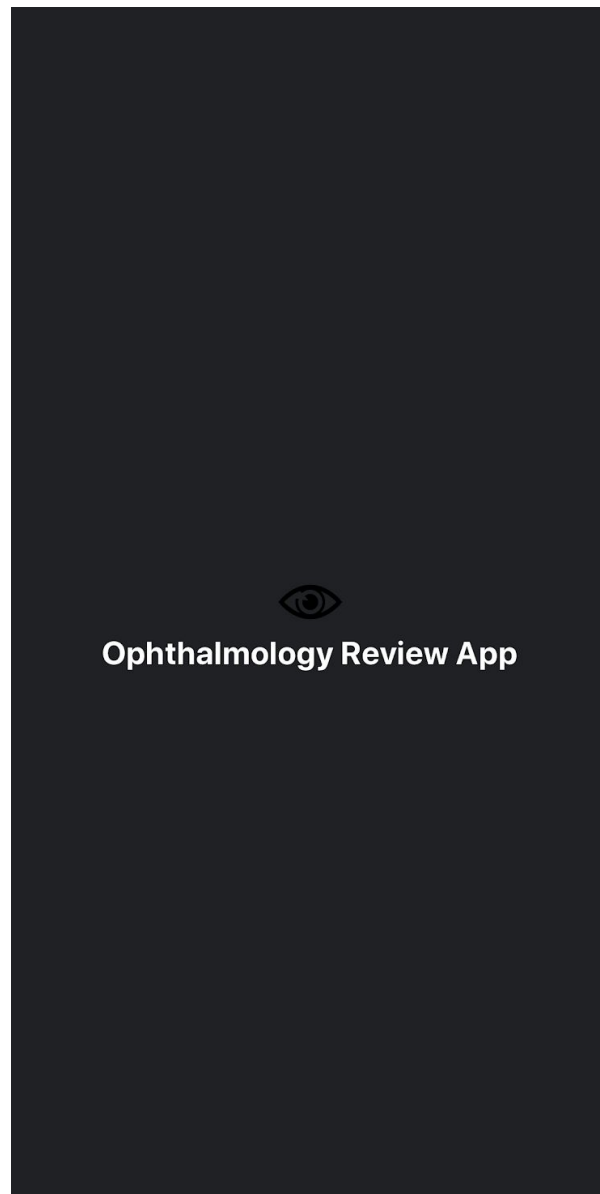


Interactive Educational Clinical Ophthalmology Application User Guide



May 24, 2019

Itzel Hernandez, Angie Ta, Cathy Hsieh, Nomundari Batmandakh

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Preface

a. README

- i. Authors: Itzel Hernandez, Angie Ta, Cathy Hsieh, Nomundari Batmandakh
- ii. Summary
 - A. The user guide is meant for the development team and the owner of the iOS application: Ophthalmology Review App, as granted by Dr. Glenn Yiu.

b. Audience

- i. Suitable audience for this application includes anyone interested in studying ophthalmology and is preparing for routine exams in ophthalmology.

c. Vocabularies

- i. Application
 - A. Ophthalmology Review App: The application name
 - B. Spaced Repetition: “A learning technique that incorporates increasing intervals of time between subsequent review of previously learned material in order to exploit the psychological spacing effect” (https://en.wikipedia.org/wiki/Spaced_repetition).
- ii. XCode 10.2
 - A. Xcode: “The integrated development environment (IDE) from Apple that is used to create, compile and test Mac OS-X and iOS (iPhone, iPad, iPhone) applications” (<https://www.pcmag.com/encyclopedia/term/55875/xcode>). The current version being used is 10.2. Please note that any updates to Xcode may affect the application’s development.
 - B. Storyboard: the portion of the application that shows the individual application pages along with the flow from page to page. Notably where the user interface (UI) can be seen and modified.
 - C. Page: the individual frame that holds the UI for a particular view in the application. Often emulates how a single page appears when the application is running.
 - D. Segue: the connections between pages that affect the transition and flow of the pages together to create the Storyboard.
- iii. Slide/Card
 - A. Represents the subtopic (includes header and info sections).
- iv. Data/Excel File/TXT File
 - A. Represents the clinical ophthalmology information from Dr. Yiu condensed to an Excel data format. The Excel file is converted to a .txt file and then parsed by our application.

2. Overview of the product

a. Background

- i. There is too much information spread out over several books that is too difficult to study over for medical students. This application serves to condense the extensive amount of information on ophthalmology and makes learning more efficient, simple and interactive.

b. Description

- i. An educational iOS app for medical students studying for the clinical Ophthalmology exam. An interactive powerpoint-style application designed specifically for Ophthalmology students.

c. Technical Specifications

- i. XCode 10.2 and Swift
 - A. This project was developed on the current and latest release of Xcode, version 10.2. This version of XCode supports both Objective-C and Swift languages.
- ii. Parse Data
 - A. All data in this application are stored within the app. The data is put into an Excel file, which is then converted into a .txt with tab delimited file, which is then stored within the app.
 - B. The development team is able to change the data if needed and store a new file in the app (or simply edit the file already in the app), that is formatted correctly to match how the data is parsed.
 - C. The data is nested as Category → Topic → Subtopic.

d. Features

- i. **Space Repetition**
 - A. On the bottom of each subtopic card, there are Easy, Unsure and Hard buttons. The user can mark the subtopic card with either button and this will update the score and the repeat factor of the card. The score and repeat factor are numbers that represent how often the card shows up in review (5 = more often, 1 = less often).
- ii. **Occlusion**
 - A. The user can tap the screen to reveal more information on the page for the respective topic.
- iii. **Search**
 - A. The user is able to press the search button in order to look up any data in the app that the user would like to start studying or be redirected to. Once tapped, the user will be redirected to the page relating to what they wanted to see. Underneath each searched word, there is an indication of what category, topic, subtopic, it pertains to, since there are repeated words in the data.
- iv. **Table of Contents Page**

- A. The user is able to scroll through a Table of Contents page to pick a subject to study. It is used to navigate through relevant topics to study. The page shows the categories first. If the user clicks on a category, the topics under that category will appear. If a topic is clicked, the subtopics of that topic will appear on a new page.
- v. **Images / zoom**
 - A. The user will be able to view images that pertain to a specific page and scroll through them if there are multiple images.
 - B. If an image is clicked, then the image will be expanded to fit the whole screen, which can easily be un-expanded by tapping it again. The user is able to zoom into the image in the expanded view.
- vi. **Captions**
 - A. Each image on a page (if the page has any images) has a short caption describing it right below.
- vii. **Progress Page**
 - A. The user can check their progress on how many subtopics they have completed.
- viii. **Notes Page**
 - A. The user can take notes for any subtopic page by tapping the notes button in the right hand corner, which redirects to a notes page. If there is a note saved for a specific subtopic, there will be a notes icon next to the subtopic name in the list of subtopics page.
- ix. **Navigation**
 - A. Back feature: The user will be able to go back to the previous page in case they accidentally pressed a button.
 - B. Tabs feature: on the bottom of the Table of Contents page, the user is able to tap on the icons: Table of Contents, Shuffle, Progress, About Us, in order to go to any of those respective pages.
- x. **Shuffle**
 - A. The user can choose to shuffle all subtopics within every category and topic to review.
- xi. **Update Parsed Information**
 - A. If there is misinformation on a page or if there is a breakthrough in research, the page can be updated/edited to present recent information.
 - B. The text file in which all the page information is read from, can be updated so that new pages, or information, can be added or deleted, but only from a backend perspective, so not any user can do that.
- xii. **About Page**
 - A. A page giving acknowledgement to people involved with the development of the app and a short description of our app and what it is about.

xiii. **Connect to Website (stretch goal)**

- A. The user will be able to login into a website that connects to their phone app and continue where they left off.
- B. This was not implemented in this first version of the app.

3. Installation or distribution

a. **Data Using Parse Setup**

Example data file:

	A	B	C	D	E	F	G	H	I
1	Category	Topic	Subtopic	Image	Image Caption	Header 1	Info1	Header2	Info2
2	Retina	General	Layers of the Retina	188_Retina.j	nil	How often	days		
3	Retina	General	Wavelengths	nil	nil	sensitive to	nil	Rhodopsin	(green)
4	Retina	General	Bruch's Membrane	190_Bruchs	nil	membrane is	RPE and	elements?	lamina of
5	Retina	General	Imaging	191_Imaging	nil	# FA	Fluorescein	Indocyanin	805m; Emit
6	Retina	General	Electroretinogram (ERG): ERG	230_ERG.jpg	nil	tested by	nil	receptor	segment of
7	Retina	General	Electroretinogram (ERG): Ddx	nil	nil	Negative	- CRV(A)O	pathologic	myopia
8	Retina	Macular Diseases	Age-Related Macular Degeneration (AMD)	nil	nil	# Treatment: AREDS	Component s?	Treatment: AREDS 2	Component s?
9	Retina	Macular Diseases	Age-Related Macular Degeneration (AMD): Dry AMD	193_DryAMD 1.png,	nil	# What are risk factors	- age, smoking,	# Drusen: Hard vs.	- Hard: nodular
10	Retina	Macular Diseases	Wet AMD Treatments	nil	nil	# Laser: MPS	Extrafoveal	Regular vs.	600mW/c

- i. The data file is an excel file formatted as the image above. The column names are Category, Topic, Subtopic, Image, Image Caption, Header1, Info1, Header2, Info2, Header3, Info3... (Header and Info listings can repeat as much as needed)
 - A. Category: Category Name
 - B. Topic: Topic Name
 - C. Subtopic: Subtopic Name
 - D. Image: List of images (separated by a comma “,”)
 - E. Image Caption: Captions for images listed in the same order as image list above (captions separated by an asterisk “*”)
 - F. Header: Header information (cyan text in the app)
 - G. Info: Information related to respective header (white text underneath cyan text in the app)
- ii. Additional Text Formatting for Header and Info Sections:
 - A. # : Closed Bullet
 - B. ## : Open Bullet Indent
 - C. ‘-’ : -

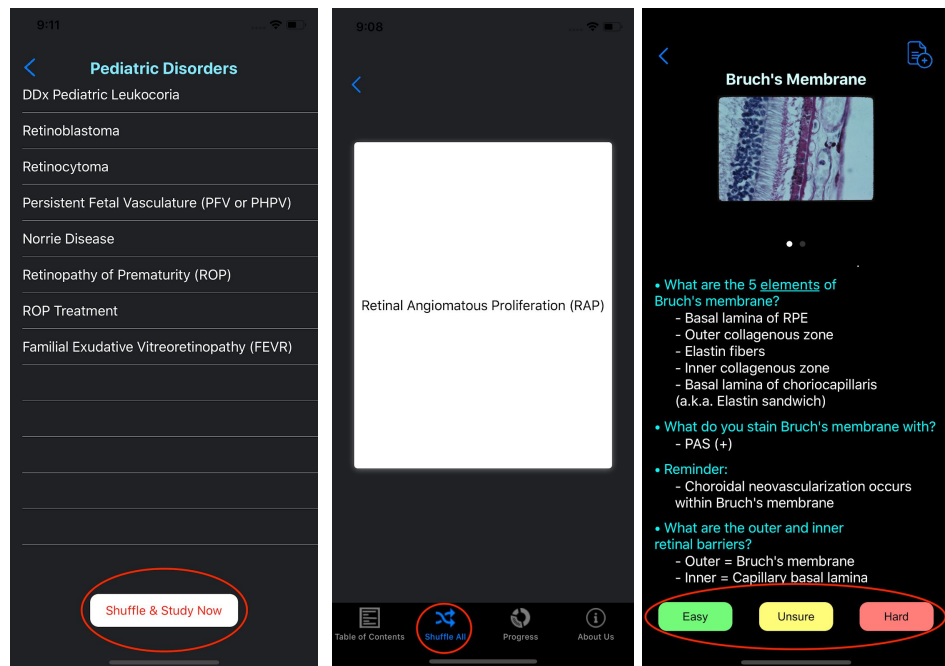
b. **Ad Hoc Distribution**

- i. TBD

4. Functionality

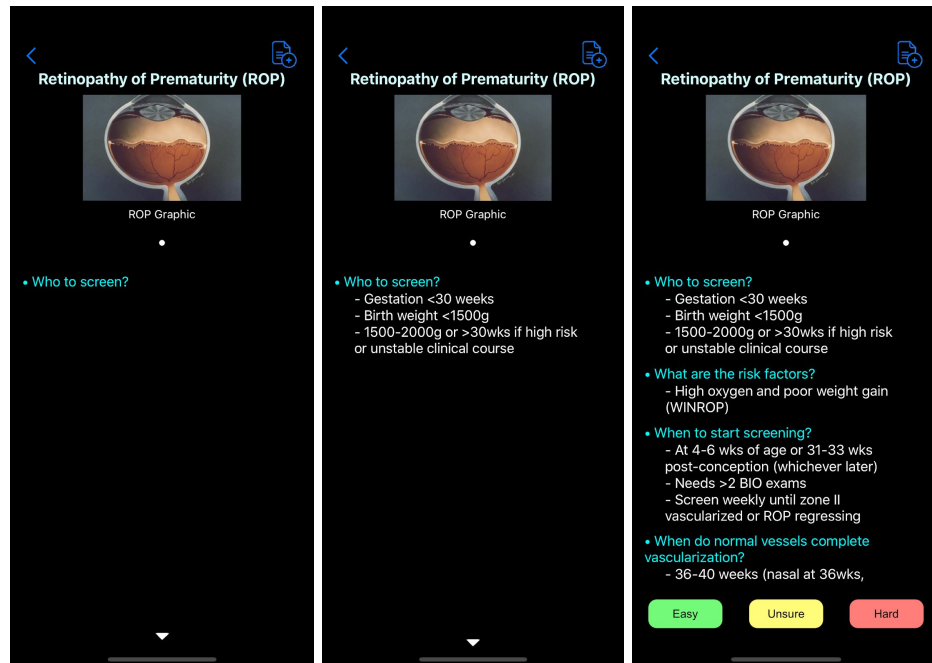
a. Space Repetition

- i. To use the spaced repetition feature, the user has to tap either “Shuffle & Study Now” button located in the Subtopic Table of Contents or the “Shuffle All” tab button. When the user reaches the end of the page, the spaced repetition buttons will show up as “Easy,” “Unsure,” and “Hard.”
- ii. The user is able to repeat a page that is hard to remember. That page will reappear after a certain number of pages have been reviewed based on time and user familiarity. This is determined from the user’s input on how they felt reviewing that specific page.



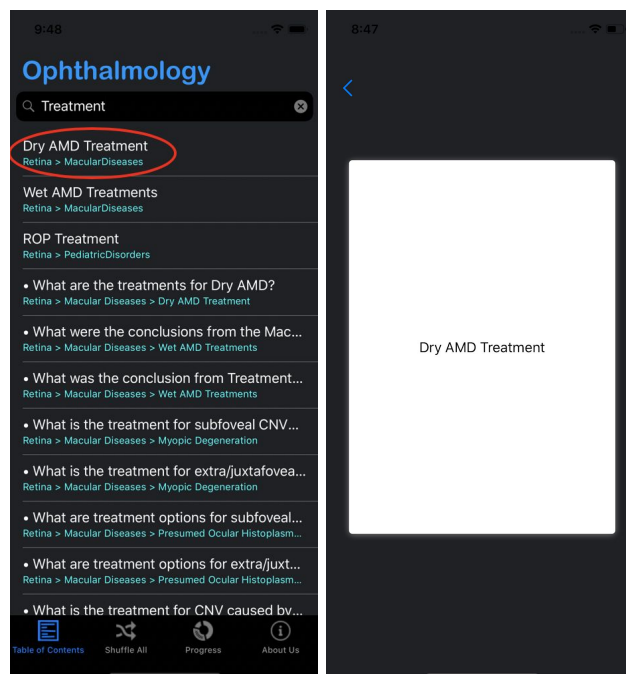
b. Occlusion

- i. The user will be able to see more detailed information when they tap on the screen. At first, it will be hidden until the user continuously taps in order to test their knowledge on the subject. The header will be cyan in color, while the information will be in white.
- ii. The user will be able to determine if there is more information to tap or scroll through with the help of a filled-in white, down triangle at the bottom middle of the page. When the triangle disappears, there is no more information to tap or scroll through.
- iii. If the user is on Shuffle mode, which uses spaced repetition, then the buttons (“easy”, “unsure”, “hard”) that allow for spaced repetition will appear at the end, otherwise they will not.



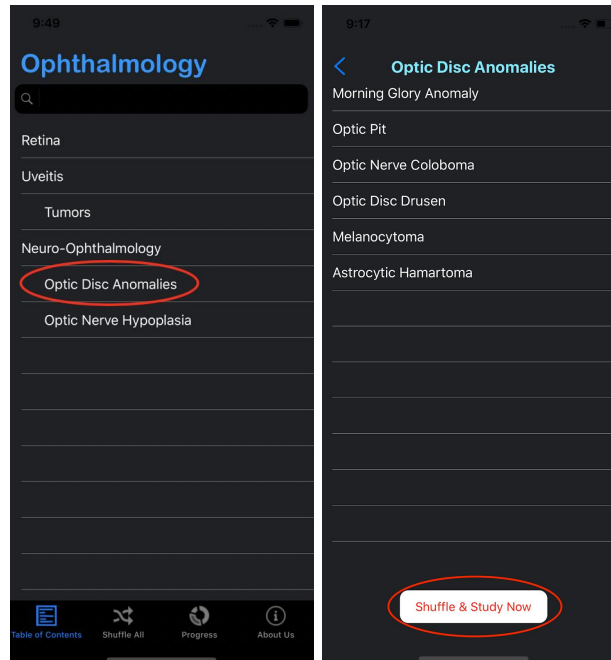
c. Search

- The user will be able to press the search button in order to look up any data in the app that the user would like to start studying or be redirected to.
- When the user starts searching for a subject they want to study, there will be a description of what category, topic, subtopic, and/or header it pertains to in cyan color underneath the searched word, since words are repeated throughout the pages.
- Once tapped, the user will be redirected to a page relating to what they wanted to see.



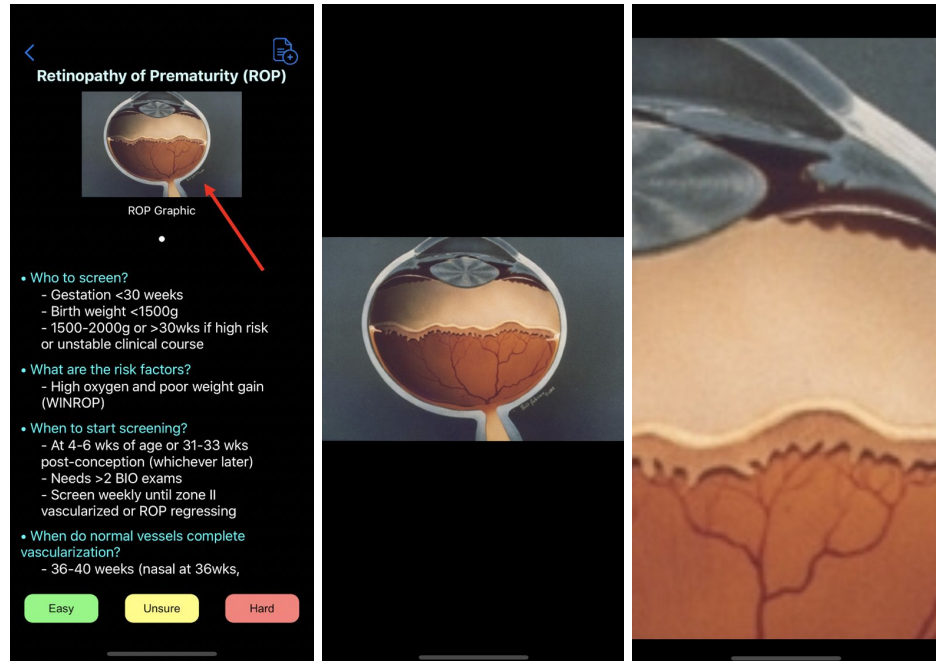
d. Table of Contents Page

- i. The user starts at the Table of Contents Page, where the categories are displayed. In order to see what topics are included in a specific category, you can tap on that category in order to expand the cell. The expanded cell will show the topics in that category. The topics will appear indented. The user can click on a topic they want to study and will be redirected to the Subtopics Table of Contents (shortened Subtopics) page with all the subtopics under the user-picked topic.
- ii. In the Subtopics page, user can scroll through and pick the subtopic they want to review.
- iii. Once in the Subtopics page, the user can also pick review all the subtopics at once by tapping the Shuffle & Study Now button at the bottom middle of the page. If this option is chosen, then the user can start studying with the spaced repetition algorithm that is implemented in the code.



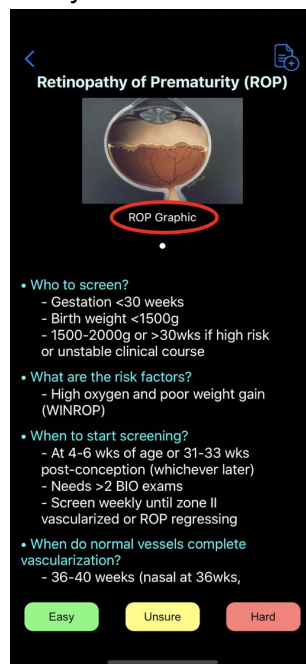
e. Images / zoom

- i. The user will be able to view images that pertain to a specific page and slide through them if there are multiple images.
- ii. If an image is tapped, it will be expanded to fit the whole screen, and the user can easily un-expand it by tapping it again. The user is also able to zoom into the image in this view by just doing a pinch gesture with their fingers.
- iii. When there are multiple images, the user is able to swipe left or right through the images to view other images. There is a page indicator located at the bottom of the images that indicates how many images there are on that page.



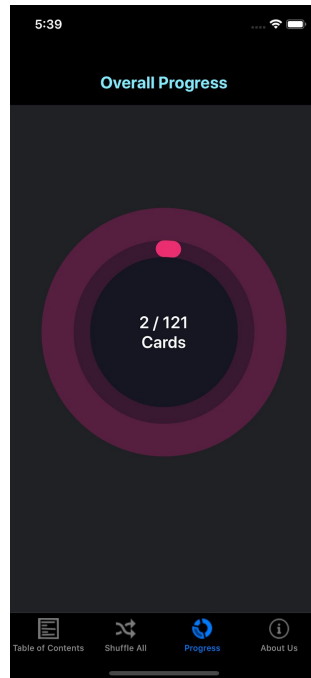
f. Captions

- i. Ability to see a short caption describing the image, right below the image.



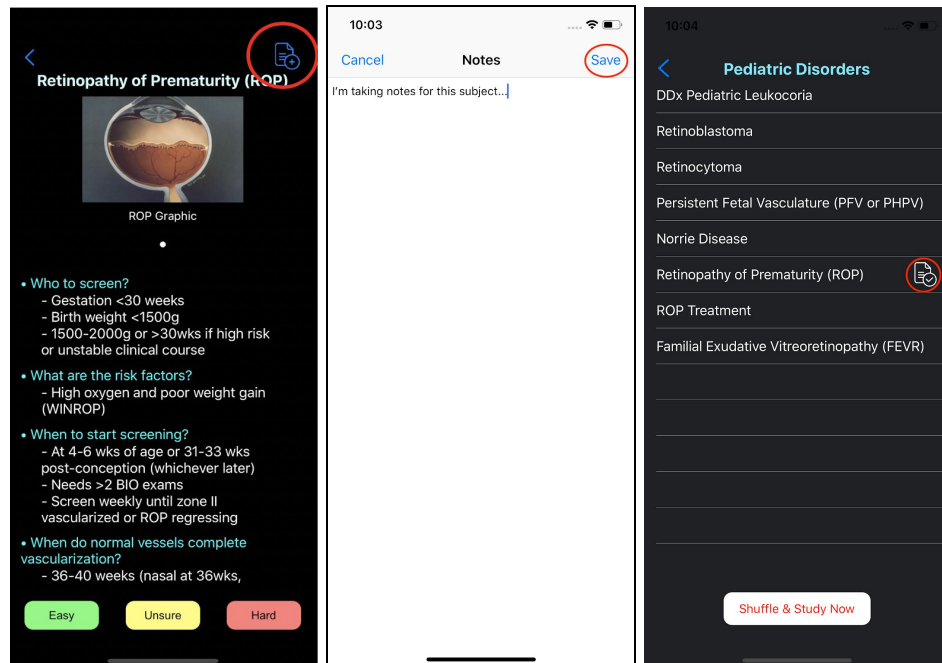
g. Progress Page

- i. The user can check their progress on how many subtopics they have completed.
- ii. When the user clicks on the "Easy" button, it indicates that the user is finished with that subtopic in spaced repetition, which will be recorded into the progress page.



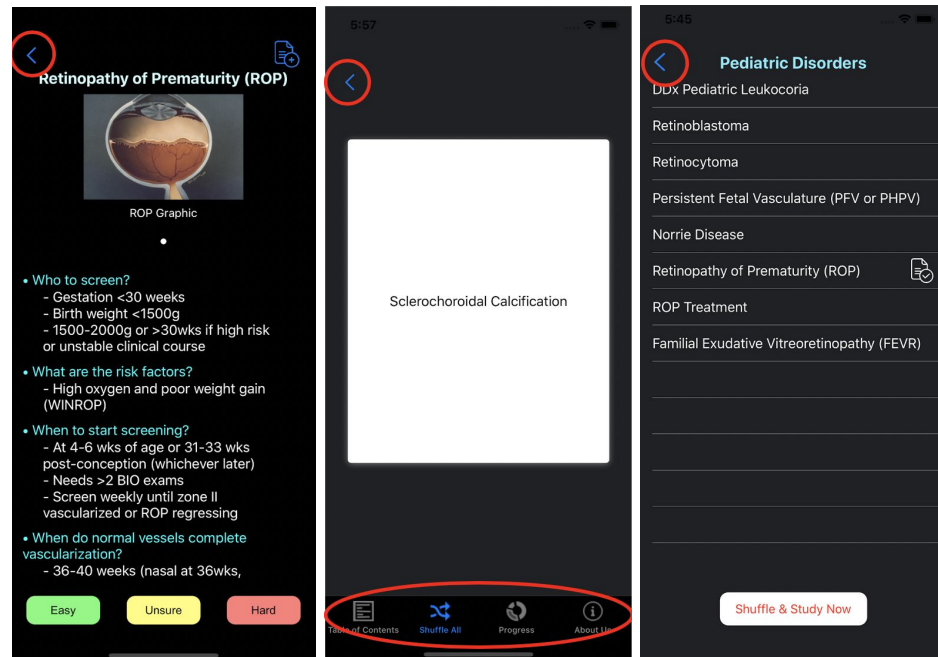
h. Notes Page

- i. For each subtopic page, the user can take notes by clicking the note icon at the top right corner, which will redirect the user to a note page for that specific subtopic. When the user taps the save button, a note icon will appear next to the subtopic in the Subtopic Table of Contents indicating that the user took notes for this subtopic. The notes will be stored in the phone's memory so that it persists even after the user has quit the application.



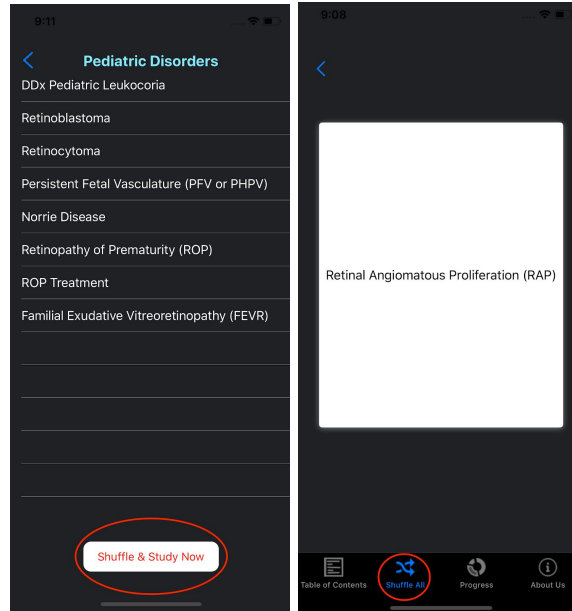
i. Navigation

- i. Back feature: The user will be able to go back to the previous page in case they accidentally pressed a button.
- ii. Tabs feature: on the bottom of the Table of Contents page, the user is able to click on the icons: Table of Contents, Shuffle, Progress, About Us, in order to go to any of those respective pages.



j. Shuffle

- i. The user can choose to randomly study through all the subtopics. This feature implements the spaced repetition algorithm, which puts the user in study mode.
- ii. If the Shuffle in the tab view is tapped, the user will shuffle through all the subtopics in all categories and topics.
- iii. If the Shuffle & Study Now button is tapped in the Subtopics Table of Contents page, the user will shuffle through all the subtopics.

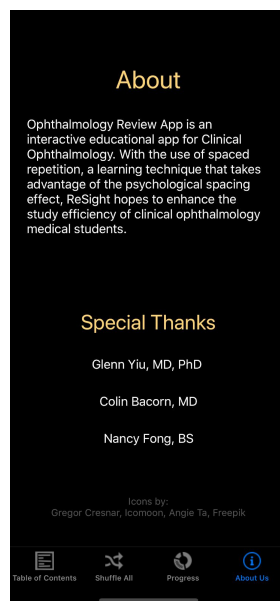


k. Update parsed information

- i. If there is misinformation on a slide or if there is a breakthrough in research, the pages can be updated/edited to present updated information.
- ii. The text file in which all the page information is read from, can be updated so that new pages, and/or information, can be added or deleted, but only from a backend perspective, so not any user can do that.

l. About page

- i. A page giving acknowledgement to people involved with the development of the app and a short description of our app and what it is about.



5. Troubleshooting

a. Xcode/ Developer Troubleshooting

- i. Your device isn't compatible with this version of Xcode
 - A. Make sure the device you are running the application on is an iPhone and that it is updated to the latest iOS software. Also, make sure the version of XCode is compatible with the iOS version running on the phone.
 - B. Check XCode documentation for further assistance and troubleshooting

b. Parse/Data file Troubleshooting

- i. To change the data file, insert the data txt file into the Information folder on the app. In ContentsOfTableviewController.swift, find the comment that indicates the data file and change the current file name to the new one.
- ii. Please ensure that:
 - A. The Excel file is converted to a tab delimited file (.txt)
 - B. The letters in the excel file are standard characters and not auto formatted by excel (ex. '...').
 - C. Delimiters are correct for each column of the file

c. iPhone Simulation Troubleshooting

- i. If you are having trouble trying to simulate the application on your iPhone as a developer through Xcode, please ensure you have enabled trust for the application with the following steps:
 - A. Open 'Settings' on your iPhone.
 - B. Go to 'General' → 'Device Management'.
 - C. Click on your Apple ID.
 - D. Click 'Trust'.
- ii. Please ensure your Apple account is linked to Xcode.
 - A. Open the application with Xcode.
 - B. Click on the topmost "Oph" on the left sidebar
 - C. Under the "Signing" section, click on the dropdown bar for "Team".
 - D. Click on "Add an Account" if you have not added an account already.
 - E. Sign in to your Apple account.
- iii. Please make sure you have a unique "bundle identifier".
 - A. On the same page as in step ii, go to the "Identity" section.
 - B. Add "Bundle Identifier" to any unique identification for your application. To avoid conflicts, Apple suggests using reverse domain name notation (e.g. com.opth123).

6. Frequently Asked Questions

a. Xcode - Found on the Apple Developer Website

- i. Downloading Xcode
 - A. The latest version of Xcode is available for free from the Mac App Store.
 - ii. Which version of Xcode can I use to submit my apps?
 - A. You should use the latest version of Xcode available on the App Store to submit your application. Do not submit apps built using beta software, as beta versions of Xcode, Operating Systems, and SDKs are for development and testing only.
 - iii. I've installed the latest version of Xcode from the Mac App Store, but a previous version of Xcode (4.2.1 or earlier) keeps launching. What should I do?
 - A. To run the latest version of Xcode, make sure you are launching Xcode.app from the Applications folder. You can delete the older version of Xcode by dragging the Developer folder to the trash.
 - iv. I have OS X Mountain Lion running on my Mac. When I try to install Xcode from the Mac App Store, the install doesn't complete because "the version of OS X is too new."
 - A. To fix this, first quit the App Store application. Then open Terminal and enter the following command:
`rm 'getconf DARWIN_USER_CACHE_DIR'/com.apple.appstore/497799835/pr
eflight.pfpkg`. Relaunch the App Store and install Xcode.
- b. Parse**
- i. How can I update information on the app?
 - A. Currently, information on the app can be updated by updating the respective excel data file.

7. Contact Information

- a. Glenn Yiu
 - i. Owner
 - ii. gyiu@ucdavis.edu
- b. Itzel Hernandez
 - i. Developer
 - ii. inhernandez@ucdavis.edu
- c. Angie Ta
 - i. Developer
 - ii. alta@ucdavis.edu
- d. Cathy Hsieh
 - i. Developer
 - ii. cchsieh@ucdavis.edu
- e. Nomundari Batmandakh
 - i. Developer
 - ii. nbatman@ucdavis.edu

8. Appendix

Appendix A: Design Document

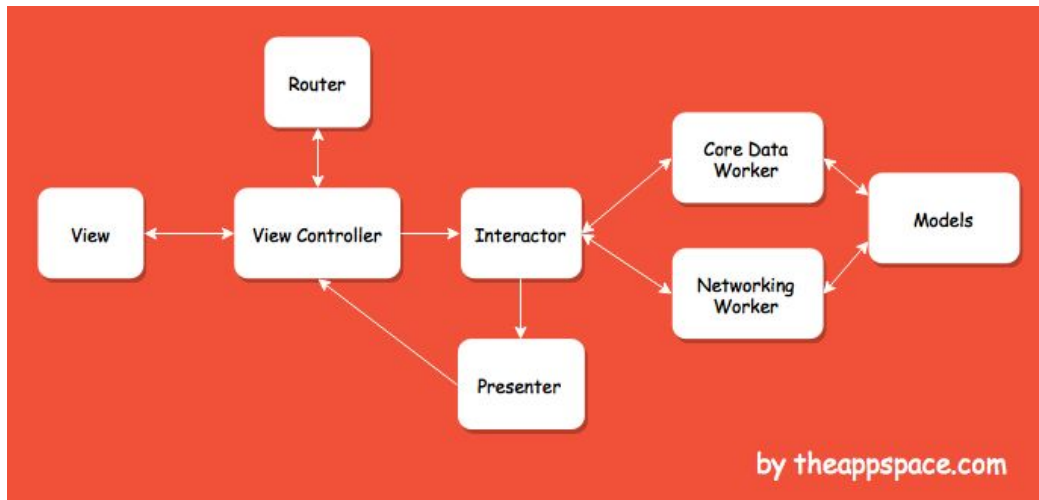
Technology Background:

- Programming Languages: Swift
 - A programming language designed for writing apps for Apple platforms, including iOS. The entire app is coded in Swift.
- Tools: Xcode
 - Xcode is an integrated development environment, which means it pulls all the tools needed to produce an application (particularly a text editor, a compiler, and a build system) into one software package.
- Tools: Github
 - Used for source code sharing amongst team members.

Architectural choices and corresponding advantages and disadvantages:

Xcode

- Advantages
 - 100% free IDE.
 - Xcode is a robust program to make native Apple product applications.
 - Easy to set up a simulator.
 - There are plenty of resources available online for Objective-C and Swift languages.
- Disadvantages
 - Need Mac in order to run Xcode.
 - Limited to Apple devices.
 - Need Apple Developer Program, Apple account, and license to publish.
 - Xcode uses Objective-C and Swift, both languages that are very Apple-specific and not really used for Windows or Linux development.
- Architecture



- Scalability
 - Very robust for Apple development
- Source
 - <https://www.quora.com/What-are-the-advantages-of-Xcode>
 - <https://www.quora.com/What-are-the-disadvantages-of-using-Xcode>
 - <https://hackernoon.com/introducing-clean-swift-architecture-vip-770a639ad7bf>

System Architecture Overview:



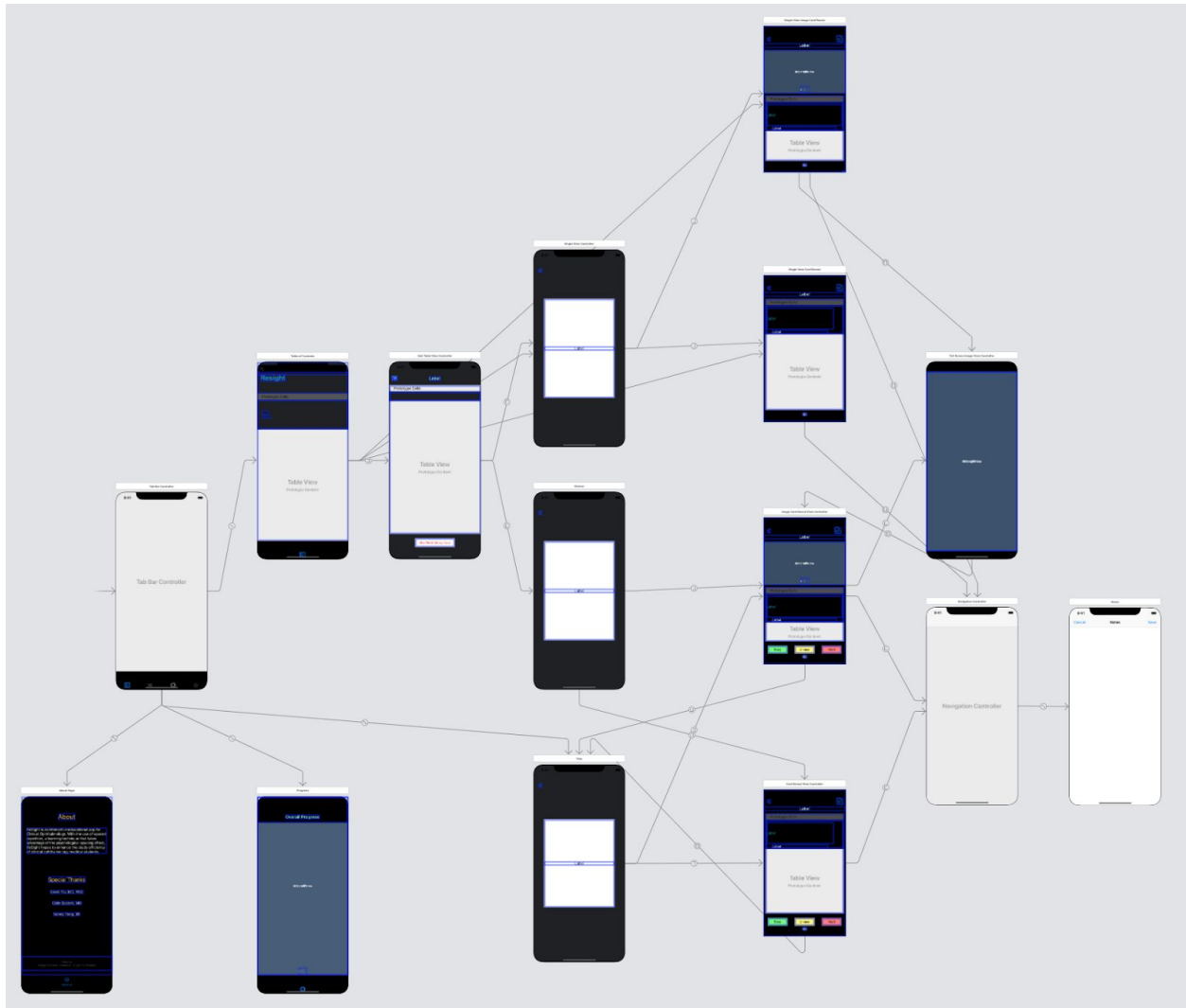
Image source:

https://www.google.com/search?safe=active&hl=en&authuser=0&biw=1745&bih=852&tbm=isch&sa=1&ei=Ye-mXNItJozfjgT4hYm4DQ&q=firebase+database+icon&oq=firebase+database+ic&gs_l=img.1.0.35i39j0i8i30.51469.51963..52857...0.0..0.95.190.2.....1....1..gws-wiz-img.....0i24.UCXAPt1RDIM#imgdii=7c4paMifB4YKvM:&imgsrc=1dJdp7rRD3082M:

There are 2 main components to our system architecture:

1. Text file of data for App
 - a. This file will contain all subtopic information to be shown on the app. This includes each page's images, category, topic, subtopic, headers and information corresponding to the headers.
2. Xcode
 - a. In Xcode we will code all the functionality of the app and UI in Swift. From Xcode we will write the code to parse the data in the text file.

Storyboard from Xcode:



Appendix B: Testing Document

Test Plan for Ophthalmology App

Prepared By: Angie Ta, Cathy Hsieh, Itzel Hernandez, Nomuna Batmandakh

For our Client: Dr. Glenn Yiu, M.D. Ph.D. and Assistant Professor of Ophthalmology and Vision Science at the UC Davis School of Medicine

Summary of Product to be Tested

- **Brief primary use case of product:** Users will utilize the app to search for, and review clinical ophthalmology information.
- **List of major elements of the product:**
 - Present clinical ophthalmology information in an organized way
 - Allow users to review information
 - Track user review progress

- Search for specific information
- Take notes
- Show overall review progress

Resources Required for Testing

- **Hardware and software resources required for testing:**
 - Computer/Laptop running Mac OS
 - iPhone
 - XCode v.10.2 supporting Swift
- **Estimated person hours for testing (will be amended by test team):**
 - 40 hours (approx. 5 hours a week per person)
- **How resources may be obtained:**
 - Computer/Laptop running Mac OS - already bought/borrowed
 - iPhone/iPad - already owned
 - XCode v.10.2 supporting Swift - free to download for Mac OS

Packaging, Building, Configuration and Option

- 1. GitHub/Bitbucket Repo/URL for checking out product (read access only):**
 - a. <https://github.com/angielt/Ophth>
- 2. How to checkout:**
 - a. Step 0: Open terminal and type the following commands
 - b. Step 1: git clone https://github.com/angielt/Ophth.git
 - c. Step 2: git checkout Ophth
- 3. How to install and configure the elements (Path names? URLs? etc):**
 - a. Step 1: Open up the project file on XCode: Ophth.xcodeproj
 - b. Step 2: Select which simulator device you would like to use, then hit build.
- 4. How to sanity check basic function to ensure it's built & installed properly:**
 - a. Check the commit message on Git for the most updated version before fetching from GitHub.
 - b. git fetch origin master
 - i. To get newest changes

Process for Defect Reporting & Repair

We decided on testing immediately after developing each feature. Testing was done by the person who developed the feature, or in pairs when a problem arose. Before merging onto our master branch on GitHub, which held the functional version of the app, we pushed onto a branch in order to fix any problems beforehand, and always have a working version. Once problems were fixed, it was merged with the working version to update it.

Functional Testing Plan

User Identification	User Goal	Test Id	Estimated Time (Devs)	Estimated Time (Testers)
General User	Use search feature	F01	30 hours	5 mins

	Review progress	F02	20 hours	5 mins
	Review slide information	F03	4 months	> 10 hours
	Take notes for specific subject	F04	10 hours	5 mins
Development team	Edit data file	F05	20 hours	> 10 mins
	Spaced repetition topic	F06	1 months	> 1 hour
	Spaced repetition	F07	3 months	> 3 hours
	Subtopic slide shows	F08	40 hours	~10 mins

List Test Cases:

Test Case F01:

1. General User
2. Use search feature
3. Initial conditions/Required Resources/Configurations:
 - a. User cannot find the specific information (Category, topic, subtopic, header, and information)
4. Test script:
 - a. Tap on the search bar in the Table of Content page.
 - b. Type specific word in the search bar.
 - c. Click on the cell, which will direct to the specific page

Test Case F02

1. General User
2. Review progress
3. Initial conditions/Required Resources/Configurations:
 - a. User wants to keep track of how many subtopics they completed.
4. Test script:
 - a. Tap on "Progress" tab button to review the progress.

Test Case F03

1. General User
2. Review slide information
3. Initial conditions/Required Resources/Configurations:

- a. Study for ophthalmology
- 4. Test script:
 - a. *Review each subject individually by clicking on them in the Subtopic Table of Contents.*
 - b. *Or, by clicking the “Shuffle & Study Now” button in the sub-table of contents.*
 - c. *Or, by clicking the “Shuffle All” tab button to review all subjects.*

Test Case F04

- 1. General User
- 2. Take notes for specific subject
- 3. Initial conditions/Required Resources/Configurations:
 - a. User need to take a note for a specific subject
- 4. Test script:
 - a. *In the subject page, click the note icon in the upper right corner.*
 - b. *Type any notes in the text box.*
 - c. *Click save.*
- 5. The note icon will appear in the Subtopic Table of Contents indicating that the user took a note in that subject.

Test Case F05

- 1. Development Team
- 2. Edit data file
- 3. Initial conditions/Required Resources/Configurations:
 - a. Need to add/edit the information
- 4. Test Script:
 - a. *Open the excel data file.*
 - b. *Add/edit the information.*
 - c. *Save as .txt (Tab Delimited Text) .*
 - d. *Upload to GitHub.*
- 5. The app content has updated

Test Case F06

- 1. Development Team
- 2. Initial conditions/Required Resources/Configurations:
 - a. Spaced Repetition Topic
- 3. Test Script:
 - a. *Click on category*
 - b. *Click on topic*
 - c. *Click shuffle and study*
 - d. *If all the cards are marked easy, the review finished*
 - e. *Cards not marked easy are repeated*

Test Case F07

1. Development Team
2. Initial conditions/Required Resources/Configurations:
 - a. Spaced Repetition
3. Test Script:
 - a. *Go through spaced repetition, either on Shuffle All or individual topics*
 - b. *Progress page should update with the number of subtopics reviewed*
 - i. *Reviewed : cards with a repeat factor of 1, no need to repeat*

Test Case F08

4. Development Team
5. Initial conditions/Required Resources/Configurations:
 - a. Subtopic slide shows
6. Test Script:
 - a. *Go to a subtopic slide*
 - i. *Tap screen*
 - ii. *Screen should reveal more information with each tap*
 - iii. *If Shuffle & Study Now is tapped or Shuffle All is tapped, the easy, unsure and hard buttons should appear after all the information is displayed for that slide*

Social/ Legal Aspect of the Product:

Our application is open source. Images displayed on the application are supplied to us by the client. Application icons are cited in the about page of the application as requested by the artists. Icons created by the team are copyright restricted by the team.

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