App Development Class

Week 1

Jeff Linwood

Goals for this Class

- Learn how to work on a team with others
- See a product all the way through from idea to shipping
- Learn new skills - writing, technical, video, design, project management
- Have something concrete for your resume/interviews/internship

Class Background

- This is the 11th year for this class
- Third time this class will have a theme
- "Time Matters" - previous themes were "Word Games" in 2020, and "Tell a Story" in 2022.
- Usually have almost all teams get their apps into the App Store or Play Store
- Journalism + CS students - an interesting mix

About your instructor

- A little bit about me

Tips for App Ideas

Make something you want to work on

- One of the biggest problems I've seen is that teams come up with easy ideas, and then run out of steam to work on them half way through because it is boring

- Think about something fun, even if there are other ways to do it already. It's ok to work on something, even if there is an app in the app store already.

- Focus in this class is product development, not making a startup.

- Preference is to build an app that you have control over, rather than build an app for a non-profit, student group, or similar, because they can be roadblocks

App Technology

What should we build the app in?

- This class is technology neutral (iOS/UIKit, iOS/SwiftUI, Android/Java, Android/Kotlin, Unity, Flutter, React Native, Ionic….all fine)
- Some things to consider
    - Whether or not you have a recent Mac than can run Xcode 14 well
    - What you want to learn - this is a great way to learn something new!
    - Your previous experience - Android, iOS, React Native, etc.
- Would suggest CS students join like minded folks for the teams - Journalism students, it is probably all new
- Happy to offer suggestions

Class Introductions

- Let's go around the room and have everyone say what they are interested in, etc.
- For the CS majors - would suggest listing any previous mobile app development experience, whether you have a Mac or not, and what platforms you are interested in.
- For both - any interesting hobbies, app ideas that you have, a little background

Team Formation

- Six teams (based on current enrollment) of four students (maybe one team of three)
- Your teams will come have to come up with at least three app ideas before you start
- Try and use some time outside class to work on finding teams too
- Will try and finalize teams next week
- Two Journalism majors, two CS majors per team (roughly)

App and Play Store Guidelines

What you can and can't do

- App Store Review Guidelines
- https://developer.apple.com/app-store/review/guidelines/
- Google Play Store Content Policy
- https://play.google.com/about/developer-content-policy/
- https://support.google.com/googleplay/android-developer/answer/10355942?hl=en&visit_id=637467847271617276-2842983964&rd=1

App Ideas!

Think Creatively

- When it comes to app ideas, feel free to pick a big problem and work on it. Remember, this doesn't have to be a startup

- You are most welcome to create an app in the journalism space, but it is not required.

- In general, you can't republish other people's content without permission, which makes making news reading apps hard

Small Groups App Ideas

Let's break up into small groups to talk

- This does not have to be your final teams
- We'll try and rotate around, so you get a chance to talk to a lot of people
- We might have to trade some people around later if we end up with a group of just CS students, for instance
- We'll go with a bit of an ad-hoc process for this to help narrow things down

App Development Class

Week 2

Jeff Linwood

App Ideas

In Class Exercise

- Let's break down some existing mobile applications in your teams
- How would you describe <your example app> in 30 seconds?
- What are two or three things that app absolutely has to have, that other apps have (example - Login screen)
- What are two or three things this app absolutely has to have, that are fairly unique?
- What are three or four things that this app has that make it better - nice to have, but not essential?
- Take ten minutes, then come back and share with the class

Project Management Tools

You can use anything

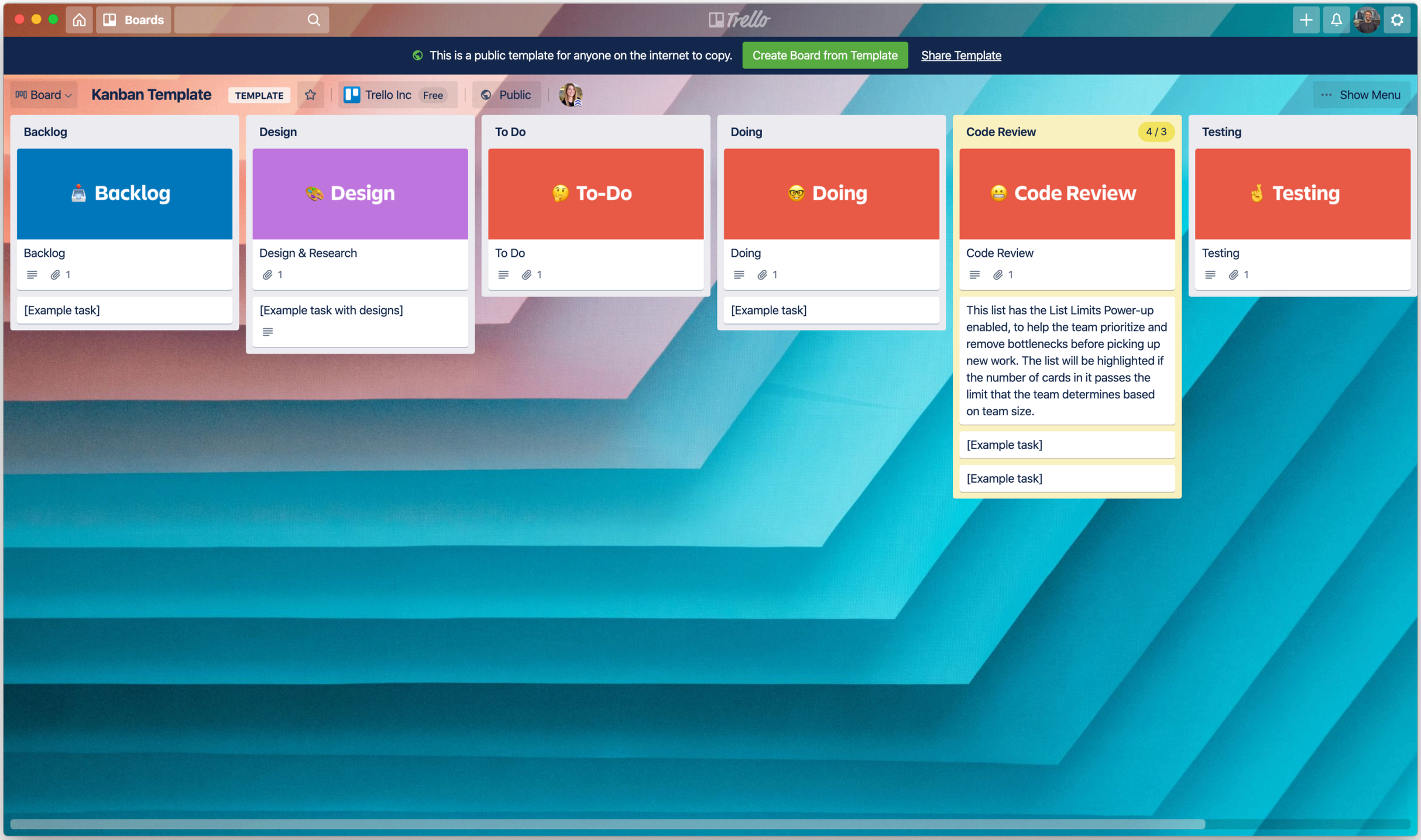
- I do strongly suggest one of these three
  - Trello
  - GitHub Projects
  - JIRA
- Others include
  - Basecamp
  - Asana
  - Gitlab

Project Management - Agile

Agile Software Development

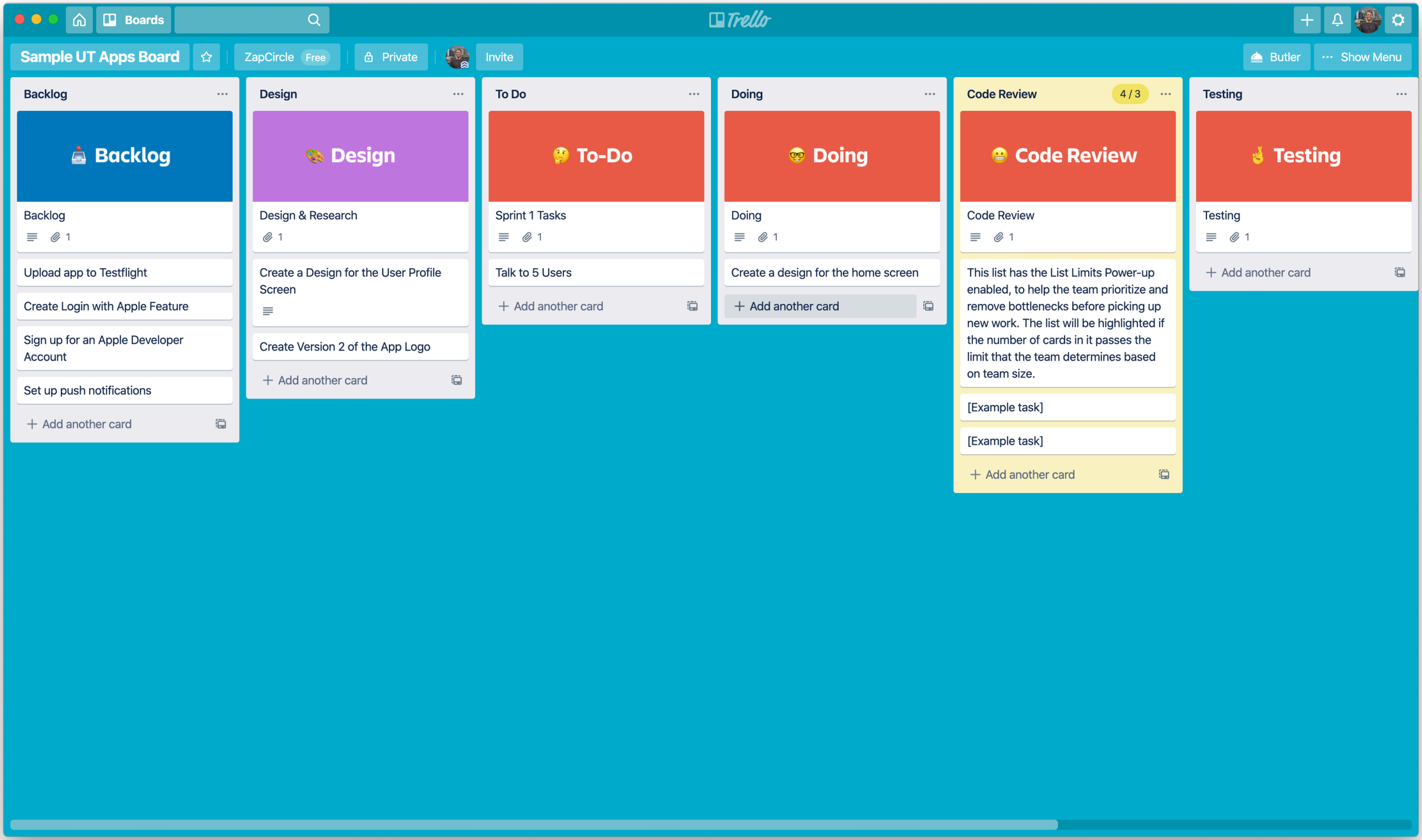
- Agile Manifesto (https://agilemanifesto.org/)
- Kanban (https://www.atlassian.com/agile/kanban)
- Scrum (https://www.atlassian.com/agile/scrum)
    - Standup Meetings
    - Story Points
    - Product Owner
    - Scrum Master
    - Sprint Retrospectives

Trello - Kanban Template

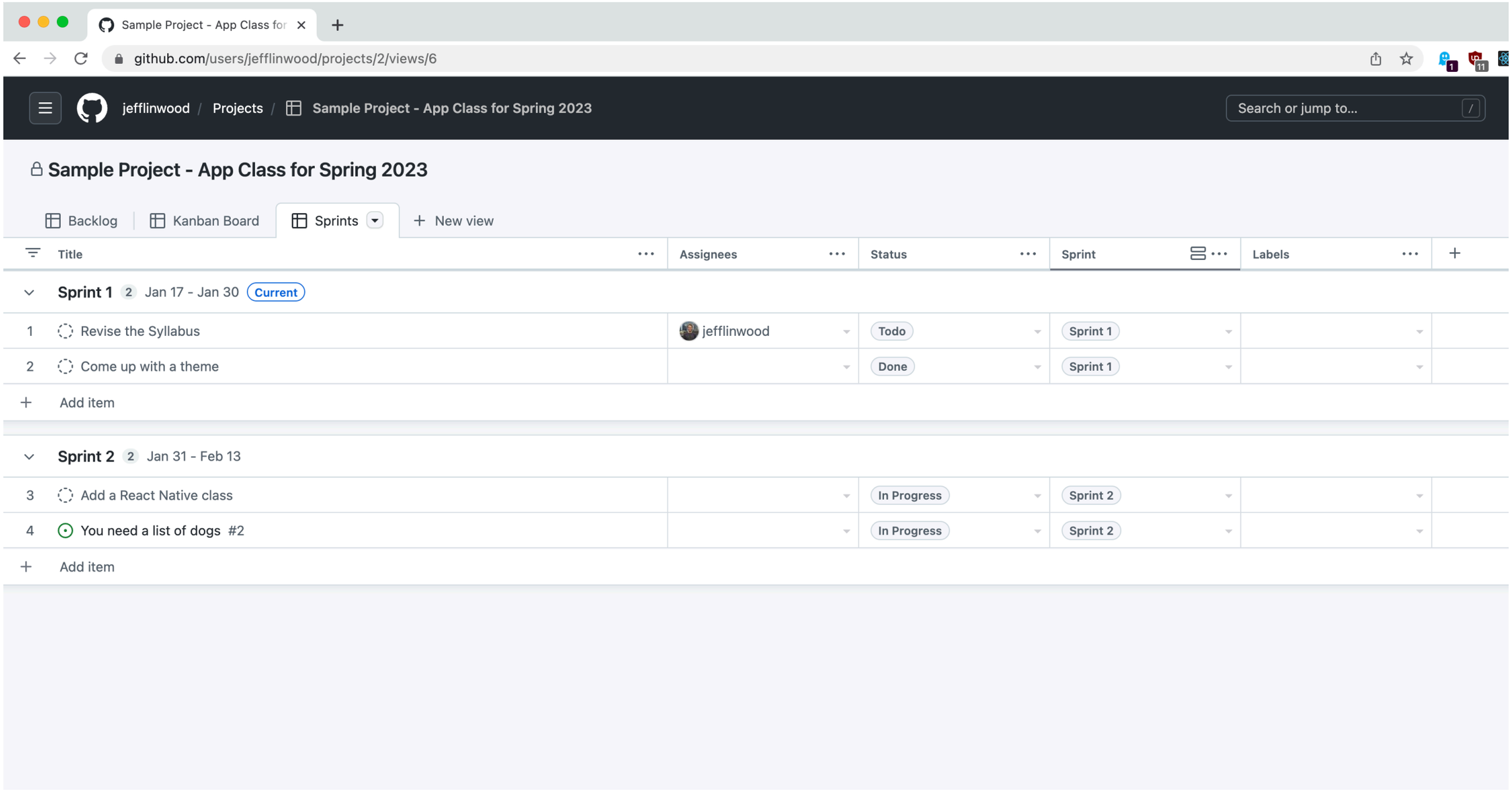


Trello - Example Board

Sprint 1



GitHub Projects



App Development with Xcode

Swift Development with iOS

- Let's launch Xcode, and I'll go through a few things
- Please ask questions as we go!

- Swift and UIKit - https://www.buildingmobileapps.com/docs/ios-guides/first-uikit-app

- SwiftUI - https://www.buildingmobileapps.com/docs/ios-guides/first-swiftui-app

Learning Resources

Beyond the Class - iOS and Swift

- Apple Curriculum - https://developer.apple.com/learn/curriculum/
- Head First Swift https://www.oreilly.com/library/view/head-first-swift/9781491923184/
- iOS App Dev Tutorials - https://developer.apple.com/tutorials/app-dev-training#uikit-essentials
- Learn SwiftUI - https://developer.apple.com/tutorials/swiftui
- Swift Playgrounds - https://www.apple.com/swift/playgrounds/
- Kodeco (Formerly RayWenderlich.com) https://www.kodeco.com/ios/paths

Learning Resources

Beyond the Class - React Native

- Learn the Basics - React Native - https://reactnative.dev/docs/tutorial

- React Native on Codecademy - https://www.codecademy.com/learn/learn-react-native

- Javascript - https://developer.mozilla.org/en-US/docs/Web/JavaScript

Initial Pitch Assignment

This should be an expanded version of your elevator pitch for this app idea.

In a few weeks, your team will give a presentation about the progress you made in Sprint 1. This assignment is to write down the opening of that presentation, when you introduce your app idea to the rest of the teams. How will you tell them that this is the most exciting app idea in the class?

Be sure to consider a few things:

* What does the app do?
* What benefits will users get from the app?
* Who are the users for the app?
* Why is your team is the best ones to build this app?

Developer Sign Up

Please have one member of your team sign up on the Apple App Store or Google Play Store as a developer.

This process can take a while to go through, based on corporate policies - do not leave it until the last minute.

For the assignment, just take a screenshot of the web page or the email that says you were accepted into the program

Plan for Sprint 1

For Sprint 1, your team should come up with tasks for each member of the team. The purpose of this plan is to make sure that everyone has something to work on, and that the amount of work you take on during this sprint sets you up for success for the next sprint.

A sample Sprint Plan might look like this (but your tasks will be different):

App Design:

Choosing Colors for the logo - Student A and Student B

Creating several App Icon ideas - Student A

Research:

Talking to Potential Users - Student B and Student C

Reviewing Competitive Apps - All

Learning:

Adobe Premiere Tutorial - Students B, C, D

Firebase Realtime Database Tutorial for iOS - Student A

Tutorial on Setting up Push Notifications - Students B and C

Writing:

Setting up Medium - Student C

Blog Post 1 - First Draft by Student A, Reviewed by Student B

Sprint 1 - What should be done?

- Sprint 1 is not a coding sprint
- It's to set you up to begin coding in Sprint 2
- App Design does not have to be finalized, but you should be on your way so that you can iterate on it
- This is an iterative process, overall

Sprint 1

Typical Deliverables

- Name of the app (available in App Store)
- Set of colors for app
- App Icon/Logo
- Low Fidelity screens for the app
- Some user research on those screens
- Second iteration on Low Fidelity Screens
- One or more High Fidelity screens for the app

Blog Post 1

For your first blog post, you want to explain your project, and then talk about your app idea and how it is going to work for users.

Don't talk too much about technology here.

You probably won't have colors, or a logo, or anything picked out just yet, but if you have an app name, now is the time to announce it.

Should be 500-1,000 words. You can publish this on Medium, Wordpress, or another site.

App Development Class

Week 3

Jeff Linwood

Blog Post 1

For your first blog post, you want to explain your project, and then talk about your app idea and how it is going to work for users.

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Should be 500-1,000 words. You can publish this on Medium, Wordpress, or another site.

Quick Note on Coding

- Now is the time to pick up or refresh some of your mobile app coding skills!
- Depending on what technologies your team is working with, you will want to try to find some resources that work for you
- If you are building a server component, you can either build it yourself, or you can use Firebase or Supabase
- If you are brand new to mobile app development with your team's platform, try installing the development tools on your computer, just to make sure they run

Paper Prototyping

- What is paper prototyping?
- Why is it useful?
- Low fidelity vs High fidelity for prototypes

Paper Prototyping Exercise

- We'll split up into your teams
- Use one of the ideas I show on the next slide, but it's ok to change it around a little bit (like bike parking instead of car parking)
- Draw five screens for a mobile app - don't worry about getting everything perfect
- When you're ready, explain your app to the other people in the team
- When you are listening, offer constructive feedback about the design, for instance, if a step is missing, or a step could be skipped. Or if something is unclear. If you like something, definitely say that, too!

Paper Prototyping Ideas

- Don't use your team app ideas just yet, this is meant to just be a little bit of brainstorming for one of these

- Draw five screens for a mobile app - don't worry about getting everything perfect

- Individual projects!

- App to find the best food item at a restaurant
- App to find parking near campus
- App to sort out your degree plan and help with class registration
- App to let your friends know you are up to hang out

Minimal Viable Product

MVP

- Comes from a book titled Lean Startup by Eric Ries
- http://theleanstartup.com/principles
- What are the least amount of features that you need in your app to get it in front of people to use?
- Once you have users, you can collect feedback, and then use that to improve the application
- Otherwise, you end up building in a vacuum

Identifying your MVP

- There are a lot of ways to figure out what your MVP should be
- Everyone on your team should come up with a list of features that should be in the MVP, individually
- Then take some time to put those into three categories (for the MVP)
- Must haves
- Maybe
- Not necessary

Paper Prototypes for your App

- The next step to start crystallizing your idea as an app is to draw out some screens
- Use the features you identified in the MVP discussion
- Each person should draw their own set of screens
- And then discuss them with the group
- Some things may be similar, some may be unique - you don't have to make decisions on which is better yet, your user research will help with that

System Design

Understanding What to Build

- Start by taking a look at the entire system
  - Mobile Application (iOS, Android, etc.)
  - Back End Application (Node.js, Python, etc.)
  - Third Party Services (Push Notifications, Back End As A Service, etc.)
- Break down each section into subsystems
- Figure out how data flows between subsystems, and which components talk to each other

Mobile Application System Design

Breaking a Mobile Application into Components

- Persistence - key/value, queryable storage, BLOB storage - what needs to be stored, does it need to be searched, and how much of it?

- Application Engine/Business Logic - what are the key algorithms or functions in your application?

- Network Communications/Third Party APIs - which ones do you need, and how will they be called?

- User Interface - how are you going to organize screens in your application? Are you going to consider using a pattern such as MVVM?

Identifying Possible Risks

What can go wrong?

- Security risks
- Incomplete product risks
- Risk of not making a useful product
- Other risks?
- Let's take 10 minutes as a group and think about some of the risks to your project.
- Write them down on a piece of paper

Evaluating Risks

Category, Likelihood and Impact

- We can categorize or evaluate risks along a number of different axes
    - Category
    - Impact
    - Likelihood
- Take 5 minutes to go through your list of risks, and categorize them into groups. Assign an impact (High, Medium, Low), and a Likelihood (High, Medium, Low)

Mitigating Risks

What can we do in advance?

- For each of the risks, think of 2 or 3 different ways to mitigate those risks. You don't have to go into detail, but give it some thought.
- Let's then go around the class and have each team choose one risk, and explain how they could alleviate some of the concerns around that risk.

App Development Class

Week 4

Jeff Linwood

Technical Writing Assignment

Individual Assignment

- The tutorial should be between 1,000 and 1,500 words.
- Please cover a topic that is related to something you are working on on your project, such as iOS, Android, React Native or App Design.
- For the tutorial structure, generally follow the Digital Ocean Technical Writing Guidelines - https://www.digitalocean.com/community/tutorials/digitalocean-s-technical-writing-guidelines
- Do not worry about their formatting or terminology guidelines

Interested in Technical Writing?

Learn with Google (outside class)

- Google has some free classes to learn technical writing
- https://developers.google.com/tech-writing
- https://developers.google.com/tech-writing/one
- https://developers.google.com/tech-writing/two
- https://developers.google.com/tech-writing/accessibility
- https://developers.google.com/tech-writing/error-messages

Technical Writing Assignment

Continued

- You will need to include at least three screenshots to help the reader. Please provide a caption for the screenshots. If you include code, please format it with a monospace font (such as Courier or Typewriter)

- Please define an audience for this tutorial - for instance, is it a tutorial for beginning Android programmers, or is it a tutorial for Figma designers with a little bit of experience?

- Provide a list of three credible web sites that would publish a tutorial similar to your assignment. Please include two or three roughly comparable articles or tutorials for each - these may be longer than this assignment, which is ok.

- Please submit the assignment on Canvas as a PDF, or as a URL if you publish it on a web site.

New Project 1

All | Android | Assets | Big | Buttons | Common | Containers | Forms | Icons | iOS | Layout

Button | Button Bar | Checkbox | Checkbox... | Circle But... | Color Picker | ComboBox | Date Cho... | Field Set | H.Rule | H.Slider | Hel

Wireframes

New Wireframe 1

09:52 AM

My Great App

Username

Password

Login

Register

Q W E R T Y U I O P

A S D F G H J K L

Z X C V B N M

123 space return

Low Fidelity Prototypes

- The next step up from paper prototyping
- But very similar
- Can use Balsamiq Cloud - https://balsamiq.cloud/
- Figma would be preferred, as it is becoming the standard design tool for many companies and organizations

Extra Learning Suggestion!

Learn Design with Figma

- I would love to teach all of you to be amazing graphic designers
- But I am definitely not one
- Figma published a Learn Design class that complements this class very well - https://www.figma.com/resources/learn-design/
- Many of the lessons are similar to the ones we do, but have a slightly different perspective
- I would suggest going through some of the lessons, as well as some of the design exercises

Mood Boards

- Anybody ever make a physical mood board?
- Can make them for apps
- https://www.canva.com/learn/make-a-mood-board/
- https://www.toptal.com/designers/visual-identity/guide-to-mood-boards
- Adobe Spark - https://spark.adobe.com/make/mood-board-maker/
- Canva - https://www.canva.com/q/signup/mood-boards/
- Other tools, too

Choosing Fonts

Custom Fonts for your App

- Would suggest using custom fonts for your app
- https://fonts.google.com/
- Be sure to choose fonts that you can redistribute - most fonts you can not
- Google Fonts are open

Choosing Colors

Using Adobe Color

- Create a color theme for your application
- Primary colors, accent colors
- https://color.adobe.com/create
- https://color.adobe.com/explore
- https://color.adobe.com/trends
- Can upload a photo to extract colors

Color Exercise

Another app's color palette

- 5 minute exercise - choose an app that you have on your phone, and figure out what the color palette is - going beyond basic black text on a white background
- For instance, take a screenshot of the app, and then identify the primary color, along with any secondary colors
- What parts of the app get the primary color?
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- Share it with your team, and use this to inform your thinking in the next exercise

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- Do any of these palettes stand out?
- Also consider color contrast, accessibility, and color blindness

High Fidelity Prototypes

- Figma, xD, Illustrator, Photoshop, Flinto, etc.
- Don't start these until you pick out your colors, fonts, etc.
- Suggest a moodboard first
- https://www.figma.com/resources/learn-design/
- https://helpx.adobe.com/xd/tutorials.html
- Should look very similar to a screen on the web
- Create animations with Flinto (https://www.flinto.com/), but don't go too overboard, adds a lot of work

Picking a Name

- Picking a name can be hard!
- Ideally, your name would not already be in the App Store or the Google Play Store
- Try searching in the app store, but also in Google, as the App Store search isn't the best
- You don't want to be confused with an existing app
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User Research

- Quantitative User Research - https://www.nngroup.com/articles/quantitative-user-research-methods/
- Qualitative User Research - https://www.playbookux.com/what-type-of-qualitative-ux-research-method-should-i-run/
- Which research methods are which? https://www.nngroup.com/articles/which-ux-research-methods/
- Some of this is easier before you have a product, some is better done after you have a product
- In this class, we will be doing qualitative user research
- We won't be doing a full user research study as part of this class

UX Research Resources

- https://www.usability.gov/what-and-why/user-research.html
- https://www.usertesting.com/blog/what-is-ux-research
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User Centered Design

Process Map from usability.gov

- https://www.usability.gov/how-to-and-tools/resources/ucd-map.html

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Using Firebase

Backend services for mobile apps

- Firebase - part of Google
- https://firebase.google.com/
- Needs to be integrated into an iOS app using Swift Package Manager or Cocoapods - https://cocoapods.org/
- Also need to have your app's bundle identifier - like com.jefflinwood.MyAwesomeApp

Firebase Services

Commonly used in this class

- Cloud Firestore - https://firebase.google.com/products/firestore
- Cloud Functions - https://firebase.google.com/products/functions
- Crashlytics - https://firebase.google.com/products/crashlytics
- App Distribution (or use Apple Testflight) https://firebase.google.com/products/app-distribution
- Firebase Cloud Messaging - https://firebase.google.com/products/cloud-messaging

App Development Class

Week 5

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- Adobe Spark - https://spark.adobe.com/make/mood-board-maker/
- Canva - https://www.canva.com/q/signup/mood-boards/
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User Testing Assignments

- User Testing 1 - February 14 (field testing) - due February 21 - With your high fidelity prototypes
- User Testing 2 - due April 2 - should be your MVP app (no field testing date)

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Class Exercise

Share your low fidelity prototypes

- What we will do is stick together in our teams, but send one person out to the next team to be the tester - also have a facilitator and a note taker
- The tester should talk out loud as if they were using the app
- Let's limit this to about ten minutes per tester
- When time is up, the tester rejoins their group, and your team sends out another tester - that way everyone gets to see someone use their app
- Let's do 2 rounds of the app
- Take five minutes to regroup as a team and go over the notes
- After this is over - let's talk about trends or observations you've seen

App Development Class

Week 6

Jeff Linwood

Product Decisions and Scope

Prioritizing Features

- One of the most valuable skills you will have to learn in this class is what to cut out of version 1.0
- You could build almost anything, but what can you support? What will people want to use?
- If your product is too complicated, people won't use it
- Better to ship something small and iterate on it

Product Roadmaps

Need to Have vs Would be Nice

- Each of your teams should whittle down the list of core functionality in the app into what you actually need to get into the App Store or Play Store for Version 1

- Put everything else in a product backlog

- Those backlog features may not even be useful - you'll get customer feedback, user research, analytics, or other data

Instagram on the iPad

Class Debate

- https://appleinsider.com/articles/22/02/28/instagram-chief-says-ipad-market-isnt-big-enough-for-native-app

- For background - the way you program an iPad app is the same way you program an iPhone app - there are screen size considerations, of course

- For debate - should Meta/ Instagram do this?

For your app

Take some time to work on your feature list

- What do you need to keep on the list?
- For instance, do you need iPad support?

Video Script/Shooting Plan

Video 1

- We saw some pretty nice student videos from previous years of this class last week
- Generally speaking, they knew what they were going to film before they filmed it
- May be able to borrow equipment from the Moody Equipment Desk (anyone do that this semester?)
- Using your phone is fine, just not vertical! https://vimeo.com/89715837

User Testing

App Testing Scenarios

- What questions do you want to ask as someone goes through the app?
- Are there specific areas that you want them to explore?
- Does your terminology make sense?
- https://www.usability.gov/how-to-and-tools/methods/planning-usability-testing.html
- https://www.usability.gov/how-to-and-tools/methods/scenarios.html

Progress on Sprint Plan 2

How are things going?

- I'll come around to each group, and let's just go over your Sprint plans to see where things are at
- Stuck on anything? I'm happy to help your team make a decision
- Coding struggles? Happy to help there too!
- Otherwise, work on your video shooting plans, app testing scenarios, or filtering down your list of features - I'm happy to look at all of those as well

App Development Class

Week 7

Jeff Linwood

App Store Upload (or Google Play)

- Big milestone!
- Will go over the store process to release an app next week in class after the presentations
- iOS
  - https://developer.apple.com/app-store/product-page/
  - https://developer.apple.com/app-store/review/guidelines/
  - https://developer.apple.com/ios/submit/
- Google
  - https://developer.android.com/studio/publish

Problems Solved/Problems to Solve

Each Group

- Let's go around and talk about one problem you solved recently while building your app, and how you solved it
- Let's also bring up one problem you have with your app that you either are working on or haven't got to yet
- Anyone in the class is free to chime in with questions, or help

Common App Problems

Problems surfaced during previous versions of the class

- Cocoapods (install via brew instead of gem, gem is causing problems)
- UICollectionViews - creating in Storyboard
- React Native + Firebase
- React Native - Responsive Design vs Fixed Width
- Firebase - Updating UI of app in the completion block after saving
- Firebase - Data Modeling/Data Structures

App Development Class

Week 8

Jeff Linwood

App Icon Generator

Most useful for iOS app

- Need a 1024x1024 image to start with
- https://appicon.co/
- Drag your image there
- Generates a zip file with an app icon set you can drag into your Xcode assets
- For Android, you can generate ic_launcher icons, but it's not nearly as picky

App Store Upload (or Google Play)

April 10

- iOS
  - https://developer.apple.com/app-store/product-page/
  - https://developer.apple.com/app-store/review/guidelines/
  - https://developer.apple.com/ios/submit/
- Google
  - https://developer.android.com/studio/publish

App Development Class

Week 9

Jeff Linwood, 2022

Apps in the App Store

Who has their apps published?

- Congratulations on sending the apps to the App Store or Play Store!
- Who is already reviewed and ready for download?
- Who got bounced back? Let's talk through that.

Issues with App Store

From Apple

- Apple Push Notification Service needed entitlements
- Needed to have a way to block users
- Needs Sign in with Apple
- Location Permission info text is too vague

Easy 1.1 Additions

Analytics and Crash Reporting

- I would suggest adding two things if you haven't done so already
- Analytics
- Crash Reporting
- Both of these are available through Firebase

App Development Class

Week 10

Jeff Linwood, 2022

What is Accessibility?

- What is Accessibility?
- What makes accessibility different with a smartphone app vs a web site?

Accessibility on iOS

- Guided Access
- Voice Over - https://developer.apple.com/documentation/accessibility/supporting_voiceover_in_your_app
- Accessibility Inspector - Xcode Developer Tool
- https://developer.apple.com/design/human-interface-guidelines/accessibility/overview/introduction/
- https://developer.apple.com/accessibility/ios/
- https://www.apple.com/accessibility/
- https://developer.apple.com/documentation/accessibility

Accessibility on Android

- https://developer.android.com/guide/topics/ui/accessibility
- https://www.android.com/accessibility/
- https://support.google.com/accessibility/android/?hl=en#topic=6007234

Accessibility with React Native

- https://reactnative.dev/docs/accessibility
- https://www.shopify.com/partners/blog/react-native-accessibility

Accessibility Self-Audit

Try your app by voice!

- Let's go through and try your app by voice
- Enable VoiceOver on your phone
- https://support.apple.com/guide/iphone/turn-on-and-practice-voiceover-iph3e2e415f/ios
- Put headphones in
- Then run your app
- Take notes as you go - what's confusing, what do you need to add, what do you need to change?

Web Accessibility

A11y in the Web World

- MDN Accessibility - https://developer.mozilla.org/en-US/docs/Web/Accessibility
- W3C/WAI Accessibility - https://www.w3.org/standards/webdesign/accessibility
- Using Google Lighthouse - https://developers.google.com/web/tools/lighthouse
- Auditing a web site with Google Lighthouse from Google Chrome's Developer Tools
- Understanding what the suggestions mean

Accessibility on iOS

Review

- Guided Access
- Voice Over - https://developer.apple.com/documentation/accessibility/supporting_voiceover_in_your_app
- Accessibility Inspector - Xcode Developer Tool
- https://developer.apple.com/design/human-interface-guidelines/accessibility/overview/introduction/
- https://developer.apple.com/accessibility/ios/
- https://www.apple.com/accessibility/
- https://developer.apple.com/documentation/accessibility

UIKit Accessibility

In Class Exercise

- In class example in Xcode using UIKit

Accessibility with React Native

- https://reactnative.dev/docs/accessibility
- https://www.shopify.com/partners/blog/react-native-accessibility

Accessibility - Making it Better

Solve your own app problems

- Find one problem with accessibility in your app
- Could be that voice over doesn't work with an item
- Or the color contrast is off
- Or your app doesn't work in dark mode on a phone
- Take five minutes to find a problem
- Then let's discuss as a class how to solve it