Letters

Match the letter with the correct location

Submit

'Ayn	Kh	Nuun	Haa'	Saad	Faa'	Waaw	Raa'	Alif

ر ن و ف هـ أ ص خ ع

Home Alphabet Quiz

Congrats, You scored 9/9

Return to Alphabet Main Screen

Lessons from Prototype 1: Learn Arabic Letters

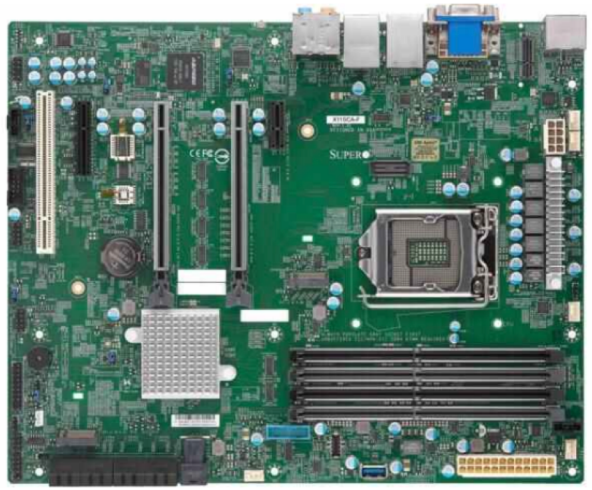
- Good topic
  - Interesting, introductory topic for this audience
  - media is good
- **Too long**
- Need stronger default for first letter to select
- Perhaps “next” button needs to be on the left, not the right.
- Not entirely satisfying to just memorize a bunch of letters. I’d like to be able to make words – things I could say. Like “Hello”

TA suggestion

- Pick fewer letters (maybe 5?) for the user to memorize
- Then show how they’re combined into words.
- Topic pivot: how to read Arabic words.

Prototype 2:
How to build a computer

Welcome to Build a Computer, where we teach you how to build a computer. First, we'll show you through the different parts of a computer and what to look for. Next, we'll show you walk you through the process of building it, step by step. After that, we'll explain some common problems that you could face while building. Finally, we'll do a quick quiz on you to make sure you paid attention.



START BUILDING!

Parts

One of the most daunting tasks to building a computer is learning what all the different components are and what they do. We'll display an image of each one, along with what to look out for when buying one. We'll link info for a budget, regular, and high-power option for each part, so you have the ability to build as we go along.

NEXT
(Graphics Card)

Graphics Card

If you're gaming or video editing, the graphics card is probably the most important piece of hardware in your PC. The important specs to look out for are **Video Memory** and **Clock Speed**, higher numbers are better.

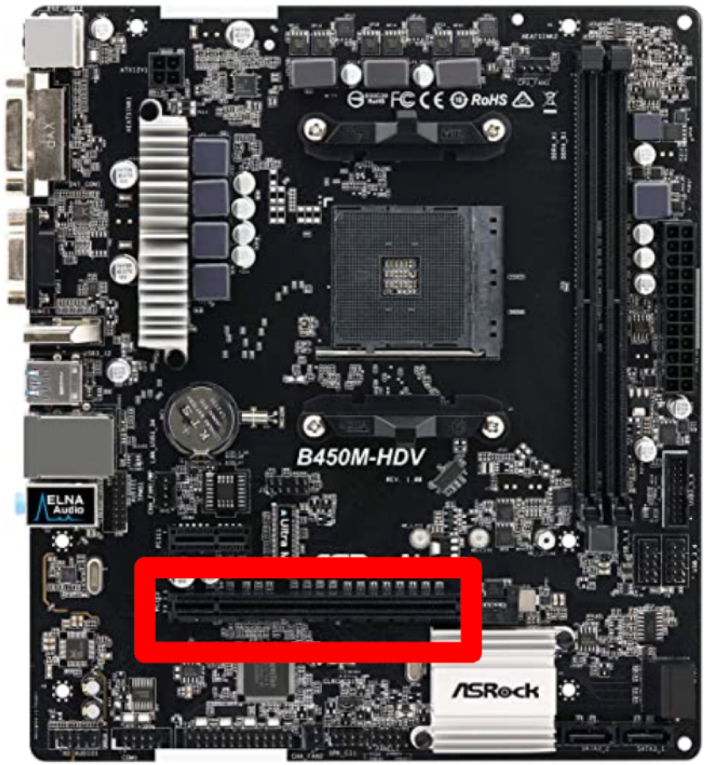
	Name	Link	Price	Memory	Clock Speed
Low					
Medium	Zotac GeForce GTX 1660 Ti Twin Fan	ZOTAC Gaming GeForce GTX 1660 Ti 6GB GDDR6 192-bit Gaming Graphics Card Super Compact - ZT-T16610F-10L	279.99	6 GB DDR6	1770MHz
High					

NEXT (CPU)

Building Time - Graphics Card

Alright, now it's time to put in the card! Just push it into the slot in the motherboard, and wait for the click. After it's in, screw it into the case using the screws from the mounting.

NEXT (CPU)



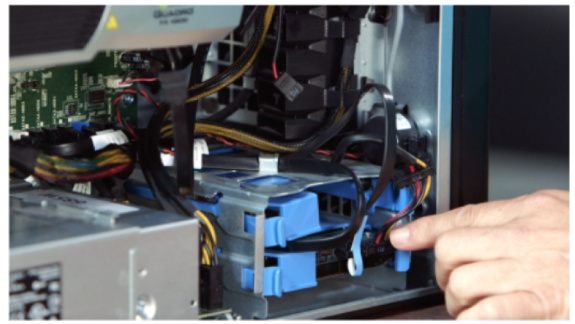
Troubleshooting

Screen won't turn on
- Reseat your graphics card

Computer turning on and off
- Check RAM

Fans really loud
- Check power connections, thermal paste on CPU

Quiz your knowledge!



Quiz - Parts

If you're trying to build a PC for gaming, what is the most important part?

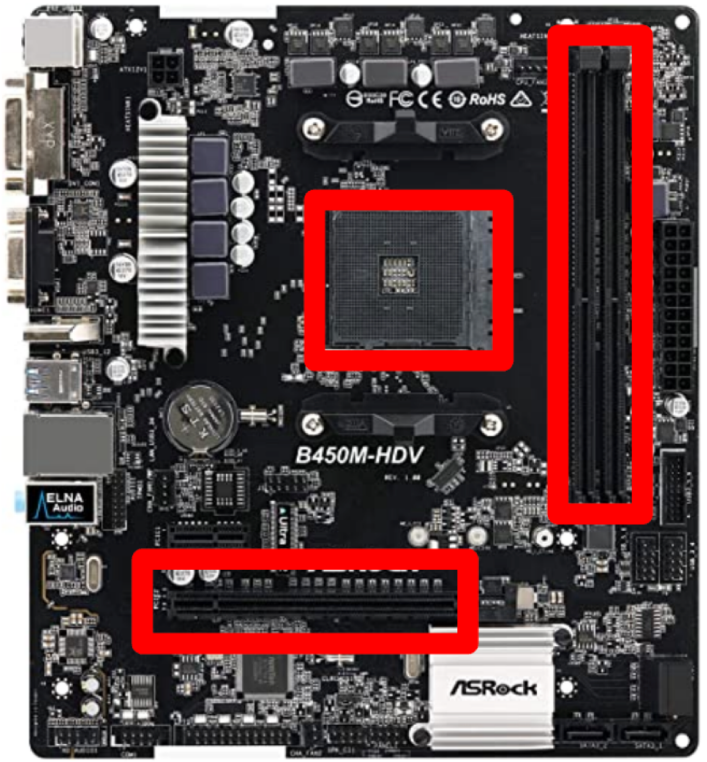
- ○ RAM

- ○ CPU

- ○ Graphics Card

Quiz - Building Time

Time to test your building knowledge. Drag the component to the correct slot and click submit when you think you have it.



Lessons from Prototype 2: “How to build a computer”

- Interesting topic, but the material is too easy
- The quiz can be passed without using the learning material
- From the quiz, it’s not clear you’re learning how to build a computer. Perhaps you’re learning to identify the parts?

TA feedback

- Pick a different prototype (or redo this one with a clearer goal)
- The instructional goal and strategy isn’t clear, and thus as a whole, the prototype isn’t coherent.

Prototype 3:
The Police are at your Door

YOU AND THE POLICE

This site serves to inform you about the laws in a police encounter as well as strategies for having a good experience.

Select a scenario

Police are at your door

Pulled over by police

Stopped by police in public

Arrested by the police

Police are at your door

Next section

Your Rights

- To remain silent
  - This means xyz
- To see a warrant
  - This means you do not have to let them in until you see a warrant

What are warrants?

Tips to reduce risk to yourself

DO

- **Ask the officer if you can see a warrant and ID**
  - Ask the officer to slip the warrant under the door or hold it up to the window so you can read it
- Write down everything officers do if you are searched

DO NOT

- **Invite the officer into your house without seeing ID and warrant**
- Speak to the officers about anything

Police are at your door

Next section

Your

- To remai
  - T
- To see a
  - T
    n
    in

What are warrants?

Search Warrant: A search warrant allows police to enter the address listed on the warrant, but officers can only search the areas and for the items listed. It must be signed by a judicial officer and lists your address as a place to be searched

Arrest Warrant: An arrest warrant allows the police to make lawful arrest. It must have your name on it as the subject of an arrest warrant .

o reduce risk to yourself

k the officer if you can a warrant and ID

Ask the officer to slip the warrant under the door or hold it up to the window so you can read it

te down everything

cers do if you are

rched

- **nvite the officer into your house without seeing ID and warrant**
- Speak to the officers about anything

Next section

Pulled over by police

Your Rights

- As a passenger
  - To remain silent
    - This means xyz
  - You can ask if you're free to leave. If yes, you may silently leave.
- As the driver
  - To remain silent

Tips to reduce risk to yourself

DO:

As a driver

- **Stop and turn off the car in a safe place as quickly as possible.**
- Turn on the internal light, open the window part way, and place your hands on the wheel.
- **Upon request**, show police your driver's license, registration, and proof of insurance.

As a passenger

- Put your hands on the dashboard.

DO NOT

- Make **sudden movements**, and **keep** your **hands where the officer can see them.**

Stopped by the police in public

Your Rights

- To remain silent
- To not have to consent to a search of yourself or your belongings
  - BUT, the police may pat down your clothing if they suspect a weapon.
- To not have to answer questions about where you were born, whether you are a U.S. citizen, or how you entered the country.

Tips to reduce risk to yourself

DO

- **Stay calm**.
- Keep your **hands where the police can see them.**

DO NOT

- Lie or give false documents.
- Run, resist, or obstruct the officers.

Take test!

Arrested by police

Your Rights

- To remain silent
- To a lawyer
- To make a local phone call

Tips to reduce risk to yourself

DO

- Say you wish to remain silent
- Ask for a lawyer immediately.

DO NOT

- Sign anything
- Make any decisions without a lawyer
- Allow the police to listen to phone call only if you call a lawyer.

Test-Part ¼ “Police are at your door”

Stuck? Click to review!

1. What is a right that you do not have?
   a. Right to stay silent
   b. Right to call a lawyer
   c. Right to read the search warrant
   d. Right to close the door

2. What should you do if the police ask to come in?
   a. Ask the officers to show identification
   b. Ask the officers to show you the warrant
   c. Allow the police to come in
   d. Ask the officers to say your name

Next

Test-Part ¼ “Police are at your door”

Stuck? Click to review!

1. What is a right that you do not have? ❌

   a. **Right to stay silent**
   b. Right to call a lawyer
   c. Right to read the search warrant
   d. Right to close the door

2. What should you do if the police ask to come in?

   a. **Ask the officers to show identification** ✅
   b. Ask the officers to show you the warrant
   c. Allow the police to come in
   d. Ask the officers to say your name

Next

Test-Part ¾ “Stopped in public”

Stuck? Click to review!

5. What can the police legally do in this situation?
   a. Force you to answer about your birthplace
   b. Force you to answer about your citizenship status
   c. Force you to answer how you entered the US
   d. Pat down your clothing to check you

6. The police has a gun on you what should you do?
   a. Confront the police officer about the gun
   b. Run away fast so that you don’t get hurt
   c. Keep your hands in the air
   d. Keep your hands hidden

Next

Test-Part 4/4 “Arrested by police”

Stuck? Click to review!

7. If you call your _____ the police can listen to your conversation.

8. You should not ___ any documents that the police give you

Next

Test-Review

Your score: X/8

Want to learn more? See https://www.aclu.org/know-your-rights/stopped-by-police/

Lessons from Prototype 3: “The police are at your door”

- Great topic, just the right amount of information
- Good states and transitions
- Information on each page **is hard to read**
  - Organize information
  - Split it up into two states if there’s too much

Second iteration

You and the police

This site serves inform you about the laws in a police encounter as well as strategies for having a good experience.

Police Are at Your Door

Police Pull You Over

Police Stop You in Public

Police Arrest You

Police are at Your Door

Your Rights

To remain silent: This means you can say you want to exerciise the 5th ammendment if you want to

To see a warrant: This means you do not have to let them in until you see a warrant

DO

Ask the officer if you can see a warrant and ID

Ask the officer to slip the warrant under the door or hold it up to the window so you can read it
Write down everything officers do if you are searched

DO NOT

Do not Invite the officer into your house without seeing ID and warrant

Do not Speak to the officers about anything

Next

Test-Part 1/4 “Police at Door”

1. What is a right that you do not have?

(a) Right to stay silent

(b) Right to call a lawyer

(c) Right to read the search warrant

(d) Right to close the door

Stuck? Click to Review!

Next

Test-Part 1/4 “Police at Door”

1. What is a right that you do not have?

(a) Right to stay silent

(b) Right to call a lawyer

(c) Right to read the search warrant

(d) Right to close the door

Stuck? Click to Review!

Next

Test-Part 4/4 “Arrested”

7. If you call your _____ the police cannot listen to your conversation.

Stuck? Click to Review!

Next

Test-Part 4/4 “Arrested”

7. If you call your lawyer the police cannot listen to your conversation.

Stuck? Click to Review!

Next

The End. Thank you!

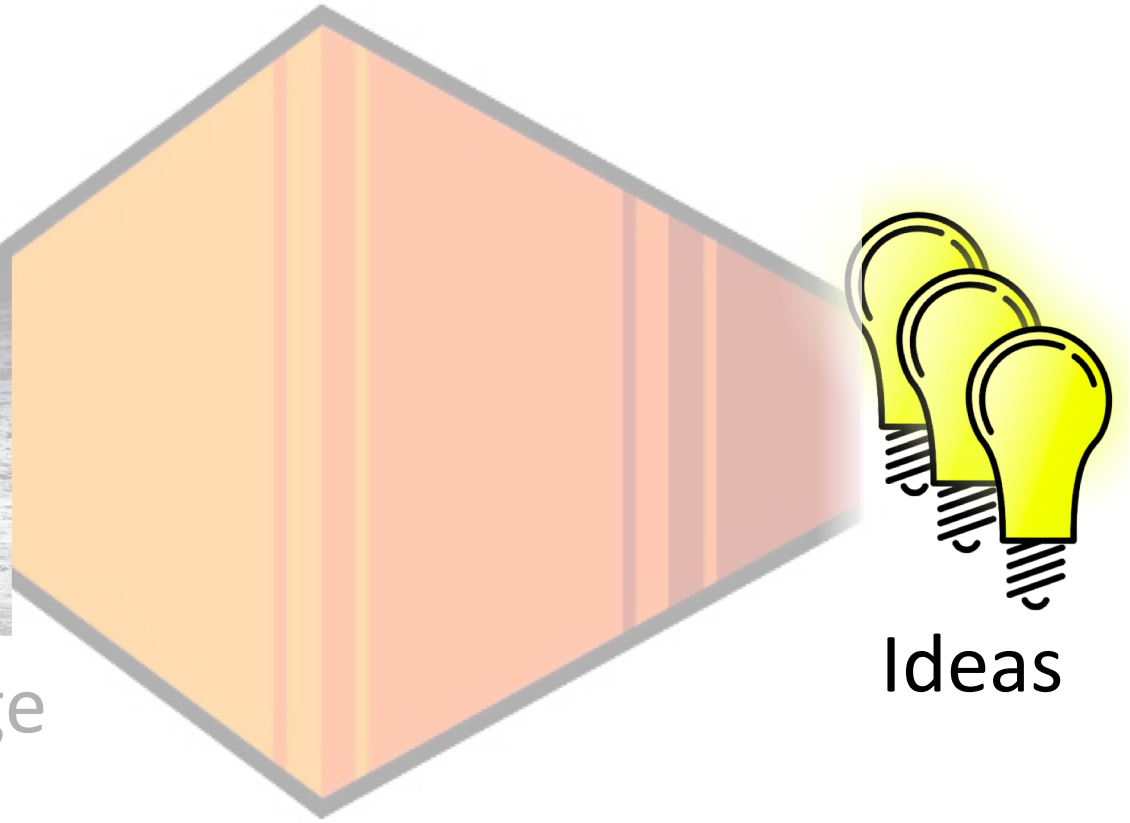
Your Score: X/8

Want to learn more?
See:
https://www.aclu.org/know-your-rights/stopped-by-police

Summary

Homeworks 9-13: Iteration and Testing

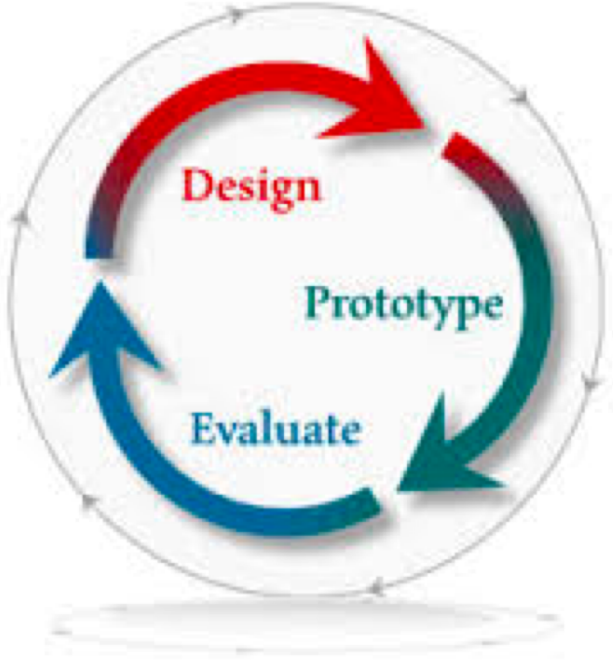
Challenge



Ideas

Ideas

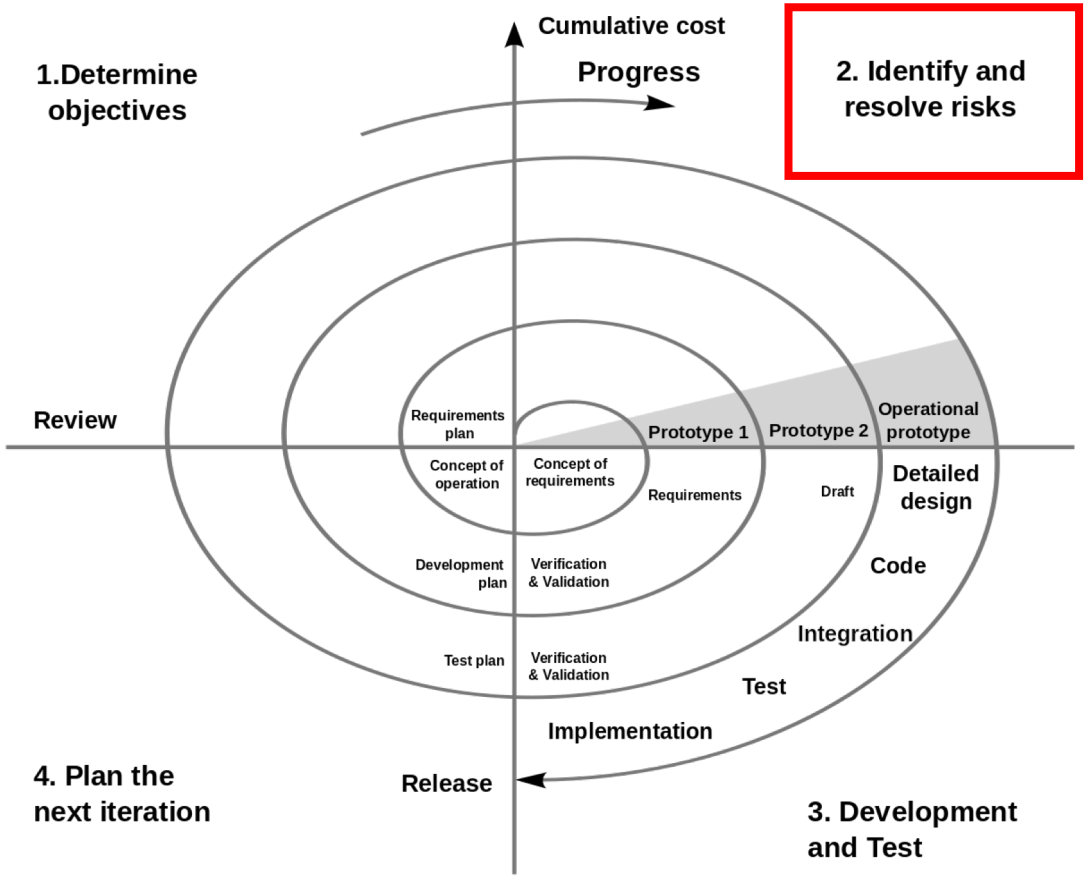
Reality



Implementation

Product

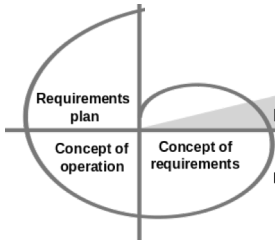
Iterative Design is good because it minimizes risk



The first iteration should be as **low-fidelity** as possible

1.Determine objectives

2. Identify and resolve risks



4. Plan the next iteration

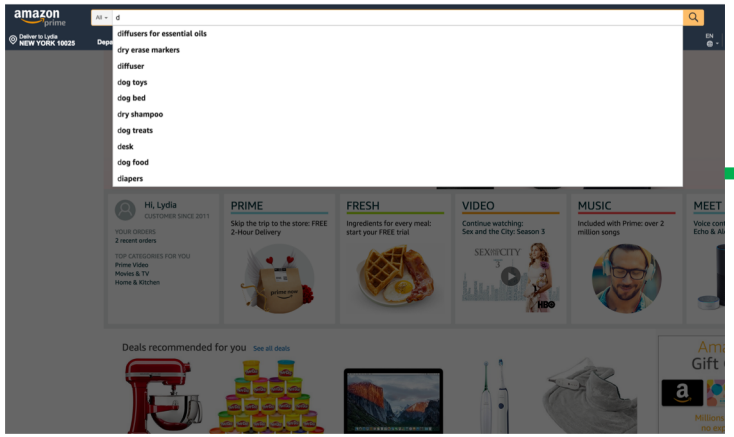
3. Development and Test

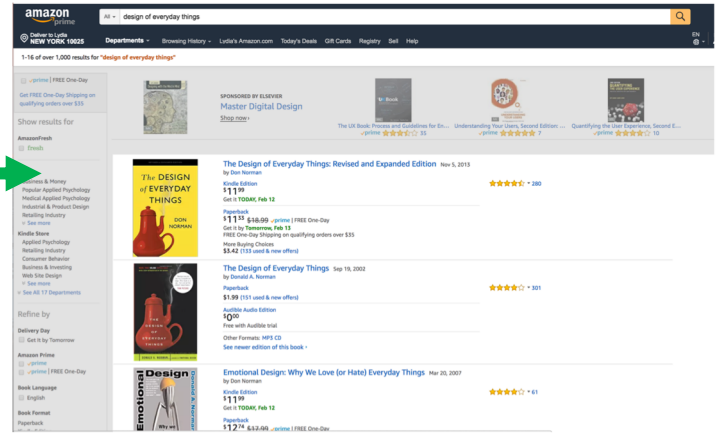
Main Prototype Goal:

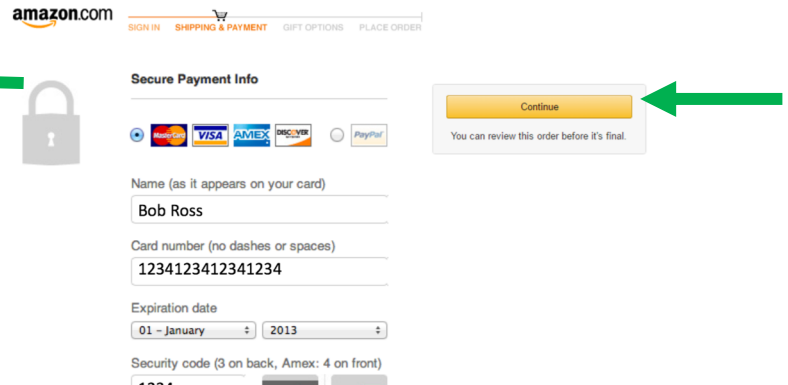
Coherence

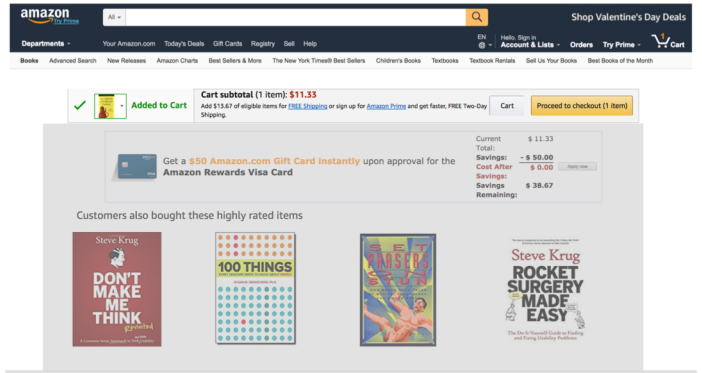
Is there a path through the system by which the user can accomplish their goal?

Focus on breaking the task into **states**, **options**, and **transitions**



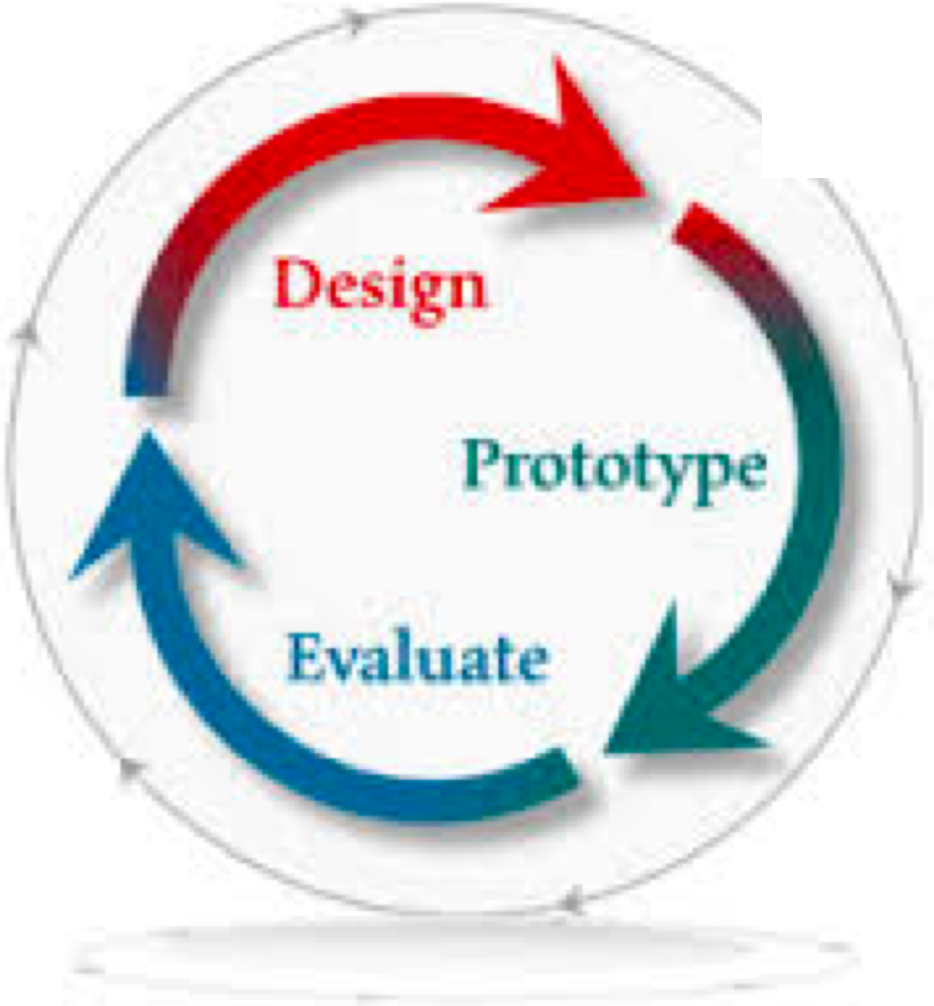


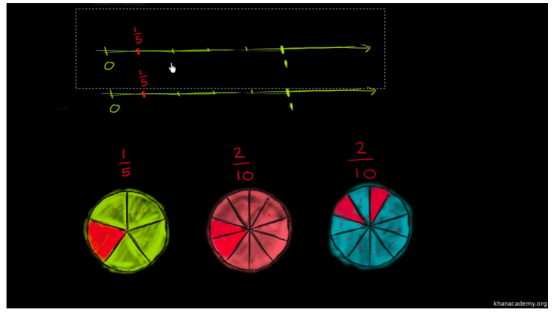




Translating an idea into a prototype is HARD.

Teach fractions by working through problems slowly.

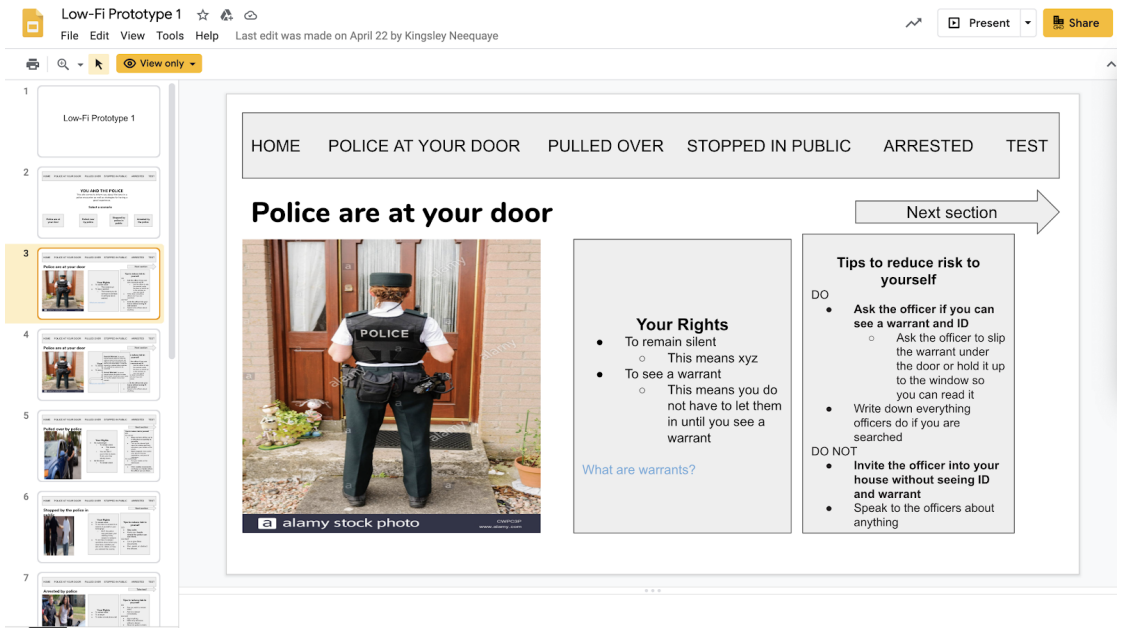


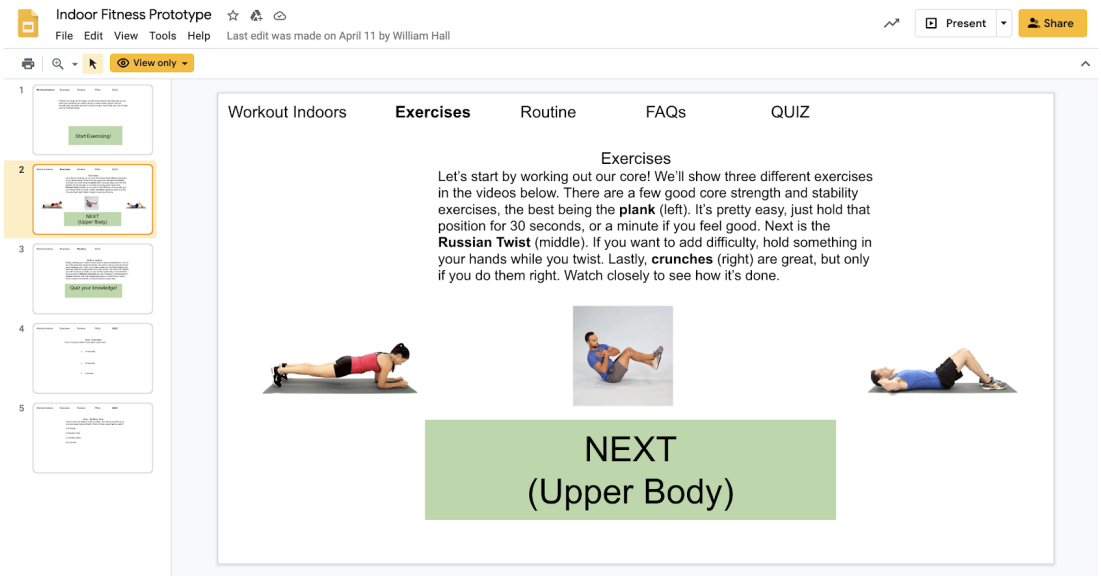


Low-Fi Prototype

You will probably learn as much from
making the prototype,
as you will from running it.

HW8: Low-fidelity Prototypes in Google Slides





Every team member will make their own, and run it on someone in the class.
You'll get TA feedback during the next TA section.