

Kinundrum

Design Documentation

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Kinundrum: a problem-based multimedia learning application for undergraduate kinesiology education

About the Project

Kinundrum is a collaborative endeavour created by Chelsea Canlas, Natividad Chen and Patricia Nguyen for their Masters Research Project in the University of Toronto Biomedical Communications graduate program (BMC). The faculty supervisory committee includes Dr. Judi Laprade, Michael Corrin, Dr. Jodie Jenkinson, Dr. Shelley Wall, and Dr. Derek Ng.

Designed to address the need for an e-learning tool that engages undergraduate kinesiology students in active learning, *Kinundrum* guides students through lower limb biomechanics case studies at increasing levels of difficulty. Case studies present animated injury scenarios, after which students solve interactive problems accompanied by 3D models, animations and illustrations of the affected anatomy.

At the intersection of art, science, education and technology, *Kinundrum* combines problem-based learning pedagogy with multimedia design and web technology to create an engaging e-learning tool that can be accessed outside of the formal classroom.

Audience

The application primarily targets first-year kinesiology students in Dr. Laprade's anatomy course to use as a supplementary learning resource. The case study exercises will allow students to review, apply and contextualize their anatomy knowledge while developing their reasoning and problem-solving skills. The multimedia assets within the e-learning application can also serve as teaching tools for Dr. Laprade and her teaching assistants to use during lectures and tutorial sessions.

Format

The website application is designed to be used only on a desktop platform at this time. Designing for tablet and mobile devices is beyond our current project scope. However, we would be open to making *Kinundrum* compatible with devices controlled by touch screens after the desktop application has launched.

Objectives

Kinundrum will engage students in deep and active learning of lower limb anatomy. To reach this goal, the following objectives will be realized:

1. Compose case study questions that allow students to apply lower limb anatomy knowledge, develop critical thinking and problem-solving skills, and teach students how to effectively learn anatomy.
2. Design and create instructional multimedia assets adhering to principles derived from educational psychology and neurobiology that reduce cognitive load and avoid elements that don't contribute to learning, direct attention to relevant information, and facilitate the formation of coherent mental models.
3. Incorporate features (incorrect answer feedback, remedial exercises, prompts, progress bars, etc.) that address and adapt to individual user needs.
4. Design an engaging and easy-to-navigate user graphic interface.

Section 1:

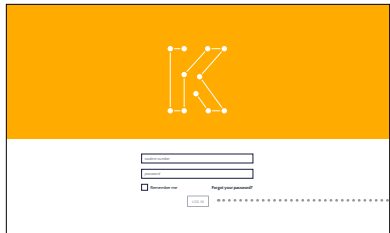
User Journey

- A. Application Architecture
- B. User Flow Diagram
- C. Wireframes

A Application Architecture

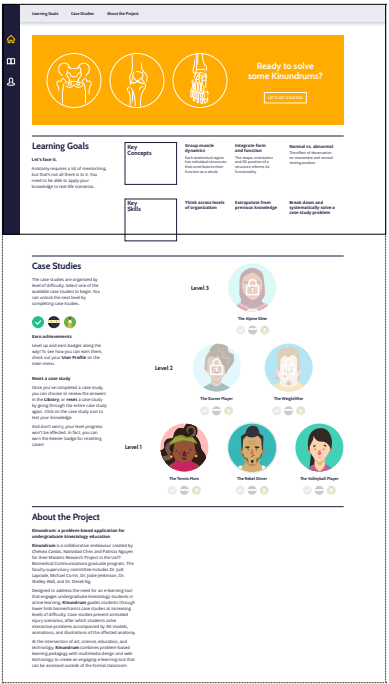
LOGIN SCREEN

Also the landing page, this screen can be accessed through a link in the course Blackboard portal website or by direct URL entry on a web browser.



GLOBAL NAVIGATION

Links to Home, Library and User Profile can be found on the side bar which is accessible throughout the application.



CASE STUDIES

Case studies can be accessed through the Case Studies section in the Home screen. Case studies always consist of an introduction, exercises and a conclusion. Progress is saved when the user exits the case study.

1

Case study mode

This is the default mode when a user first accesses a case study.

Users are only in this mode once. Once users complete a case study, they can reset it or review exercises in the Library.

2

Reset a case study

Users are able to reset only after they have completed the case study.

When a case study resets, the answers and patient folder notes clear throughout the case study. The user journey is sequential as in the case study mode.

3

Review from the Library

Users can review exercises after they have been completed and added into the Library.

Users can access any exercise from the Library. Unlocking exercises is not required.

ACHIEVEMENTS

In **Case study mode**, users can:

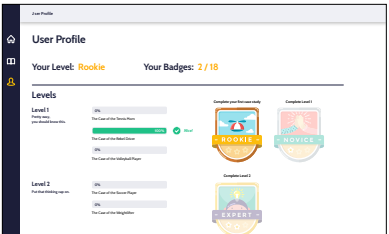
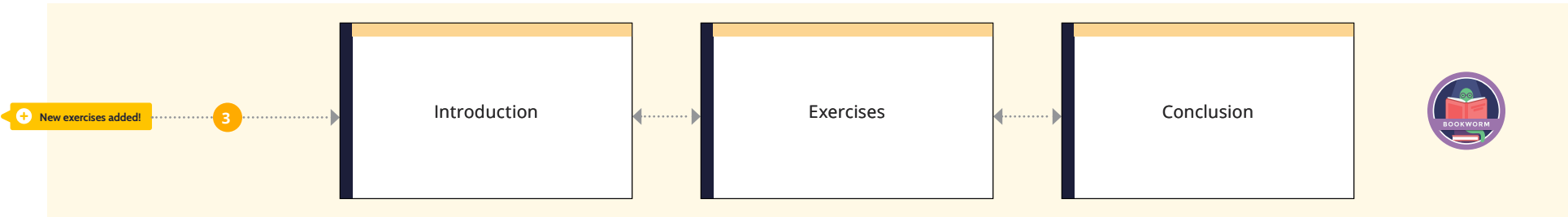
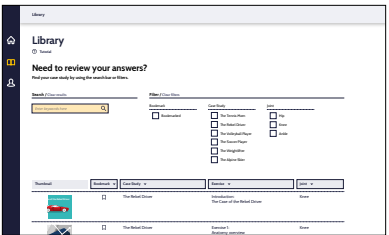
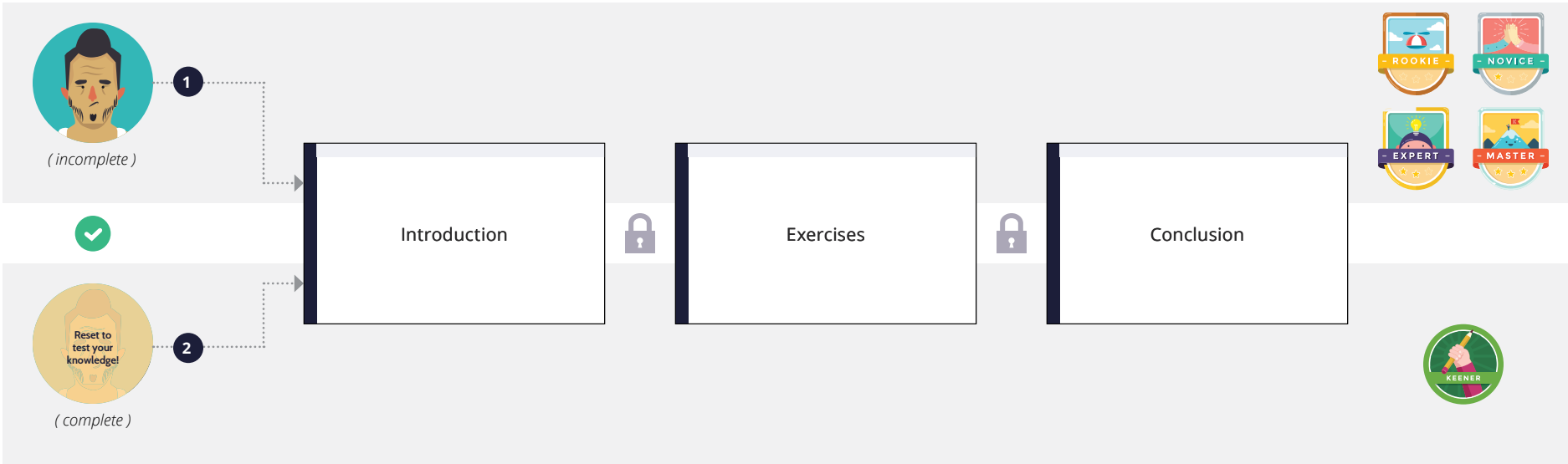
- Level up
- Earn the Kininja badge (only 1 per case study)

By **resetting** a case study, users can:

- Earn the Keener badge (only 1 per case study)
- Earn the Kininja badge (only 1 per case study)

By reviewing from the **Library**, users can:

- Earn the Bookworm badge



B User Flow Diagram

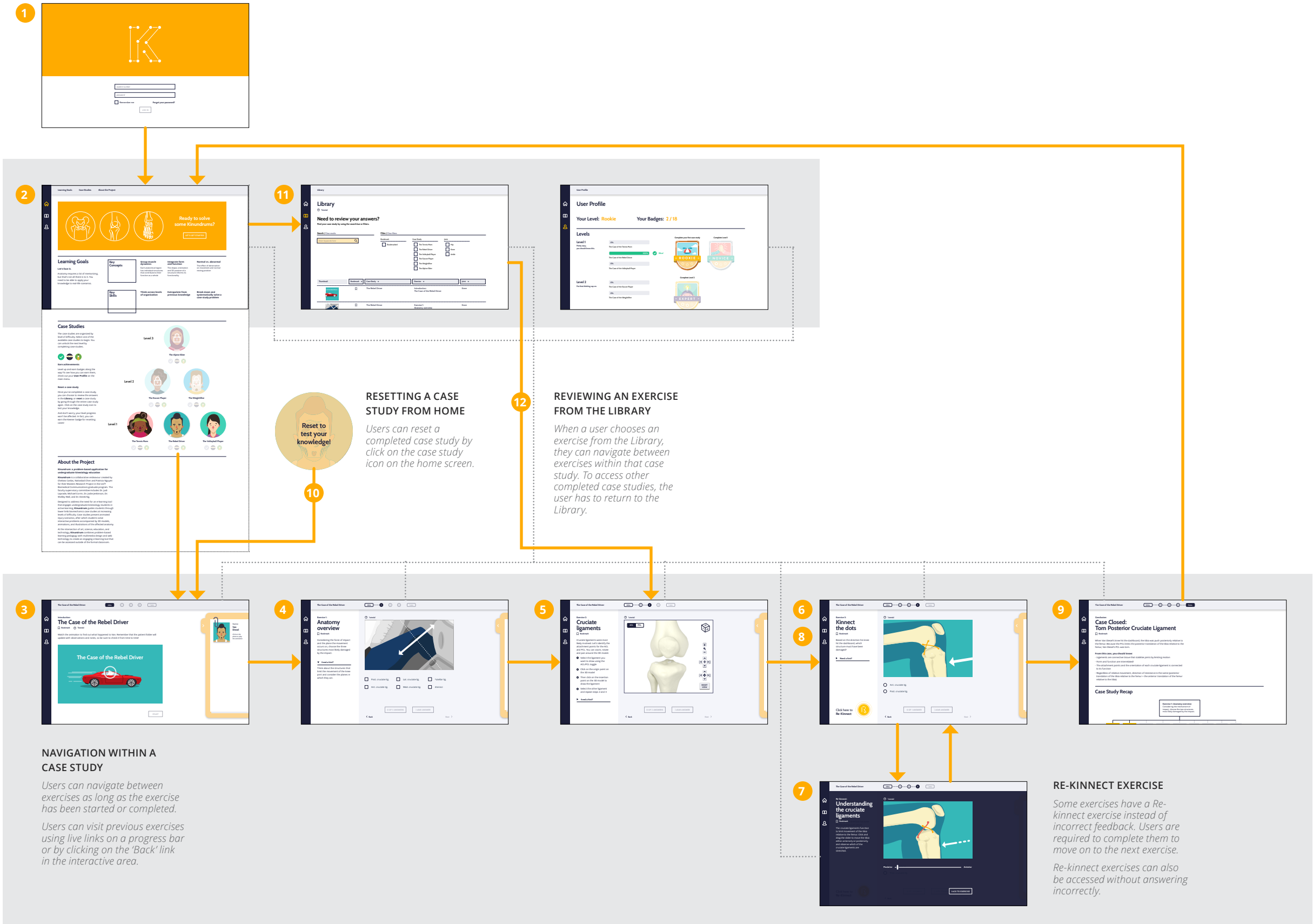
User scenarios can begin at two entry points: a link on Dr. Laprade's course website on the U of T Blackboard portal, or direct URL entry on a web browser. For this user scenario, the web application will be accessed through the Blackboard portal.

The diagram illustrates the path the user follows through their experience. This diagram also maps out other possible paths they can explore. While the case study exercises are linear paths, the user can access other features and pages of the web application without losing their progress on an active case study.

(You can click on individual wireframes to go directly to the wireframe)

→ This represents the user's path

..... This represents other possible paths the user can take



Wireframes

LOGIN SCREEN

The user types their student number and password (provided by Dr. Laprade). By clicking the *Remember me* checkbox, the application saves their account details for automatic login.

IF USER STUDENT NUMBER/PASSWORD ARE ENTERED CORRECTLY...

The user is directed to the **Home** screen.

IF USER STUDENT NUMBER/PASSWORD ARE ENTERED INCORRECTLY...

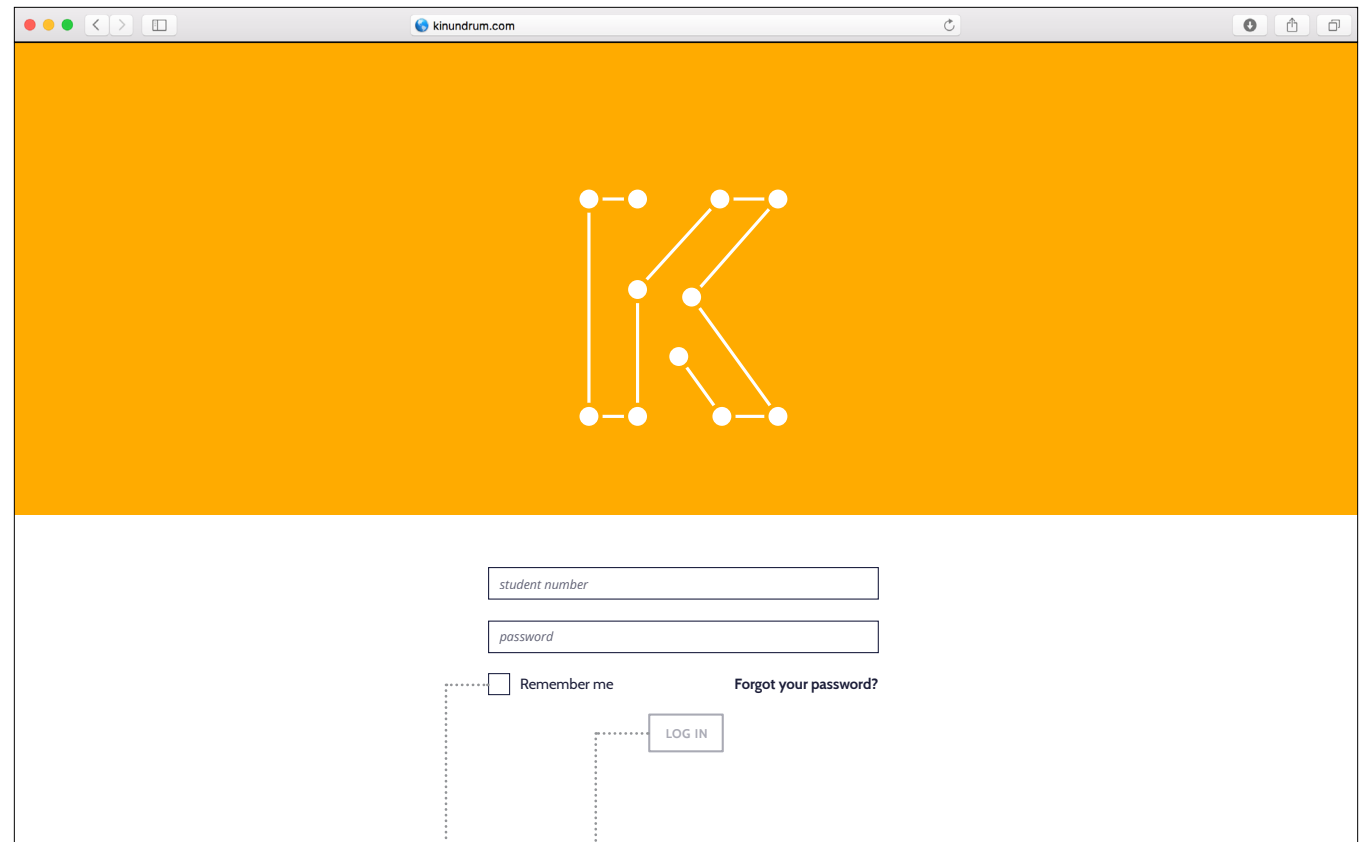
The user receives an error message.

⊗ Invalid student number

⊗ Wrong password

IF USER FORGETS PASSWORD...

The user clicks on 'Forgot your password?' and is taken to another screen where they enter their student email (*next page...*).



Box remains checked for following sessions



Active after user enters login information

LOG IN

On hover, the ghost button inverts

LOG IN



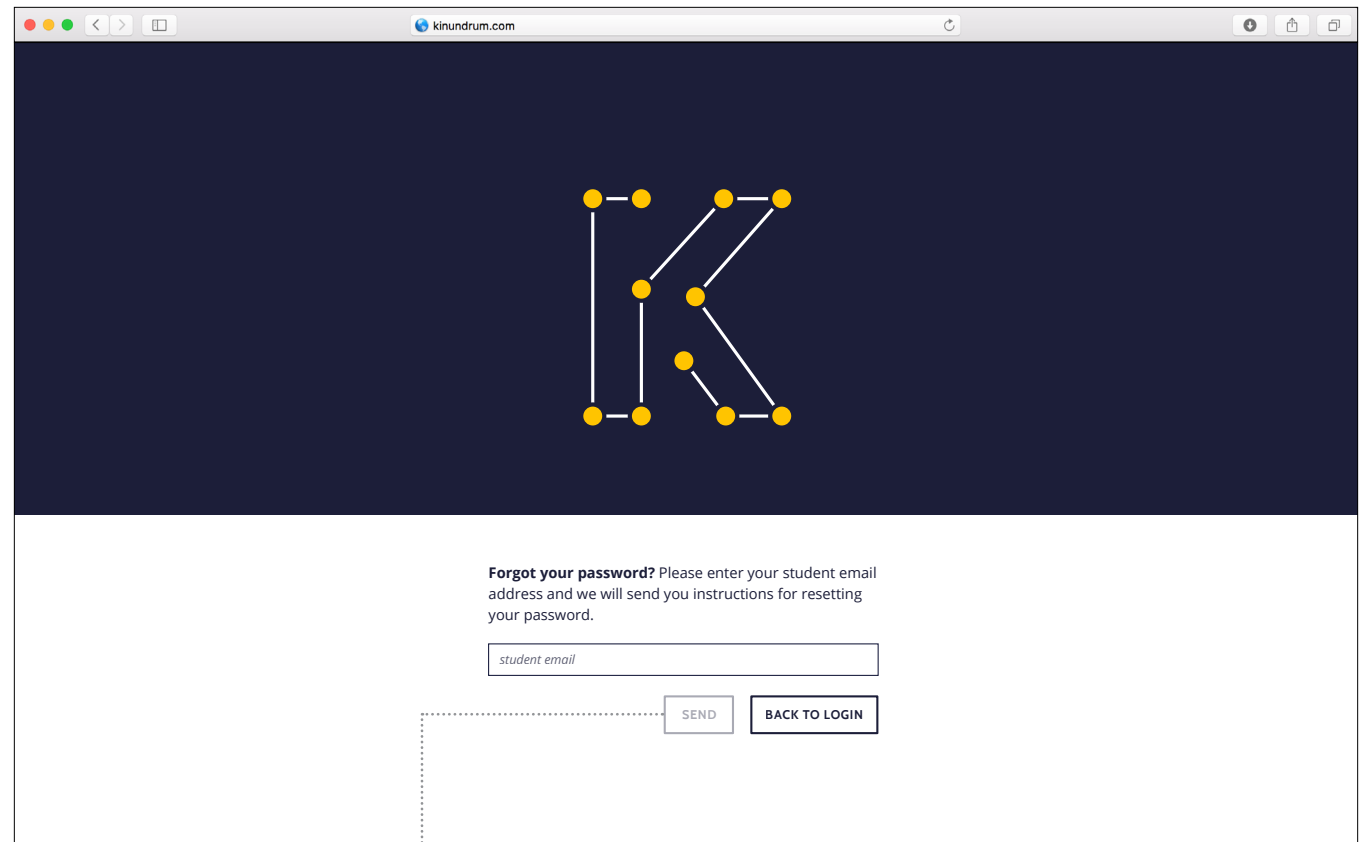
Wireframes

FORGOT YOUR PASSWORD

The user is prompted to enter their U of T student email. After they click SEND, the user receives a message confirming that an email with instructions for resetting their password has been sent to their email inbox.

IF USER ENTERS STUDENT EMAIL INCORRECTLY...

The user receives an error message.

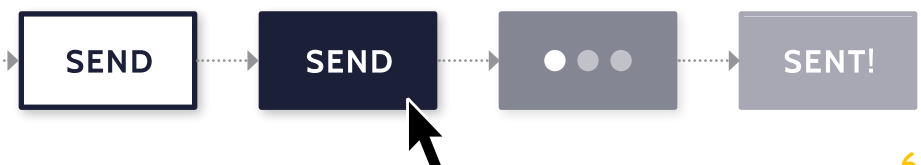


Button becomes active after the user has entered an email

On hover, the ghost button inverts

After click, the button indicates the pending status of the email

Once the email has been sent, the button becomes inactive



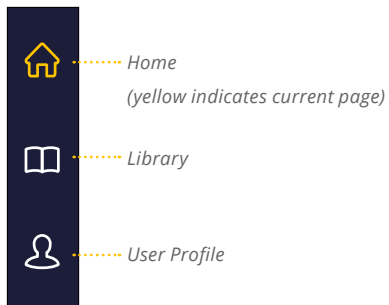
Wireframes

HOME SCREEN

Users can access *Learning Goals*, *Case Studies* and *About the Project* by scrolling down the page or by clicking on direct links on the header. The user is also introduced to the global side bar which gives access to **Home**, **Library** and **User Profile**.

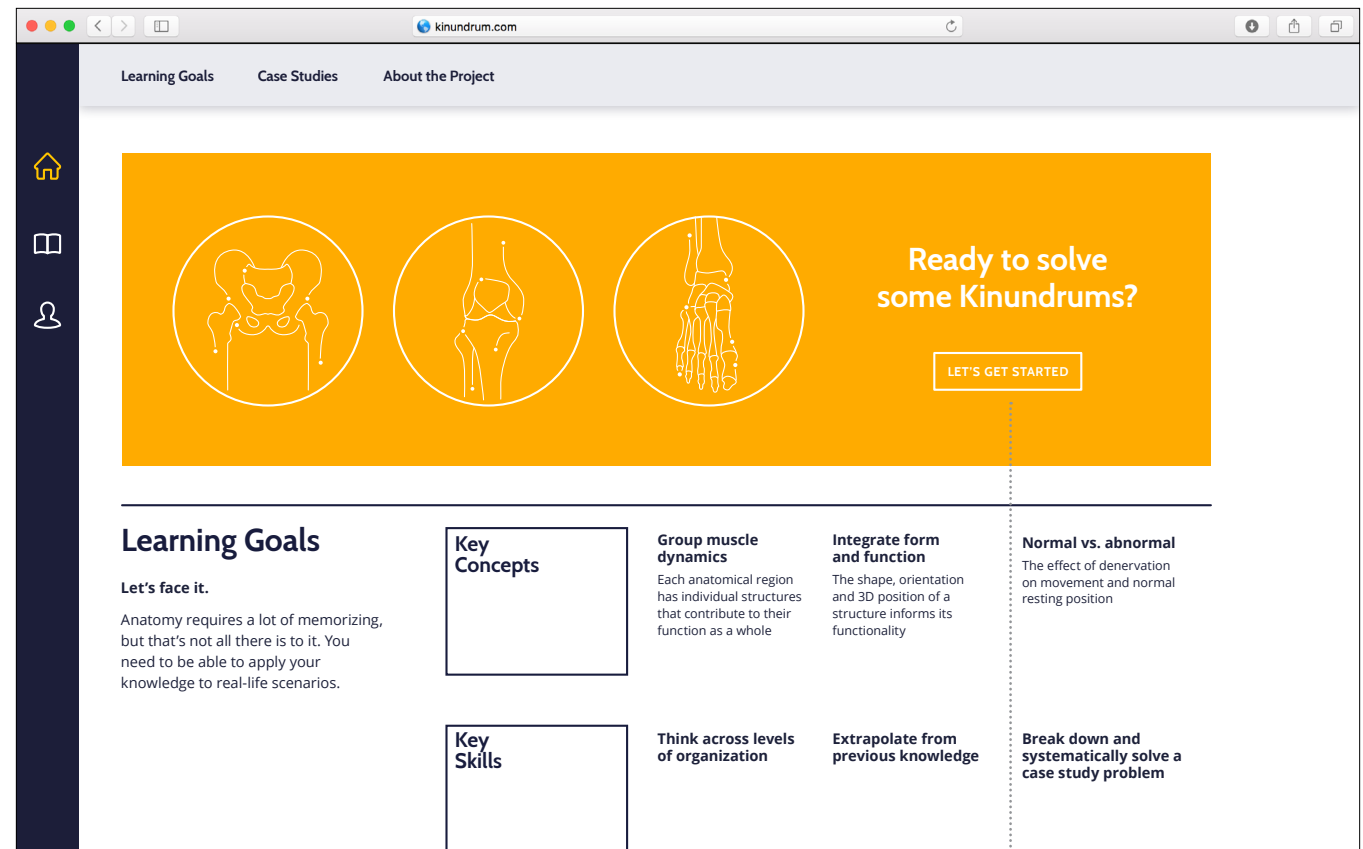
Global navigation

The sidebar remains fixed throughout the application. The icons link to the Home screen, Library and User Profile.



Local navigation

The header has direct links that jump to sections on the Home page.



LET'S GET STARTED

On hover, the ghost button inverts. This button links to the Case Studies section

Wireframes

HOME SCREEN

BROWSER BACK BUTTON

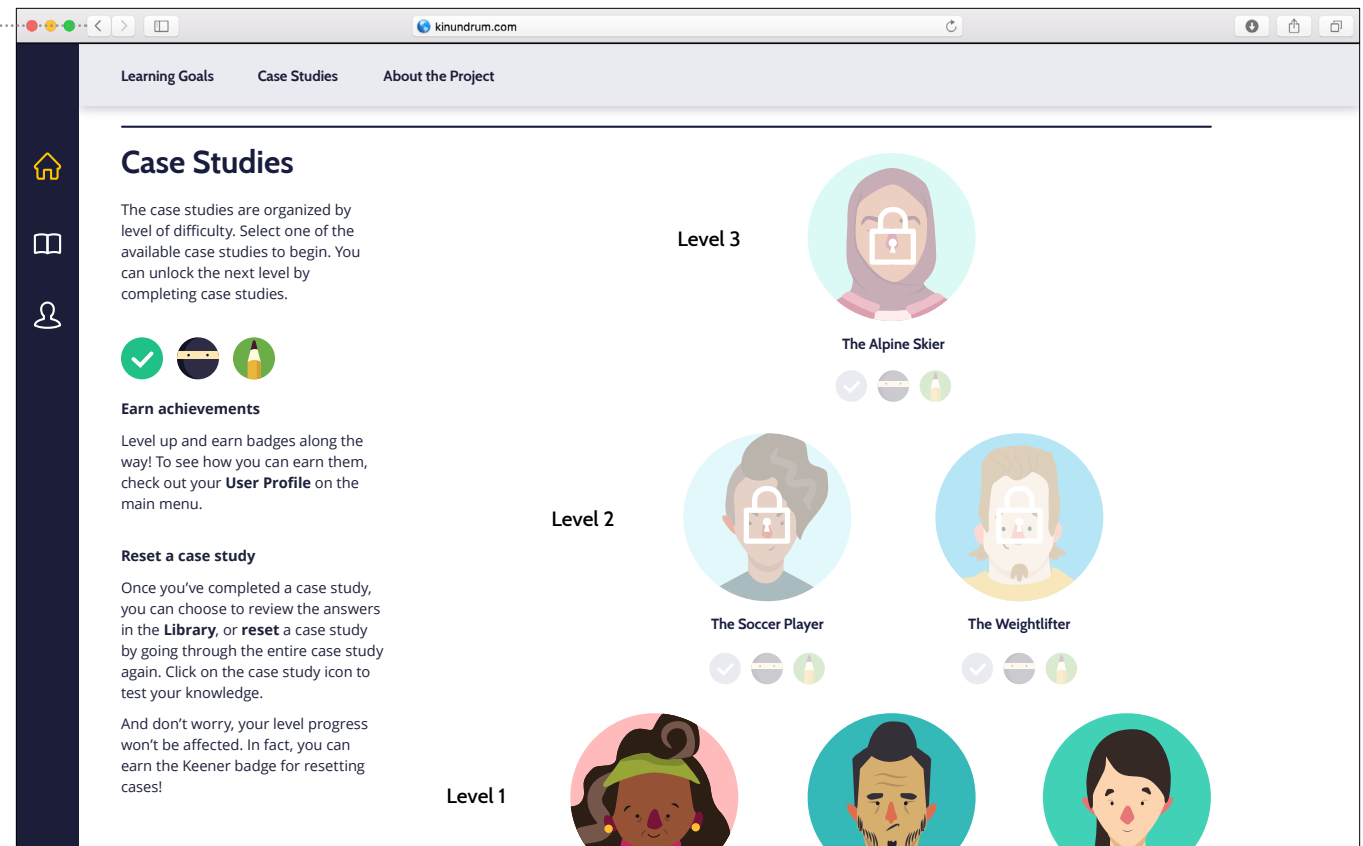
Back to Learning Goals section

Case studies

Users can access a case study that is unlocked. Locked case studies are disabled.

IF USER FINISHES A LEVEL...

The next level becomes unlocked and users can access case studies within that level.



Wireframes

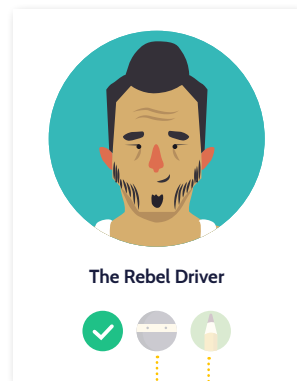
HOME SCREEN

IF USER RETURNS TO A CASE STUDY IN PROGRESS...

The user is taken to the last exercise they left the case study at.

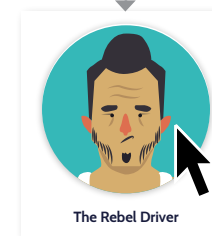
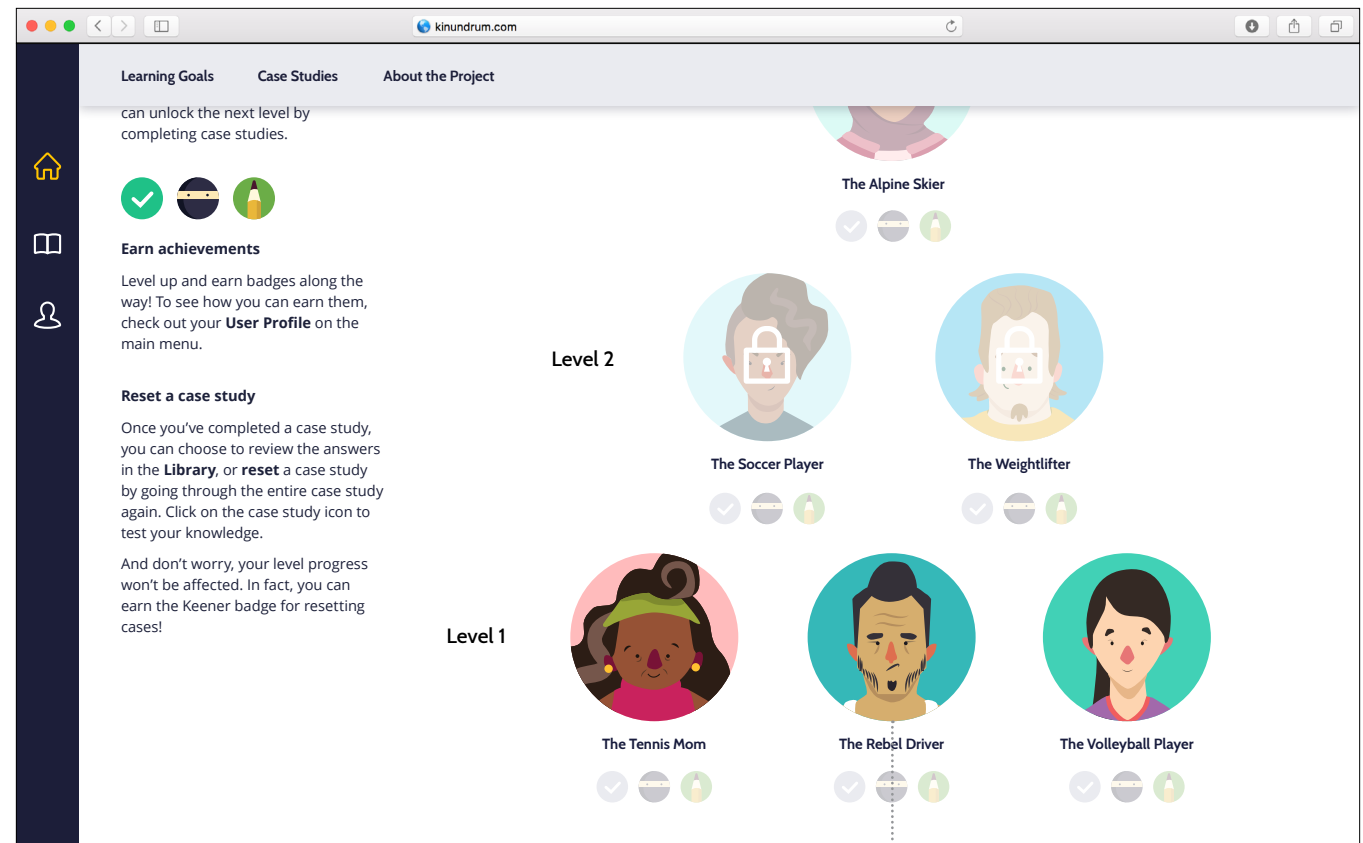
IF USER COMPLETES A CASE STUDY...

The case study icon updates, and a check mark appears below the icon.



Icon becomes opaque once the user earns the Keener badge for this case study

Icon becomes opaque once the user earns the Kininja badge for this case study



On hover, a drop shadow appears behind the case study icon

Wireframes

CASE STUDY: TUTORIAL (FIRST-TIME)

When the user accesses a **Case Study** or the **Library** for the first time, a pop-up box appears prompting the user to view a tutorial.

BROWSER BACK BUTTON
Back to Case Studies section

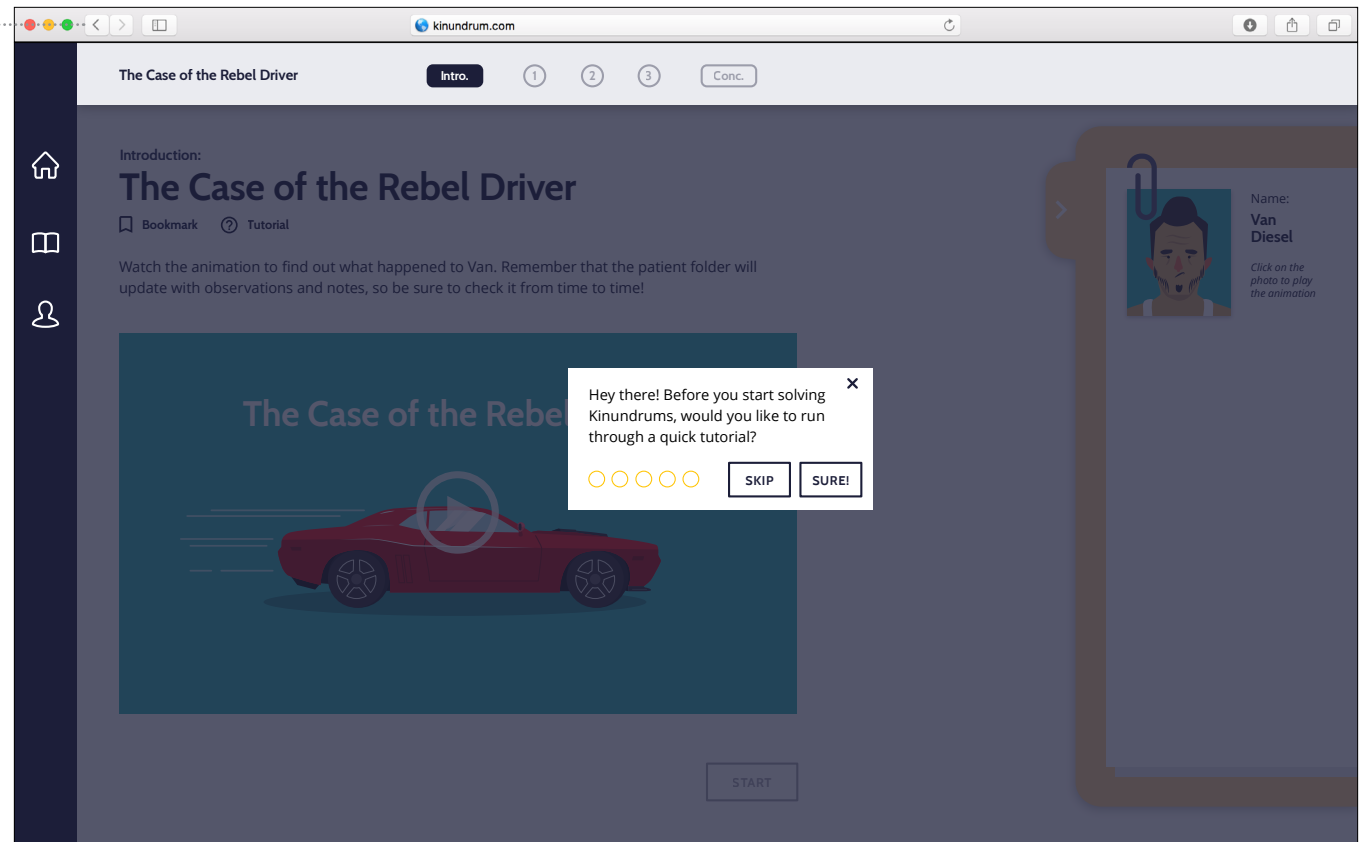
Tutorial text boxes

Each tutorial description is contained in a text box overlay that points to the feature of interest.

A progress bar indicates the number of descriptions. Users can navigate through the tutorial by clicking on navigational buttons.

IF USER WANTS TO SKIP THE TUTORIAL...

The user can click on SKIP. The user can also click on X to end the tutorial at any time.



© Wireframes

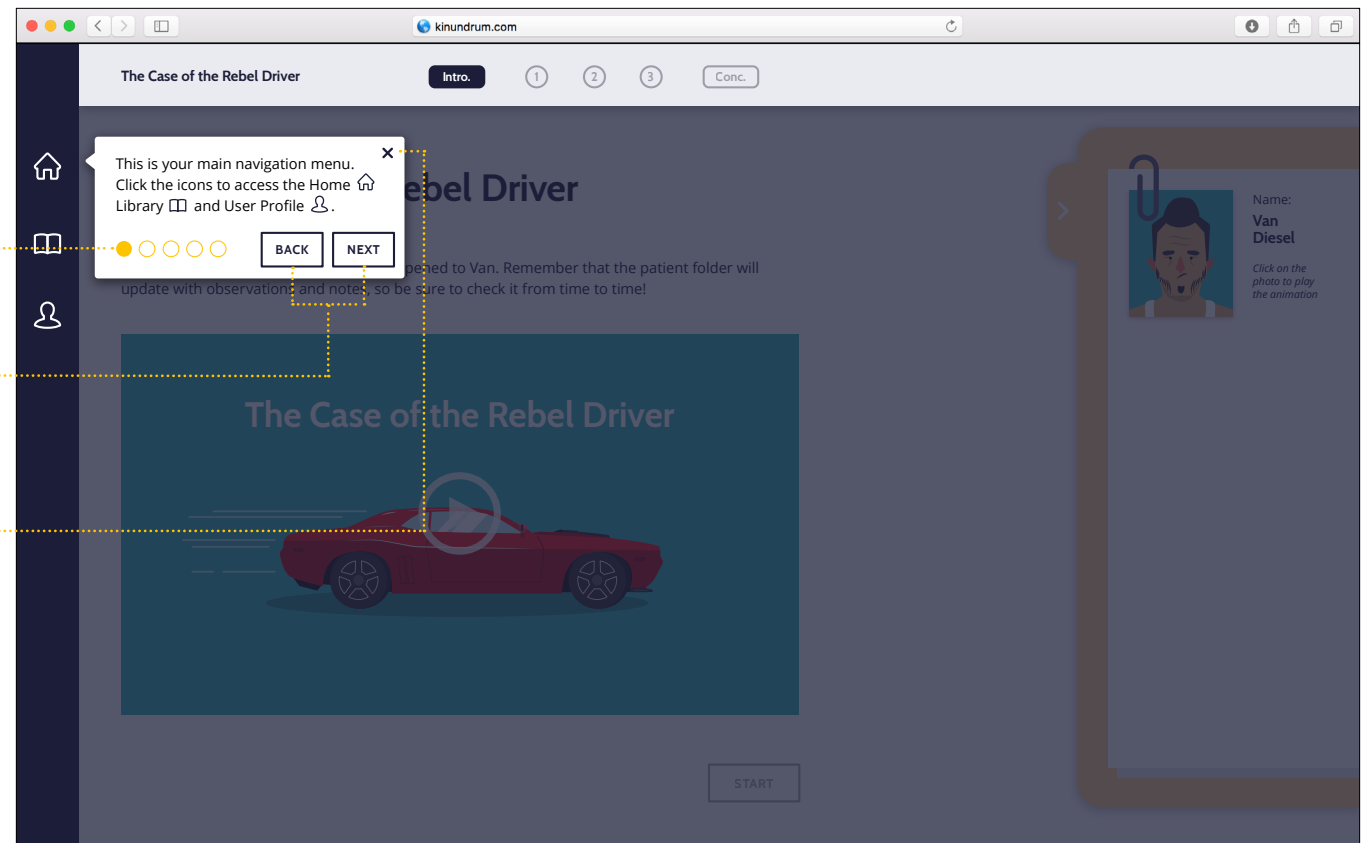
CASE STUDY: TUTORIAL

Tutorials are available for the **Case Study Introduction, Library** and each exercise type: *multiple choice, checkbox, matching, 3D model select* and *3D model draw*.

Progress Bar:
Yellow indicates
the current step;
circles are also
navigational

Users can click on
'Back' or 'Next' to
move backward or
forward through
the tutorial

Users can click
on 'x' to close the
tutorial at any time

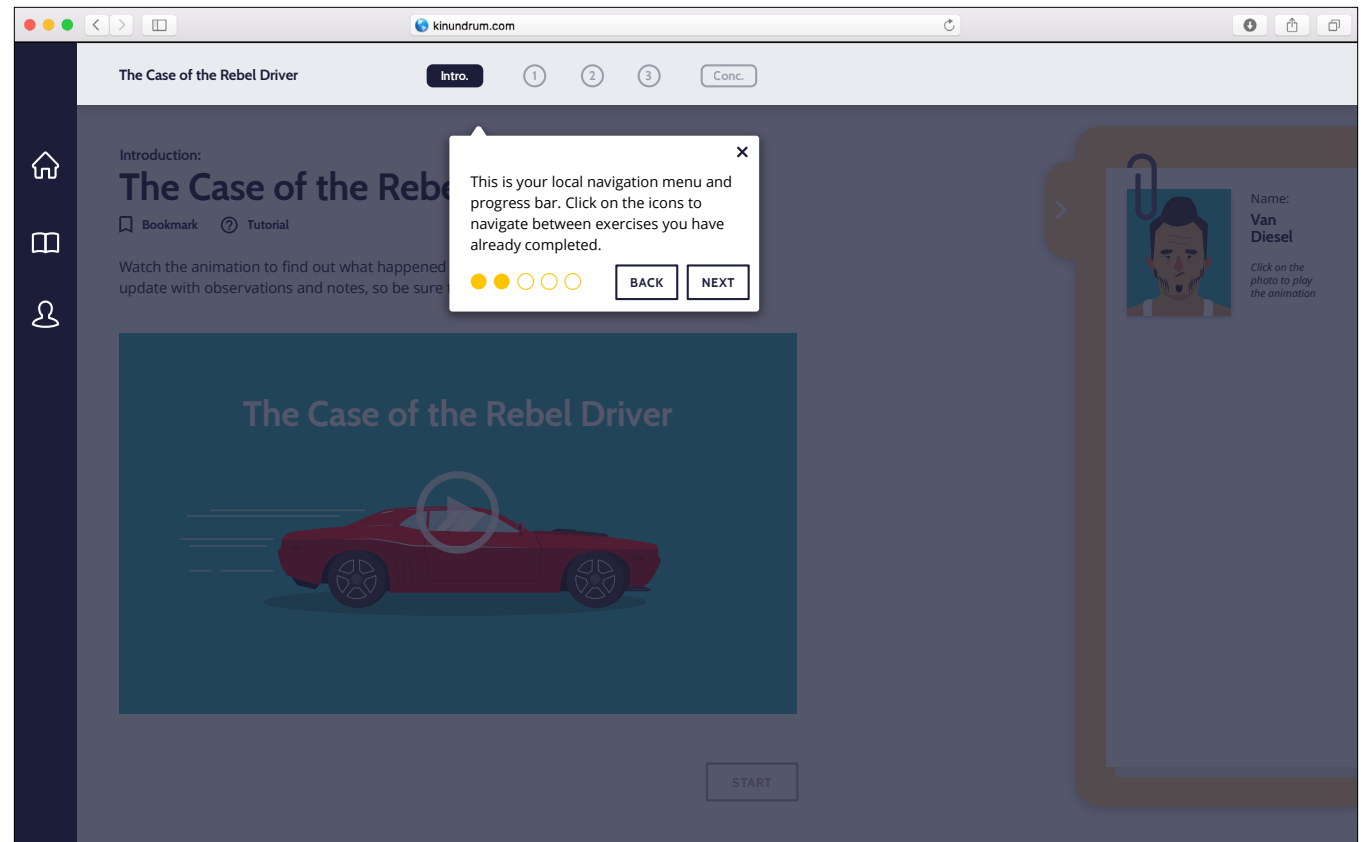
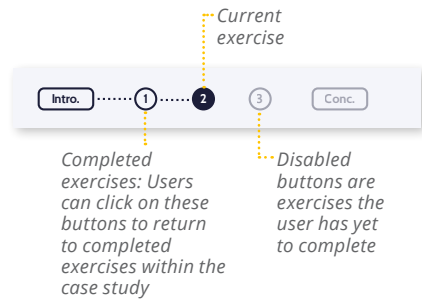


Wireframes

CASE STUDY: TUTORIAL

Local navigation

The header includes the case study title and a progress bar. To navigate between exercises of the active case study, users can click on icons on the progress bar. Users can only access exercises they have completed or begun.

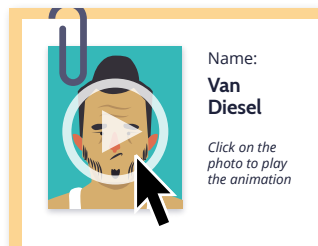


Wireframes

CASE STUDY: TUTORIAL

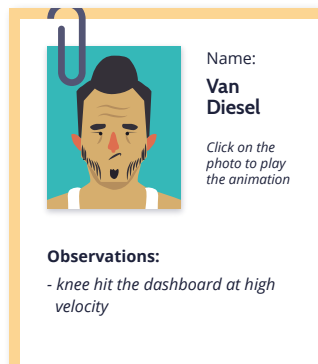
Patient folder

A collapsible element, users can replay the introductory animation by clicking on the picture.

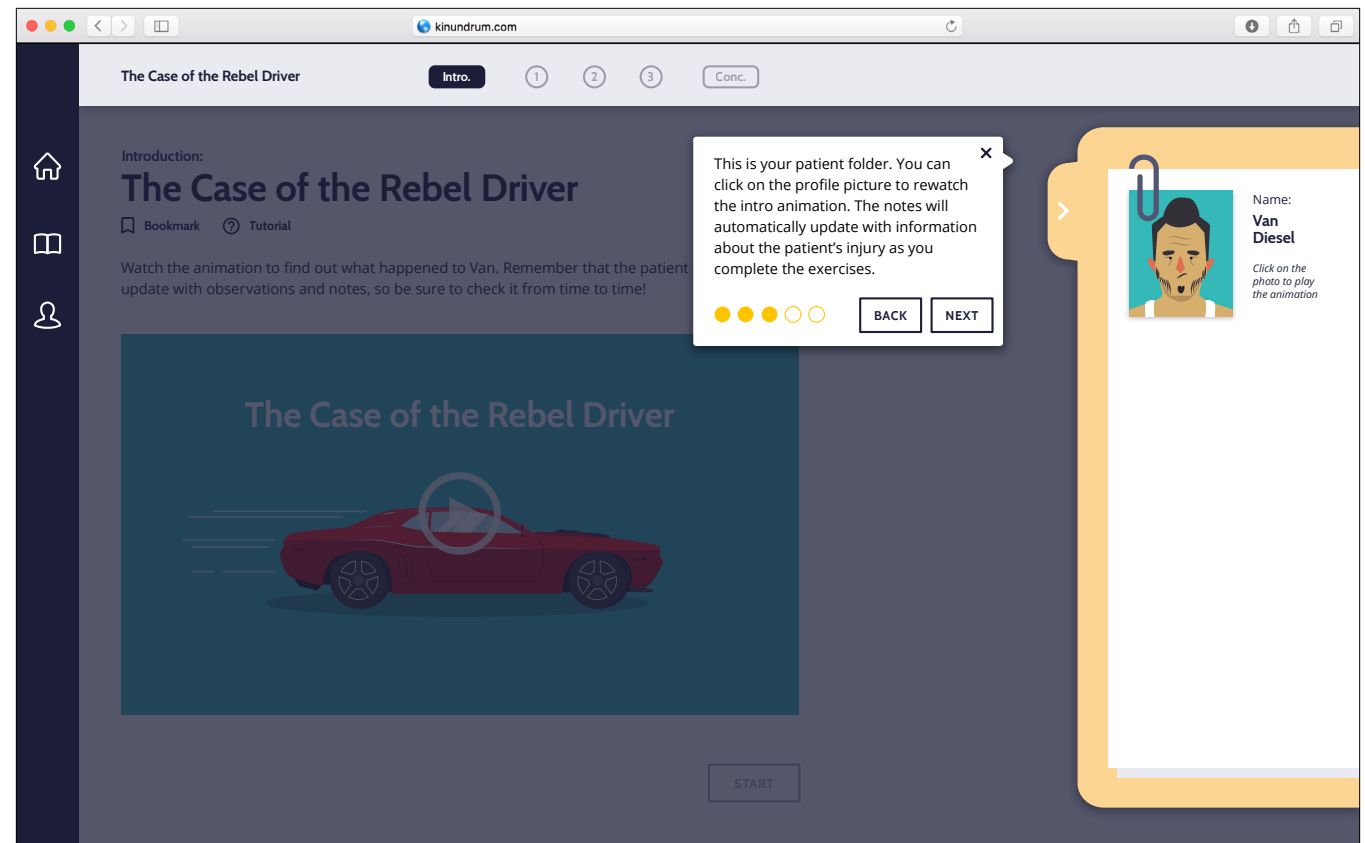


Play button appears on hover

As the user completes each exercise, the folder automatically expands and information about the injury is added to the notes section.



Notes appear with typewriter effects and audio



Wireframes

CASE STUDY: TUTORIAL

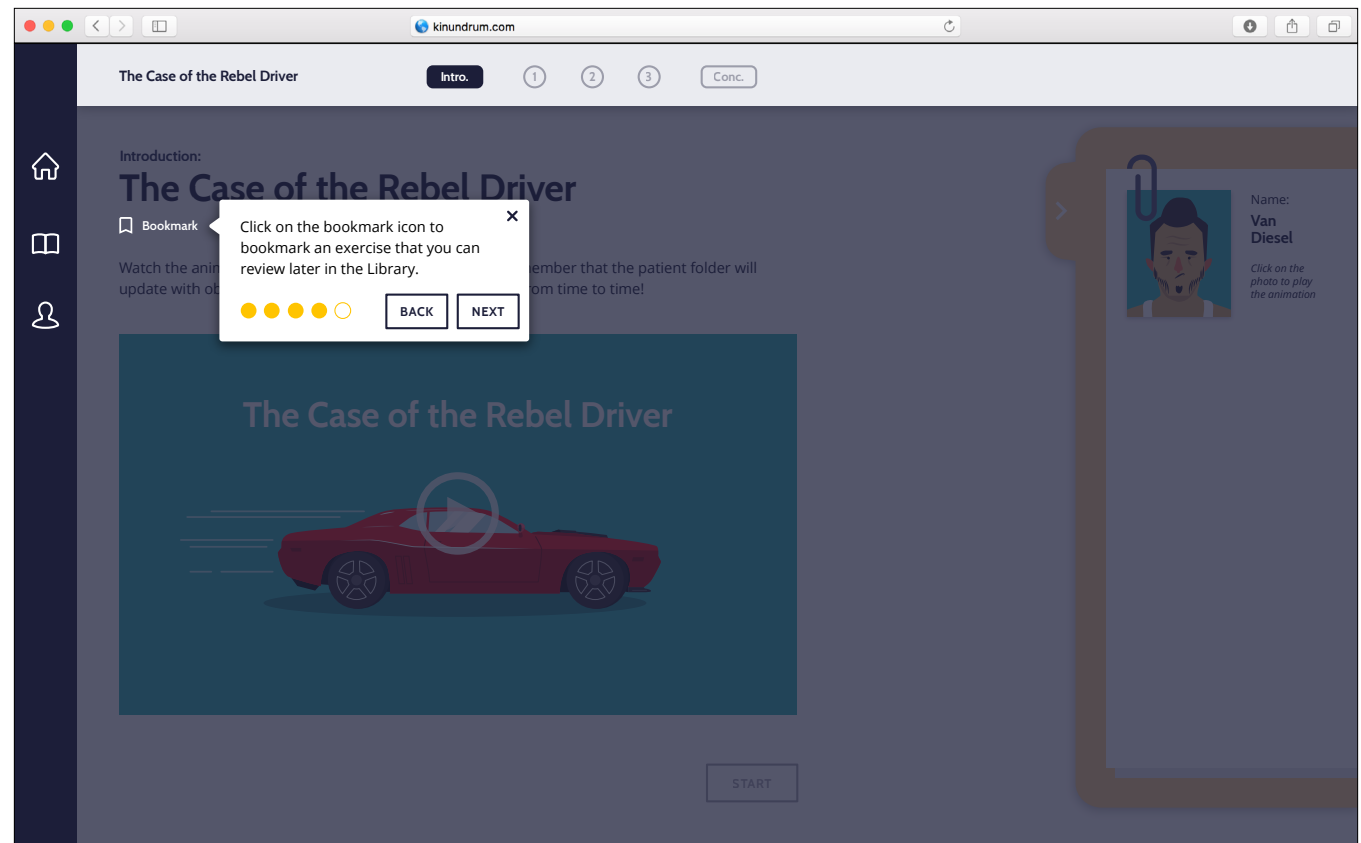
Bookmark

Users can bookmark exercises they have started or completed. Bookmarked exercises can be accessed in the **Library**.

Hover state



Bookmarked state



Wireframes

CASE STUDY: TUTORIAL

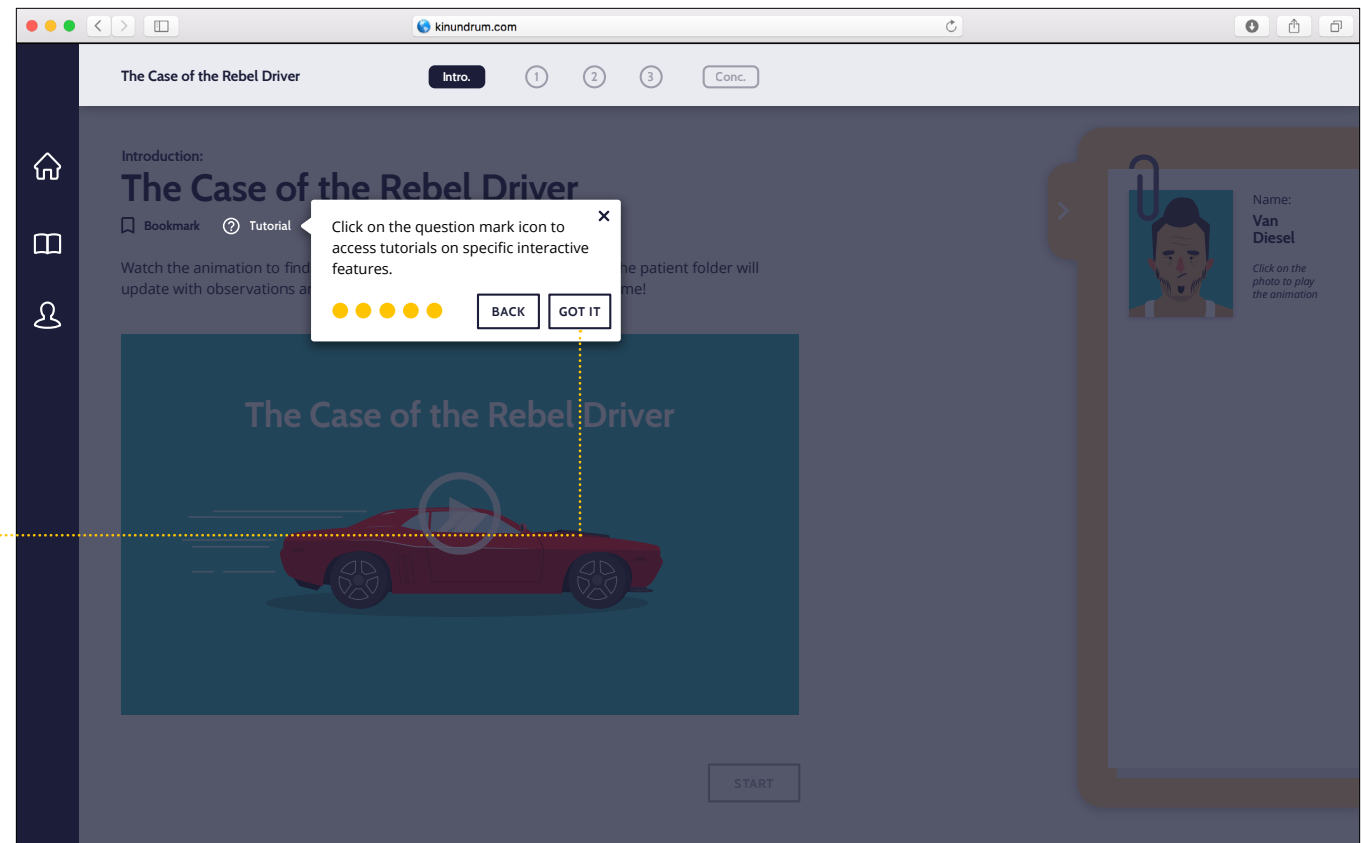
User-initiated tutorials

To review a tutorial for the Library or any of the case study exercise types, users can click on the tutorial icon.

Hover state



On the last prompt, users can click on the GOT IT button to exit the tutorial



Wireframes

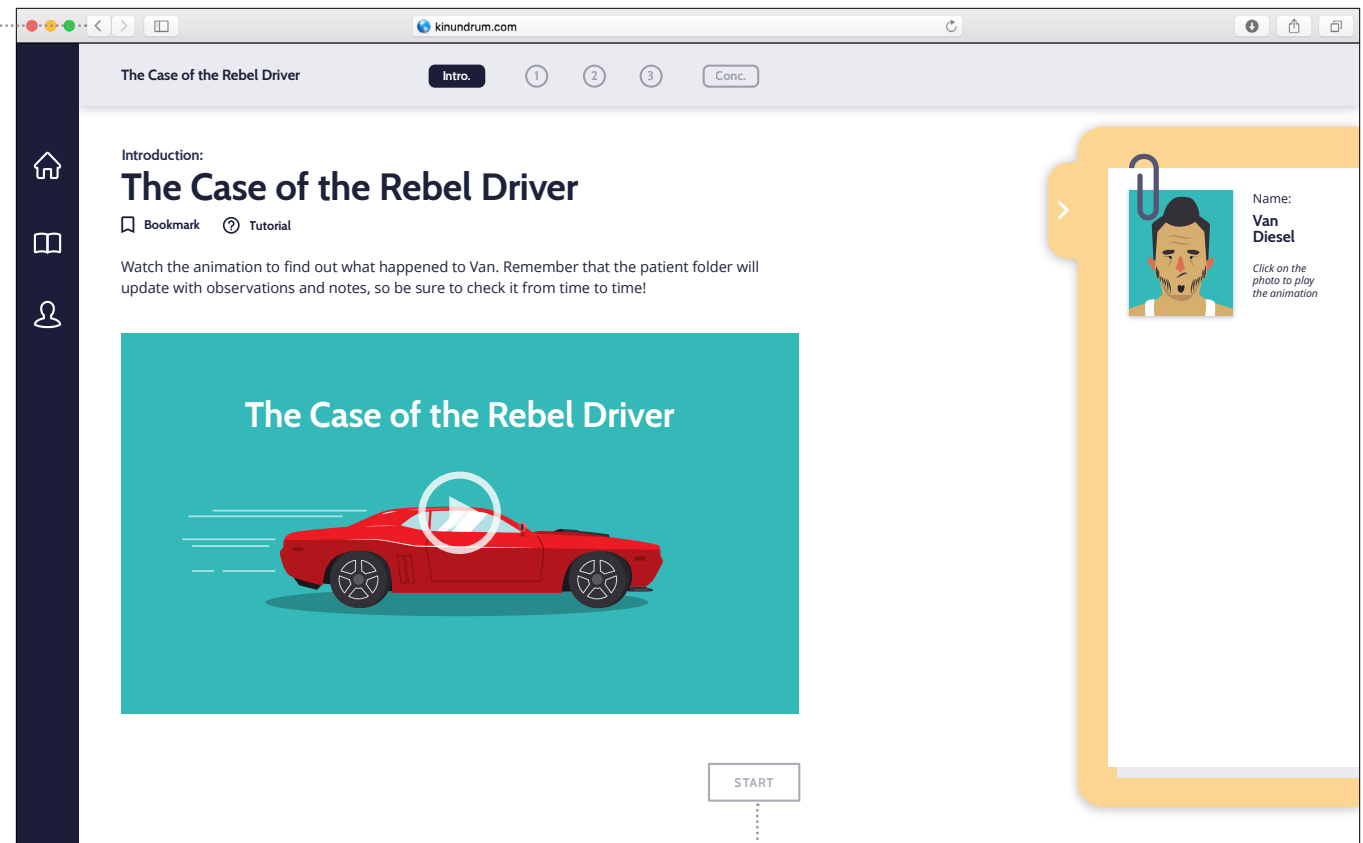
CASE STUDY: INTRODUCTION

This screen includes the case study title, introductory text, an animation of the injury scenario and the patient case folder.

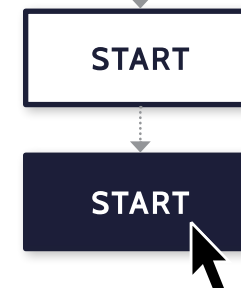
BROWSER BACK BUTTON
Back to Case Studies section

Video player

All animation assets will have standard video player functions: play/pause, video scrubber, volume controls, including full-screen mode and captions.



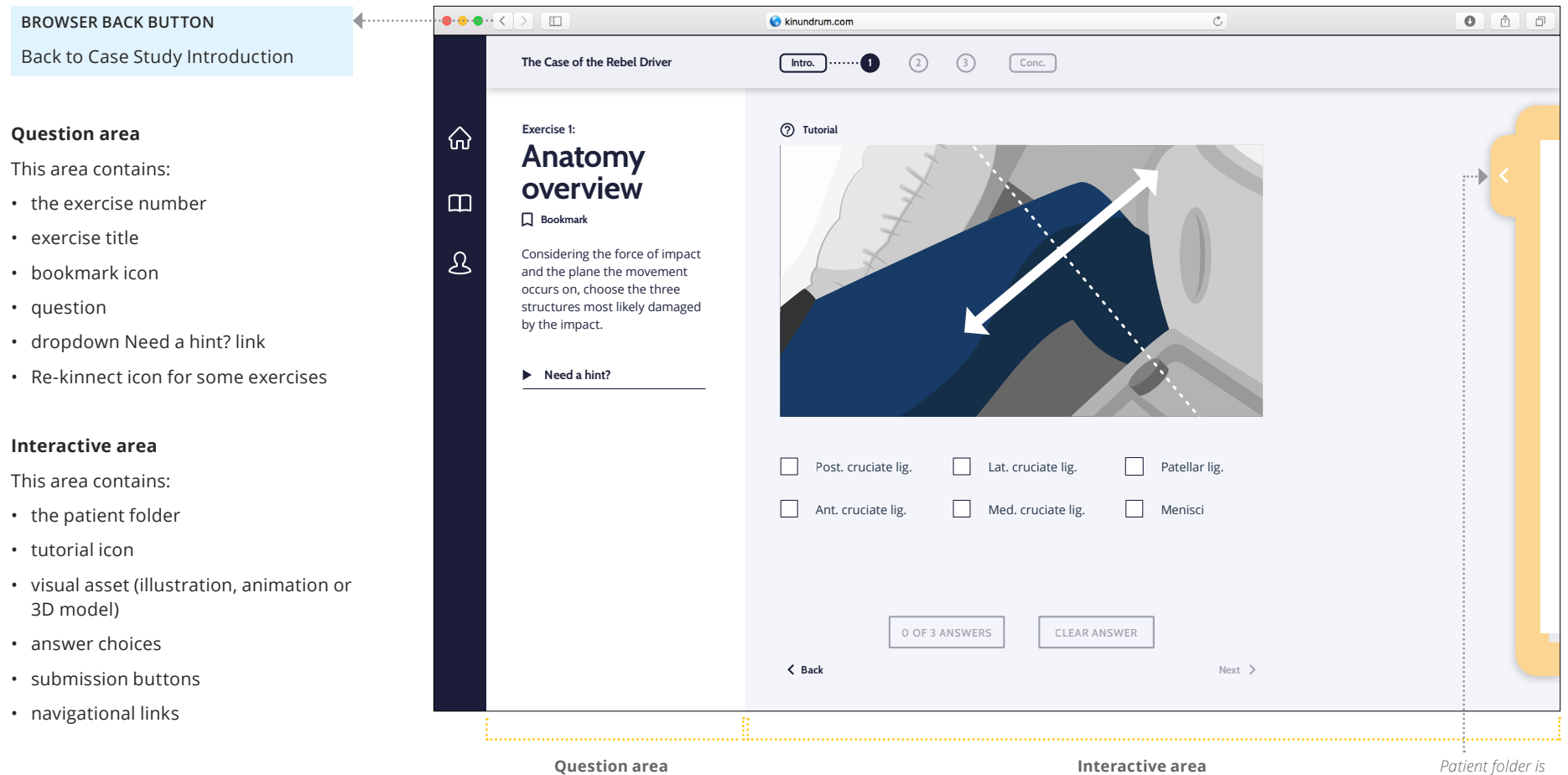
Button becomes active after the user has watched the animation



Wireframes

CASE STUDY: CHECKBOX EXERCISE

The user can click to select up to the number of checkboxes the question instructs. For SUBMIT ANSWER to become active, the user must select the number of checkboxes specified by the question.



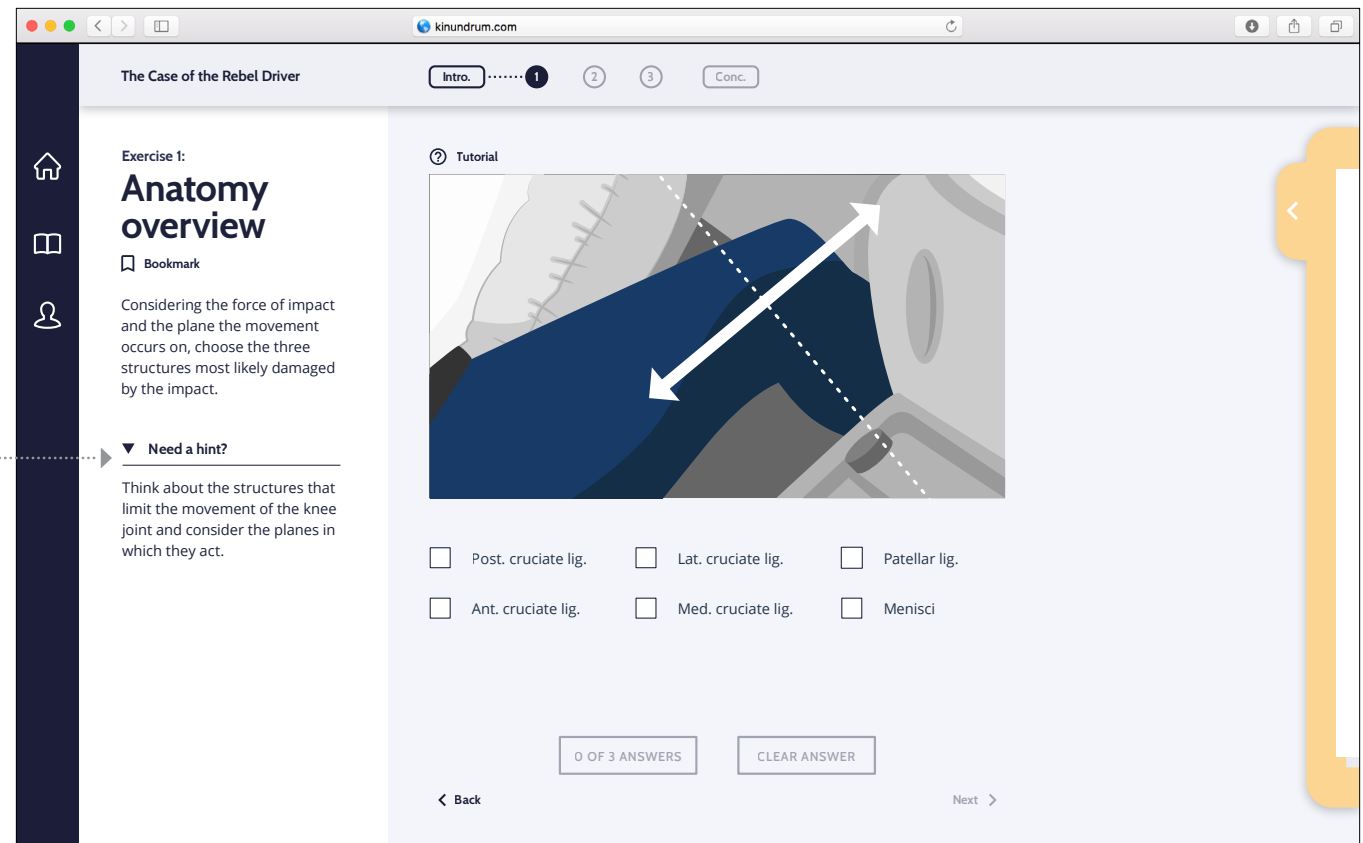
Wireframes

CASE STUDY: CHECKBOX EXERCISE

Hint

Users can click on *Need a hint?* to view text prompts. The user can click on the link again to hide the hint.

Onclick, the arrow rotates and the text drops down to view hint

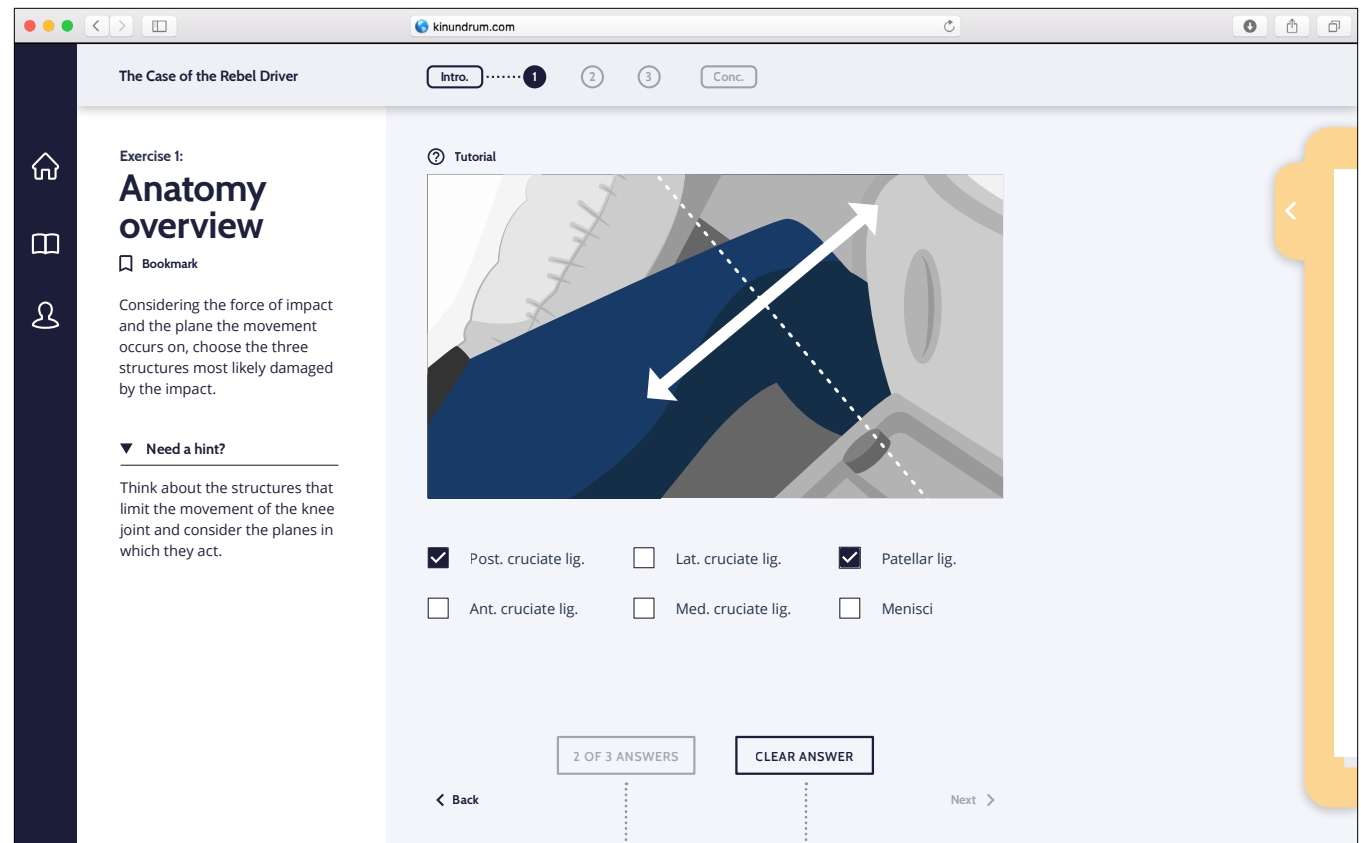


Wireframes

CASE STUDY: CHECKBOX EXERCISE

IF USER WANTS TO DESELECT A CHECKBOX...

The user can click on a selected checkbox to deselect it. Or click CLEAR ANSWER to clear all answers.

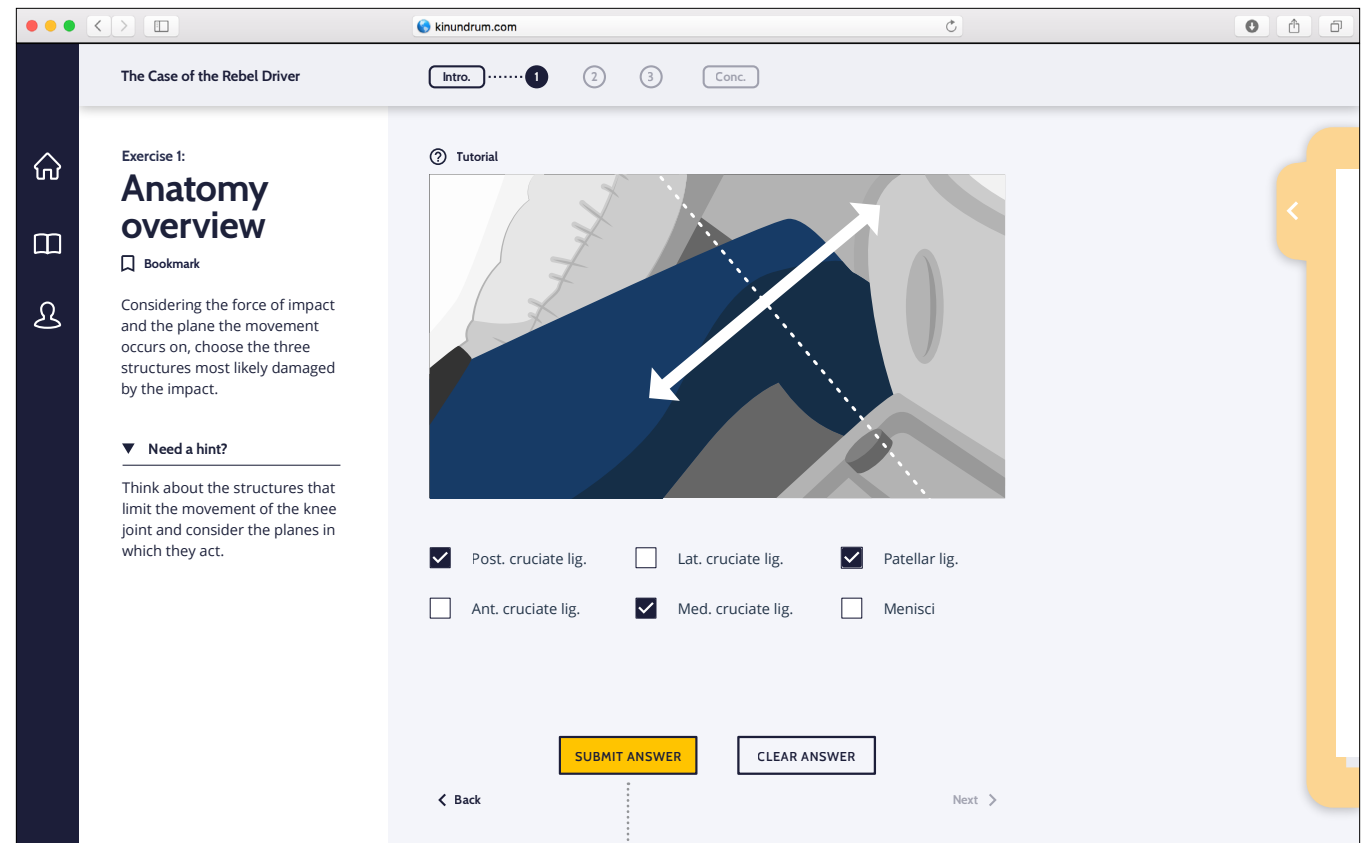


0 OF 3 updates
to 2 OF 3
ANSWERS once
checkboxes has
been selected

CLEAR ANSWER
becomes active
once a checkbox
has been
selected

Wireframes

CASE STUDY: CHECKBOX EXERCISE



SUBMIT ANSWER

Once the correct number of answers are selected, the SUBMIT ANSWER button becomes active

Wireframes

CASE STUDY: CHECKBOX EXERCISE

Incorrect feedback

When the user answers incorrectly the first time, they receive incorrect feedback. In addition to the *Try again* message, a text overlay slides from the right. After reading, the user can click on 'X' or anywhere outside the overlay to close the incorrect feedback.

The user can also click CLEAR ANSWER to clear all answers and close the incorrect feedback. Submission buttons revert back to original inactive state.

IF USER SUBMITS 1 OR 2 INCORRECT ANSWERS...

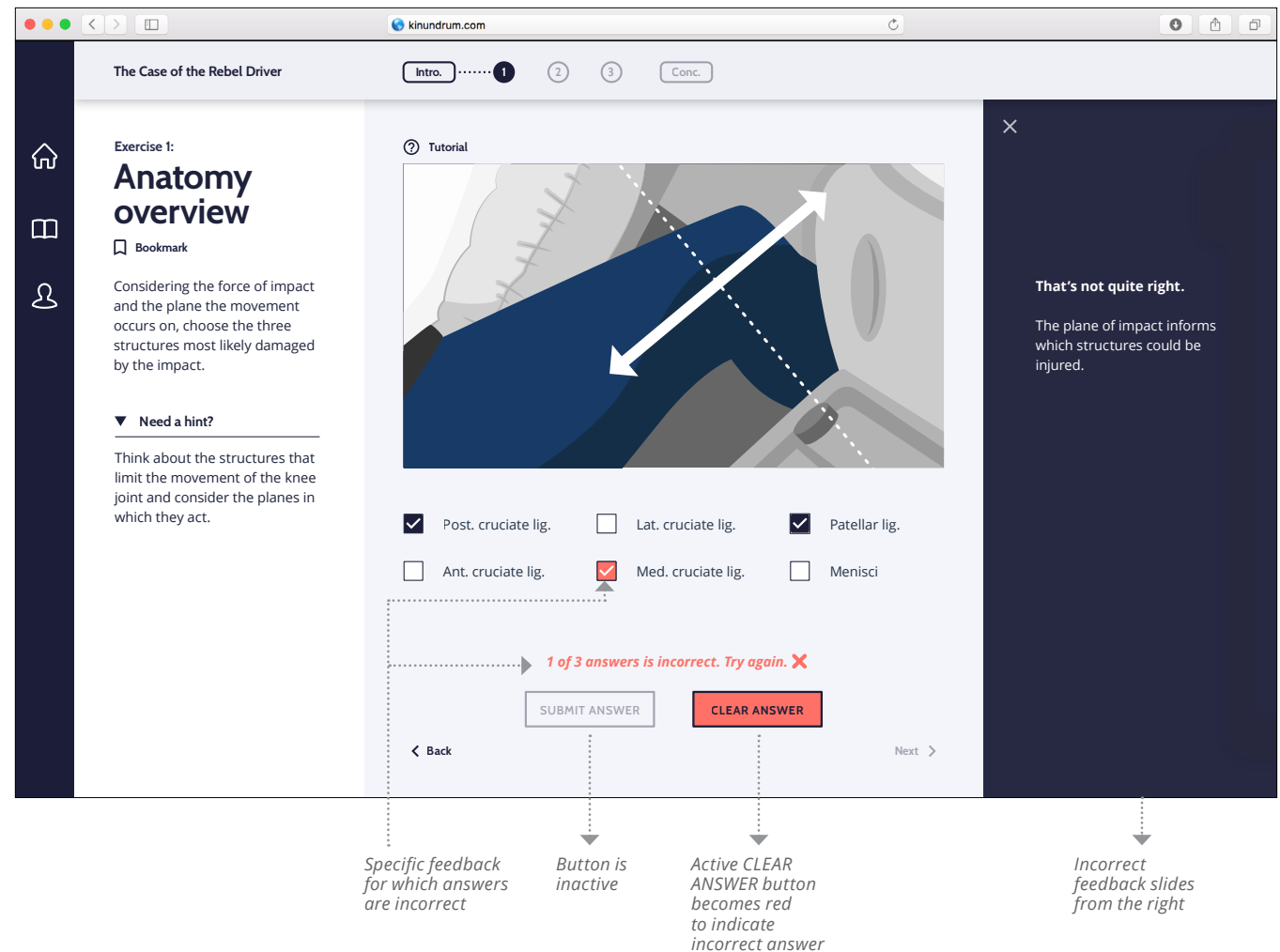
CLEAR ANSWER button will clear the incorrect answers. Correct answers remain checked.

IF USER SUBMITS 3 INCORRECT ANSWERS...

CLEAR ANSWER button will clear all answers.

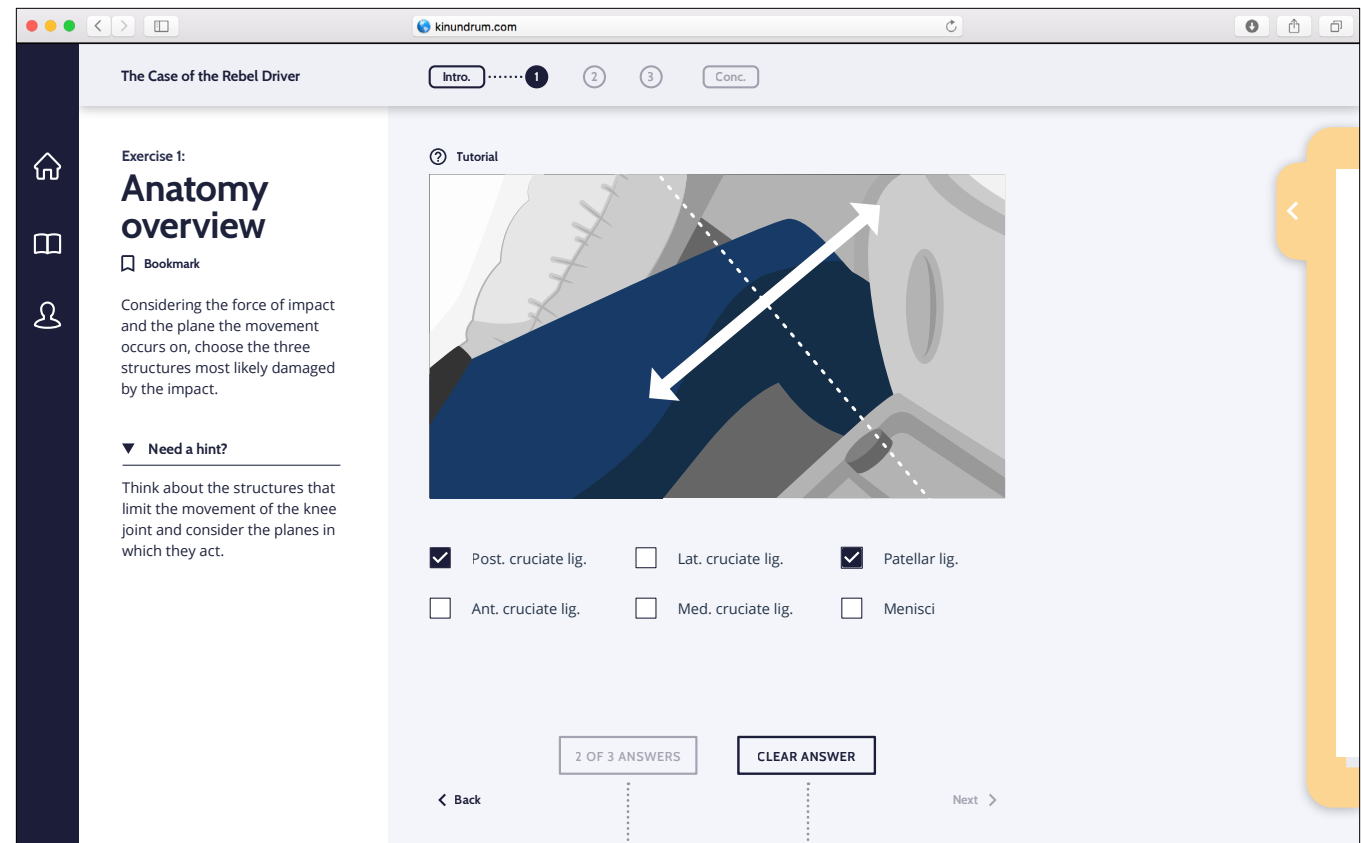
IF USER ANSWERS INCORRECTLY AGAIN...

Incorrect feedback will no longer slide in. Only the *Try again* message and specific incorrect feedback will appear.



Wireframes

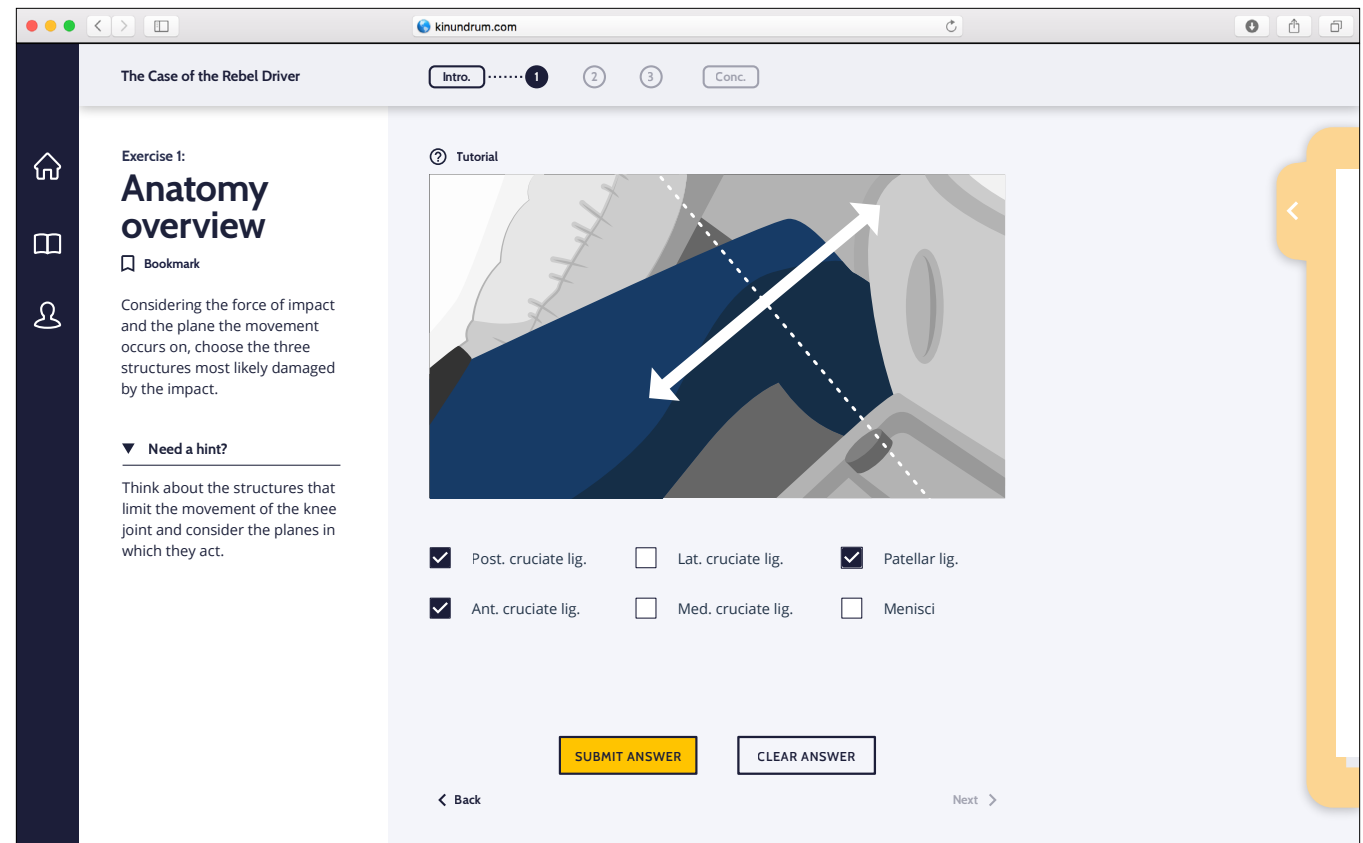
CASE STUDY: CHECKBOX EXERCISE



After users click **CLEAR ANSWER**, the incorrect answers revert back to unchecked state. Correct answers remain checked. Submission buttons update

Wireframes

CASE STUDY: CHECKBOX EXERCISE



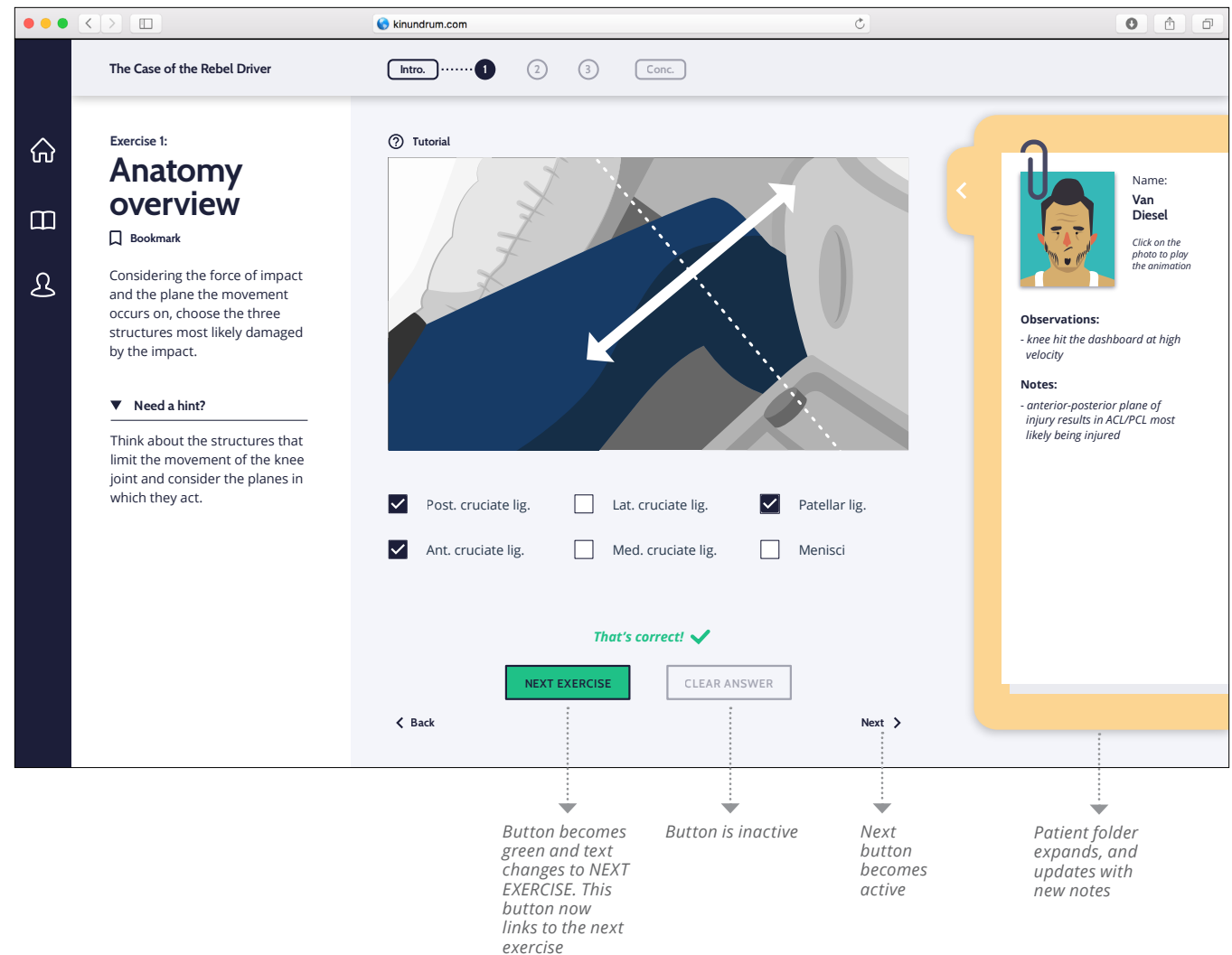
Wireframes

CASE STUDY: CHECKBOX EXERCISE

Correct feedback

When the user answers correctly, the following changes occur:

- A green check and *That's correct!* message appears
- SUBMIT ANSWER button becomes NEXT EXERCISE. The user can click to navigate to the next exercise
- CLEAR ANSWER becomes inactive
- Next link becomes active
- The patient folder expands automatically, and updates with new notes based on the correct answer



Wireframes

CASE STUDY: 3D DRAW EXERCISE

This exercise asks the user to 'draw' ligaments by clicking on attachment points on the interactive 3D model.

BROWSER BACK BUTTON

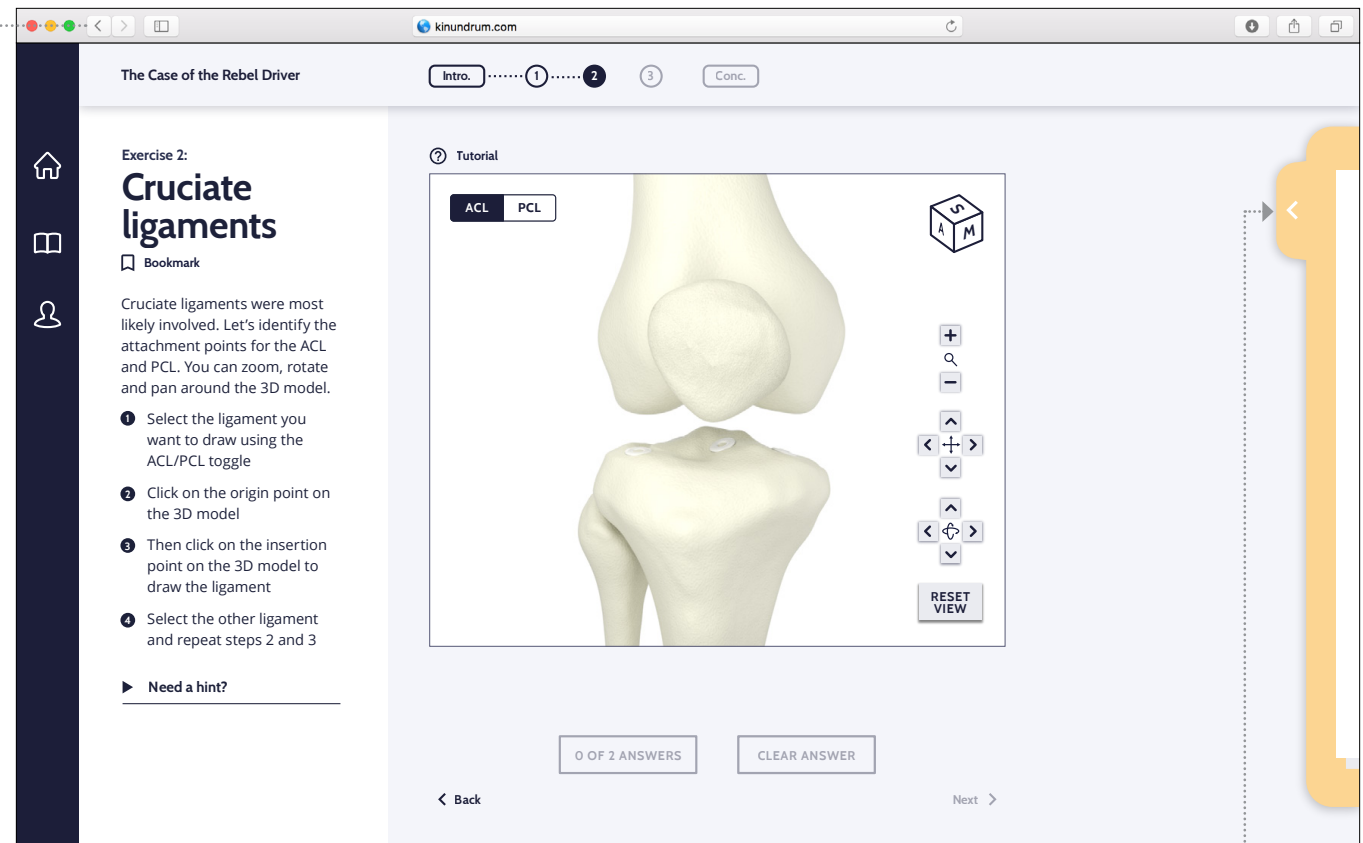
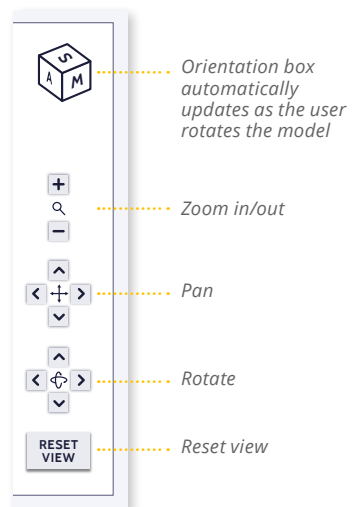
Exercise 1 with correct feedback (last state)

3D model exploration

The user can click and drag in the space around the model to rotate the model freely. To pan, the user can hold down the *spacebar* while clicking and dragging in the viewport. To zoom in/out, the user can scroll the *middle mouse* button.

For more controlled exploration of the model, the user can click on the individual *control buttons*.

To go back to the default view, the user clicks on the reset control button.



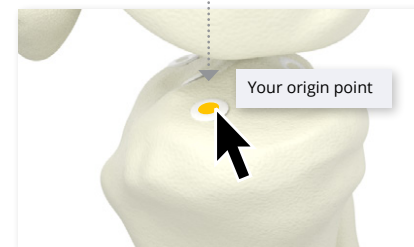
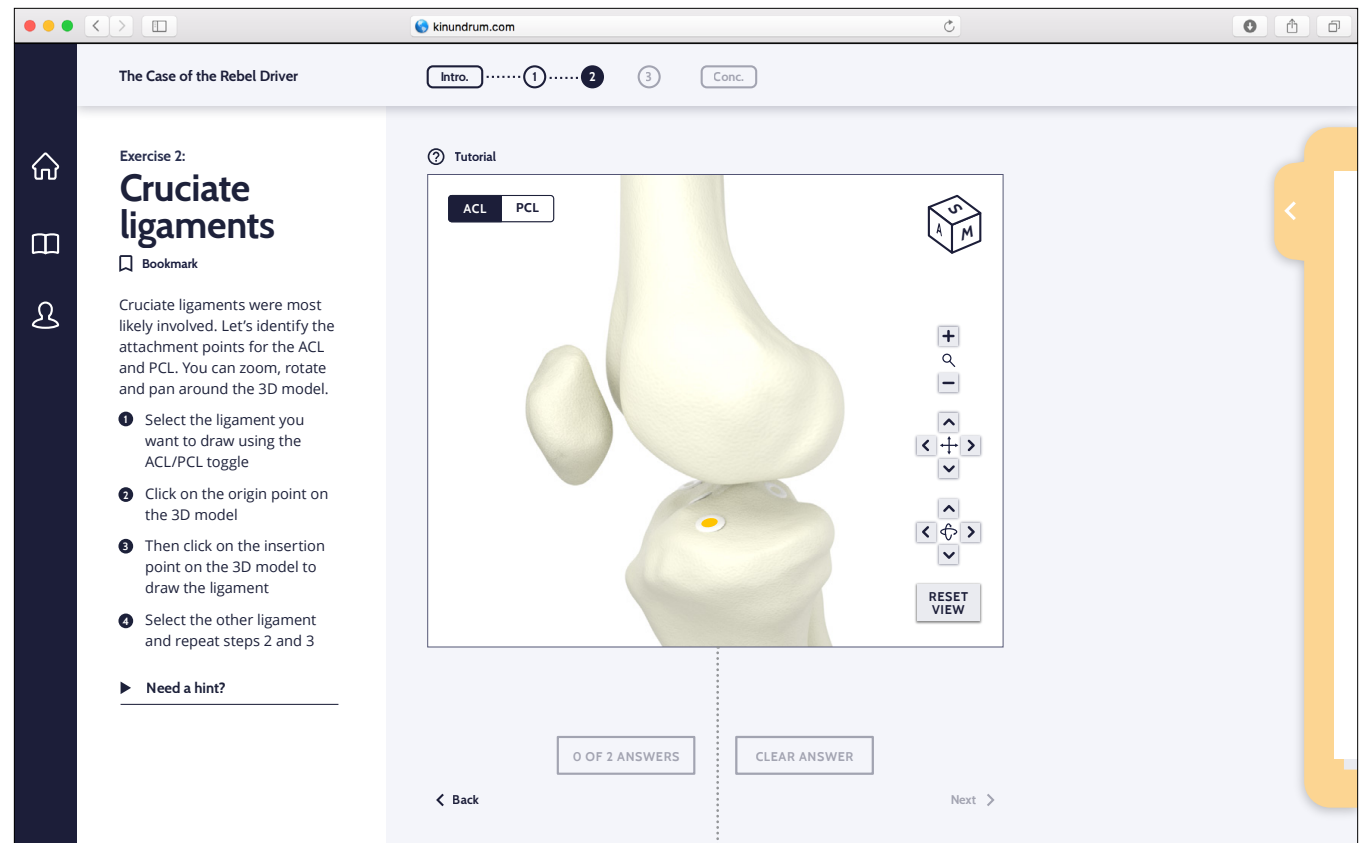
Patient folder reverts back to collapsed mode

Wireframes

CASE STUDY: 3D DRAW EXERCISE

IF USER WANTS TO DESELECT THEIR ORIGIN POINT...

Users can deselect an attachment point by clicking on the same point.



Onclick, a label appears to indicate that the user has selected their origin point

Wireframes

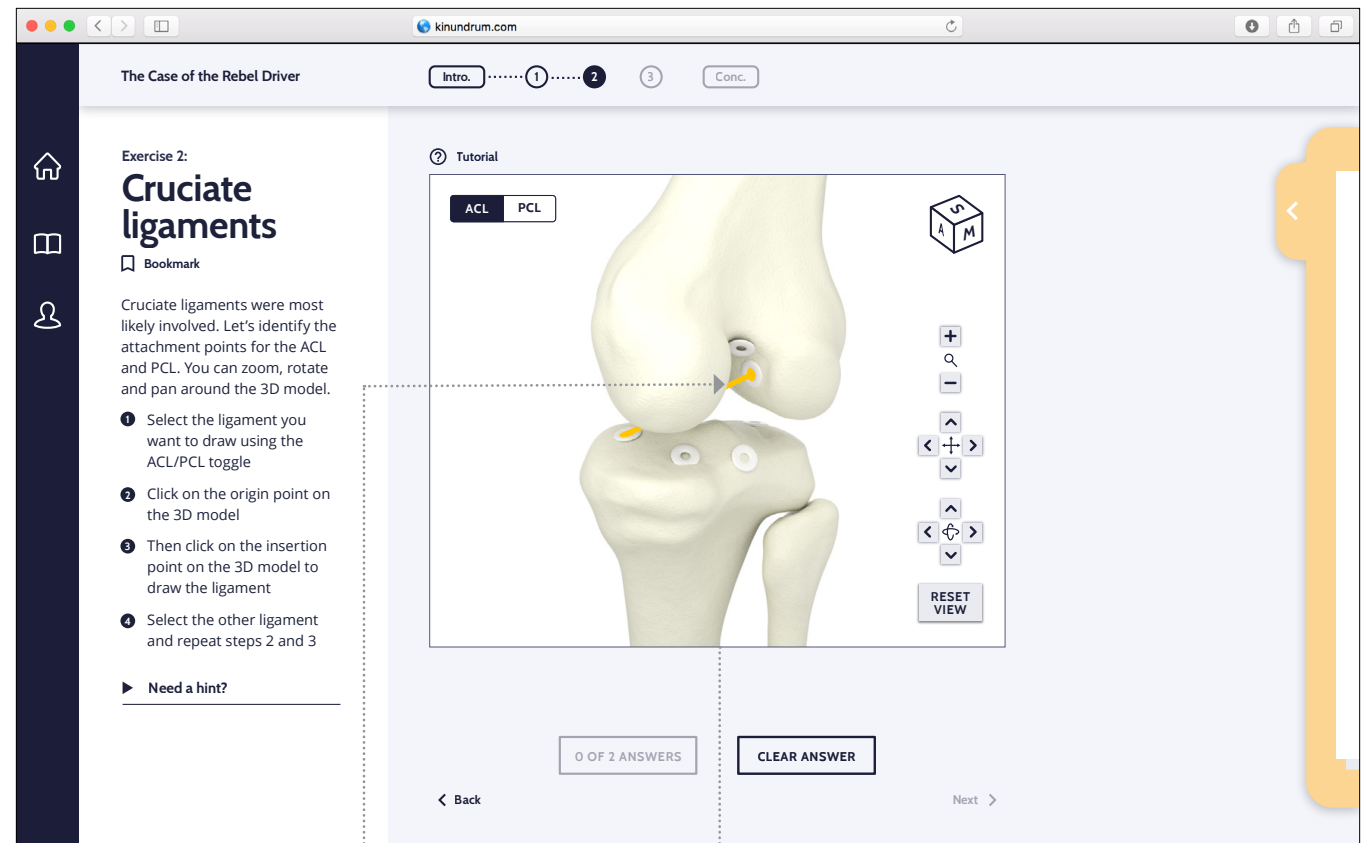
CASE STUDY: 3D DRAW EXERCISE

IF AN ORIGIN POINT IS ALREADY SELECTED, AND THE USER WANTS TO DESELECT THEIR INSERTION POINT...

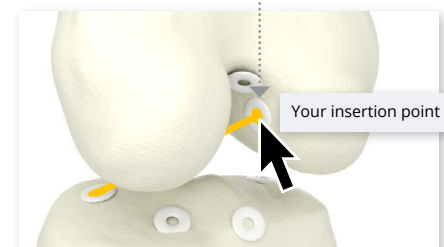
Users can deselect the insertion point by clicking on the same point. The next attachment point they select will be the new insertion point.

IF THE USER WANTS TO DESELECT BOTH ORIGIN AND INSERTION POINTS...

Users can deselect the insertion point by clicking on that point, then deselect the origin point by clicking on that point. Users can also click CLEAR ANSWER to clear both attachment point selections.



Ligament is drawn between user-selected origin and insertion points



Onclick, a label appears to indicate that the user has selected their insertion point

Wireframes

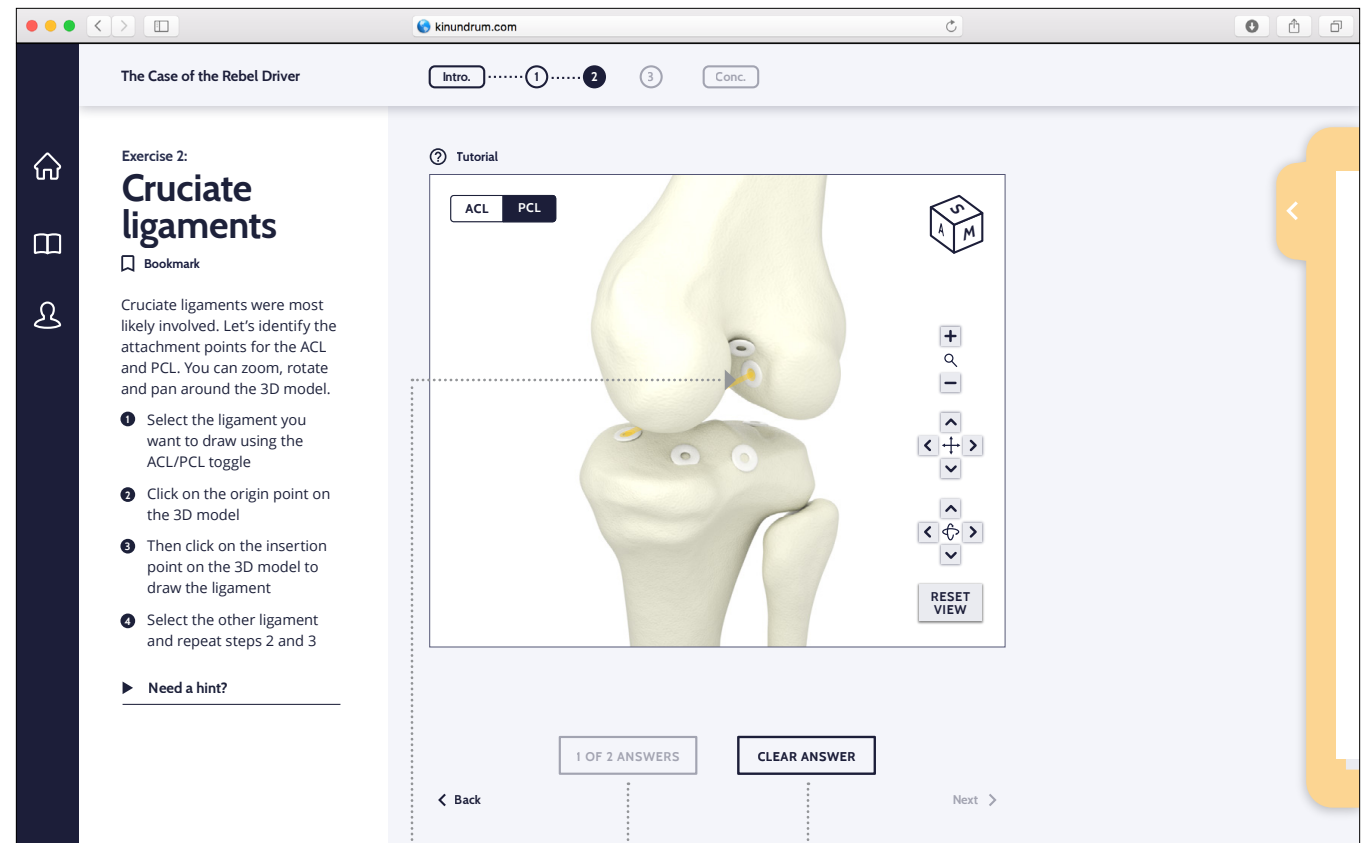
CASE STUDY: 3D DRAW EXERCISE

IF USER WANTS TO DRAW THE PCL...

Users can click on PCL on the toggle button to draw the PCL.

IF USER WANTS TO GO BACK AND CHANGE THEIR SELECTION FOR ACL...

Users can click on ACL on the toggle button to edit their answers for the ACL.



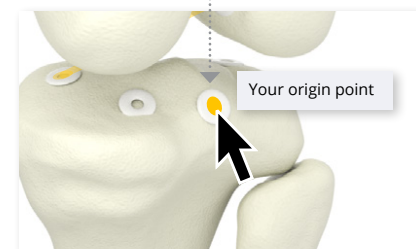
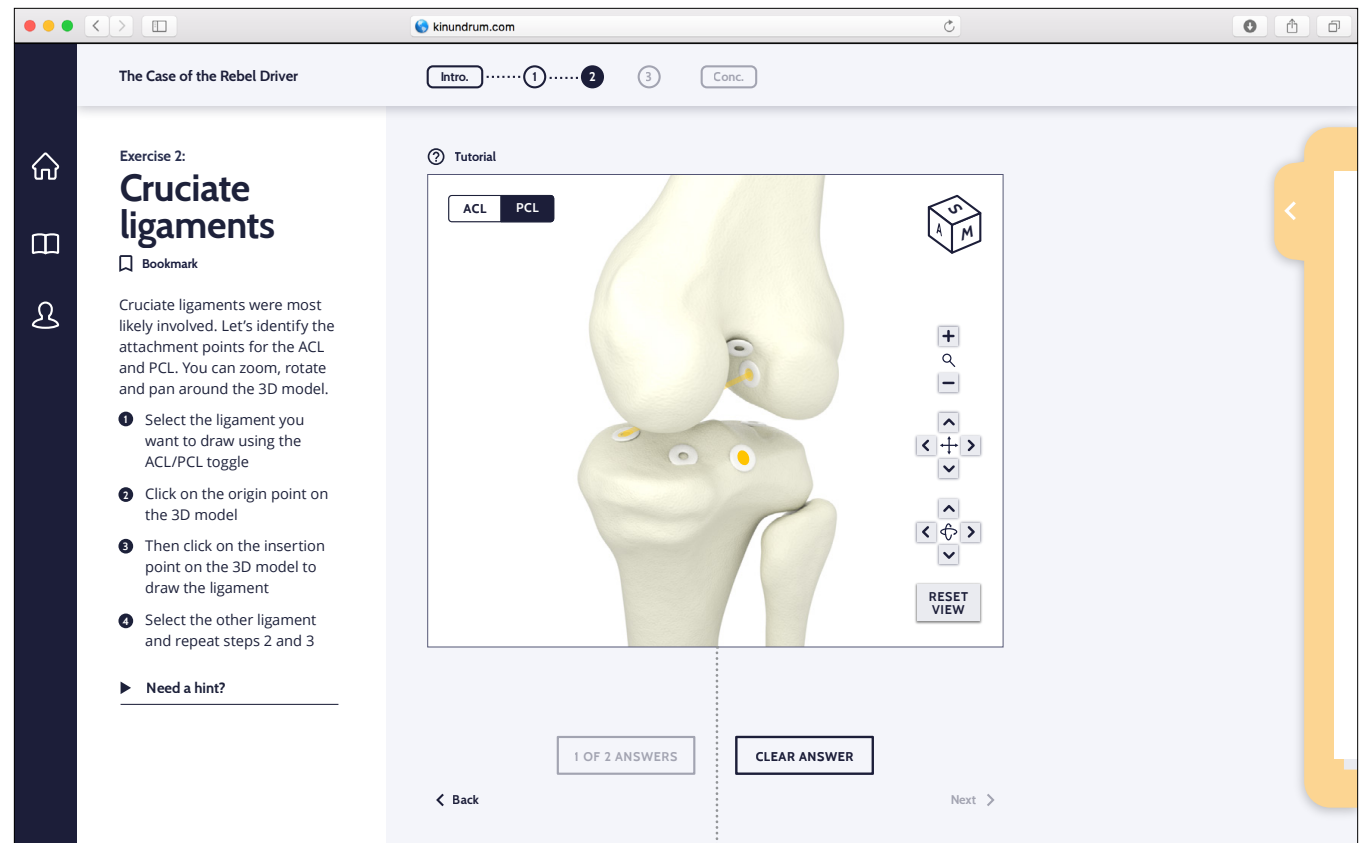
By selecting PCL, the drawn ACL ligament is now inactive

0 OF 2 updates to 1 OF 2 ANSWERS once the first ligament is drawn

CLEAR ANSWER becomes active

Wireframes

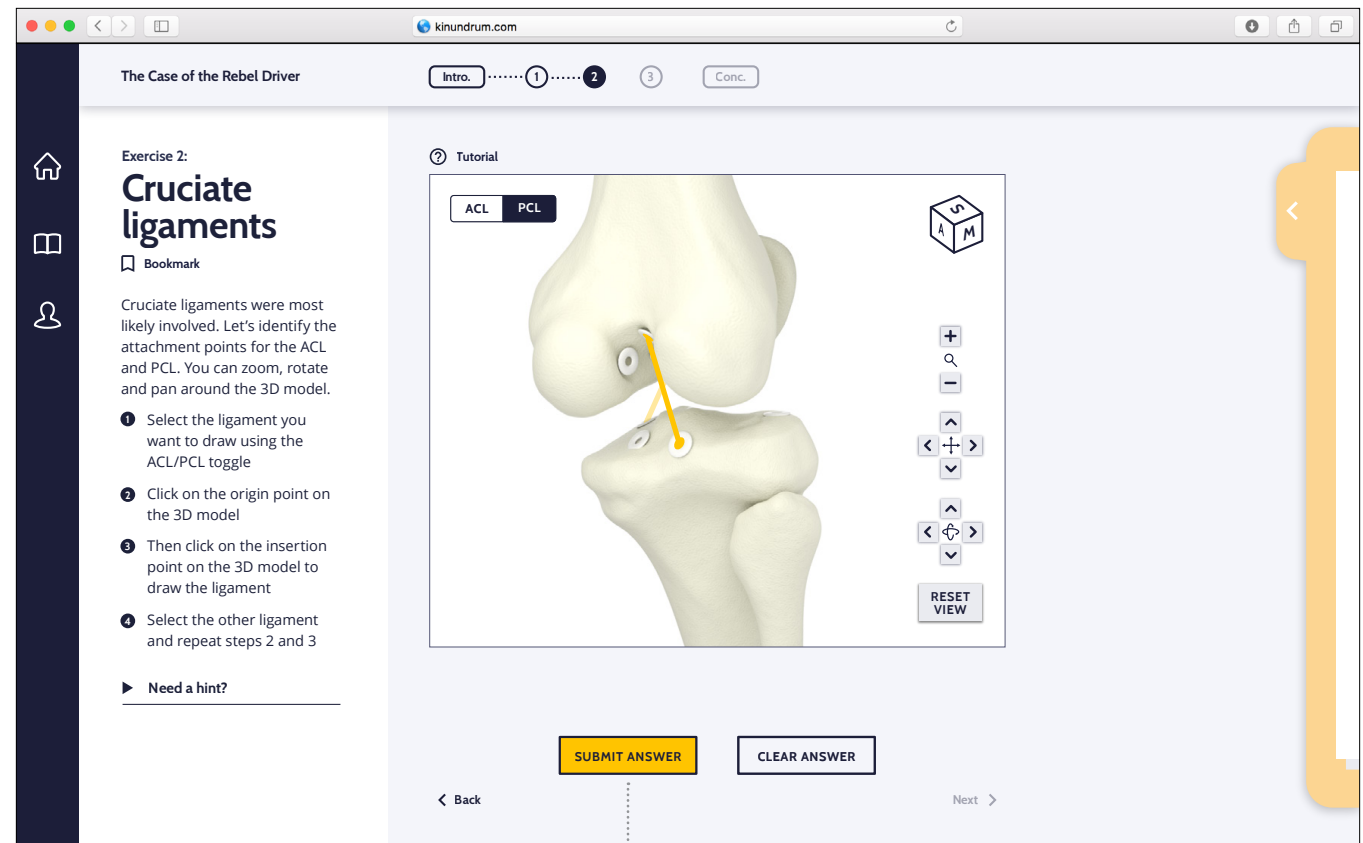
CASE STUDY: 3D DRAW EXERCISE



Onclick, a label appears to indicate that the user has selected their origin point

Wireframes

CASE STUDY: 3D DRAW EXERCISE



SUBMIT ANSWER
becomes active

Wireframes

CASE STUDY: 3D DRAW EXERCISE

Incorrect feedback

For this exercise, there is no text overlay that slides from the right. Users receive a *Try again* message, as well as additional feedback that indicates which ligament is incorrect.

IF ACL IS CORRECT BUT PCL IS INCORRECT...

CLEAR ANSWER will clear PCL. Because ACL is correct, it becomes inactive.

IF PCL IS CORRECT BUT ACL IS INCORRECT...

CLEAR ANSWER will clear ACL. Because PCL is correct, it becomes inactive.

The PCL is correct but the ACL is incorrect.

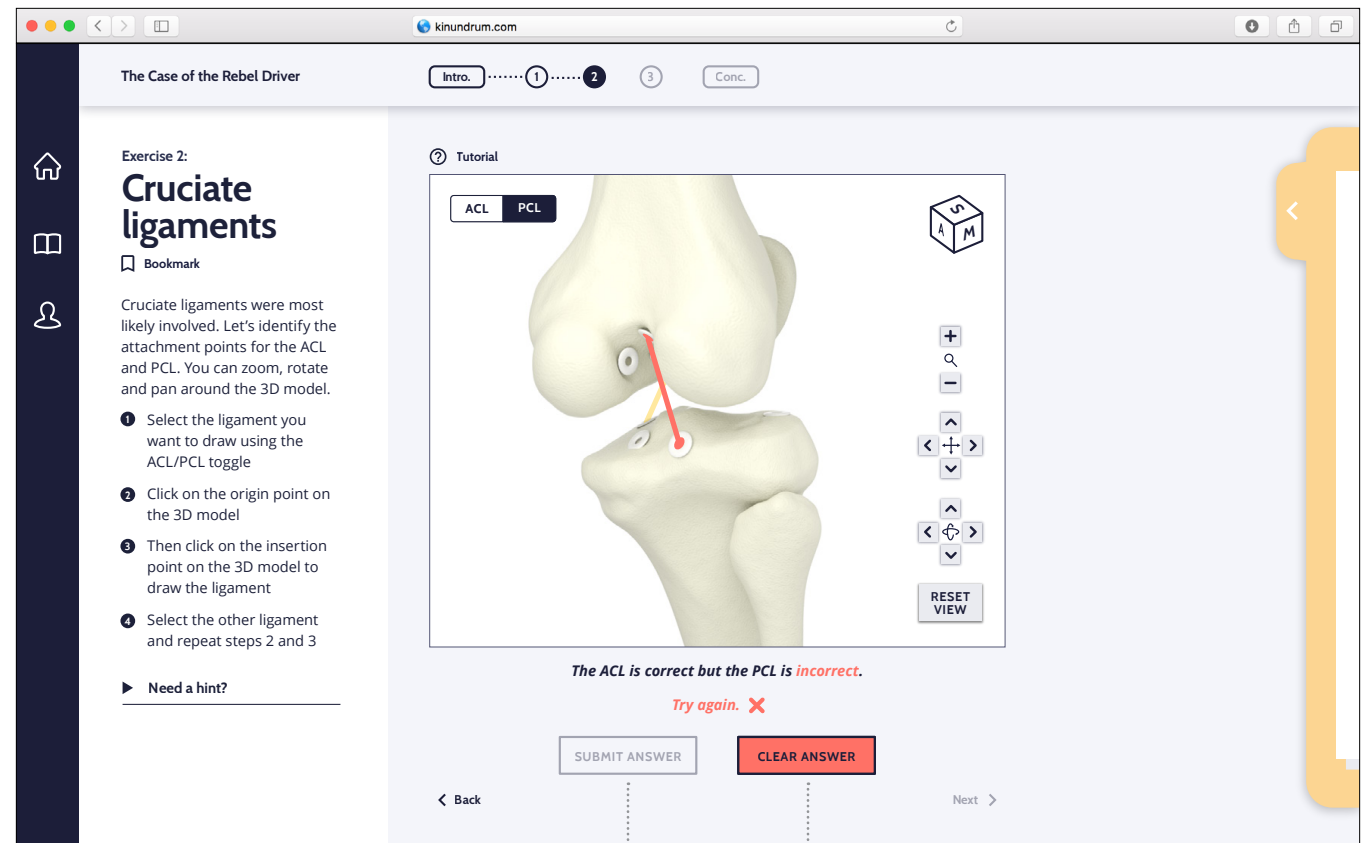
Try again. ✖

IF BOTH ACL AND PCL ARE INCORRECT...

CLEAR ANSWER will clear all.

Both ACL and PCL are incorrect.

Try again. ✖



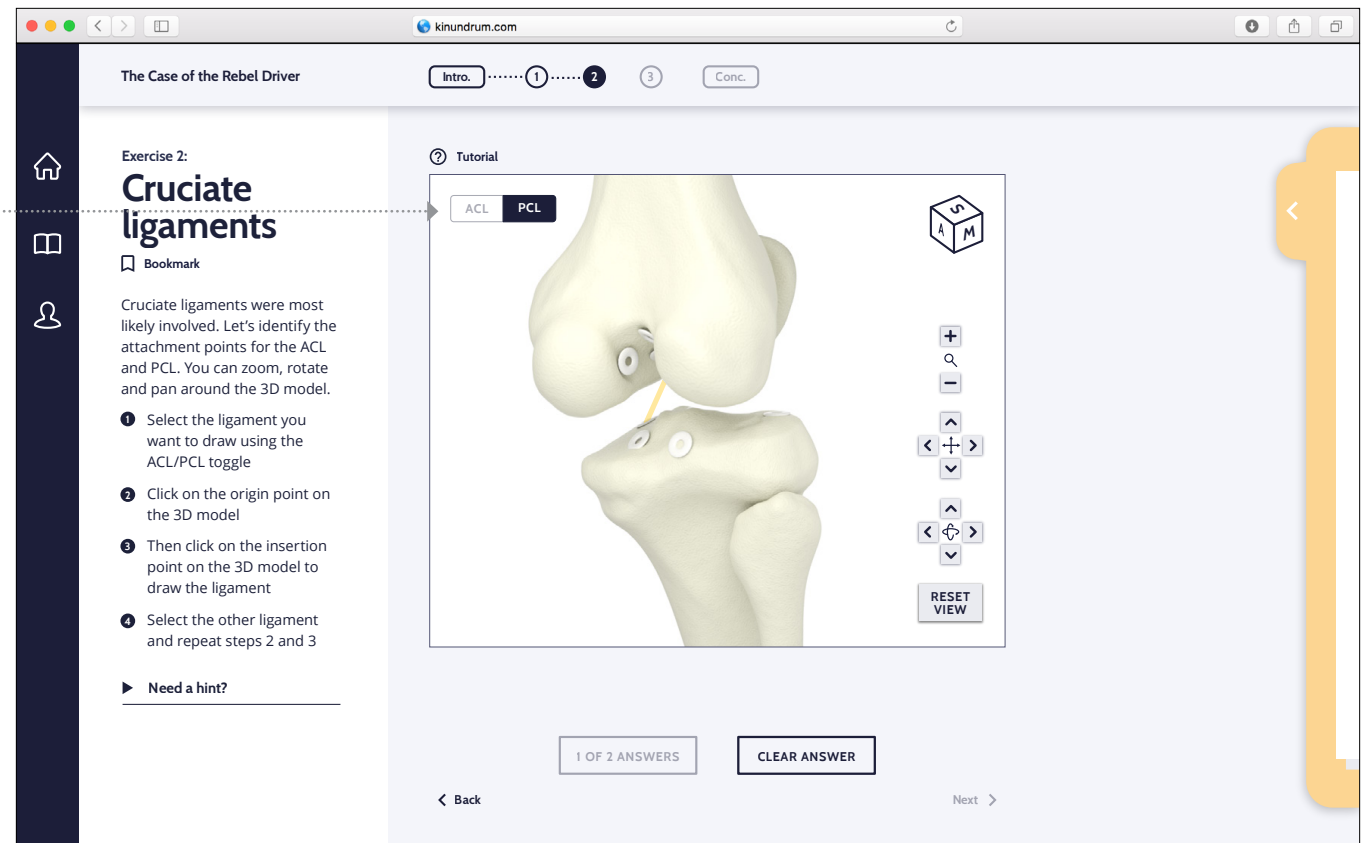
Button is inactive and goes back to original state

Active CLEAR ANSWER button becomes red

Wireframes

CASE STUDY: 3D DRAW EXERCISE

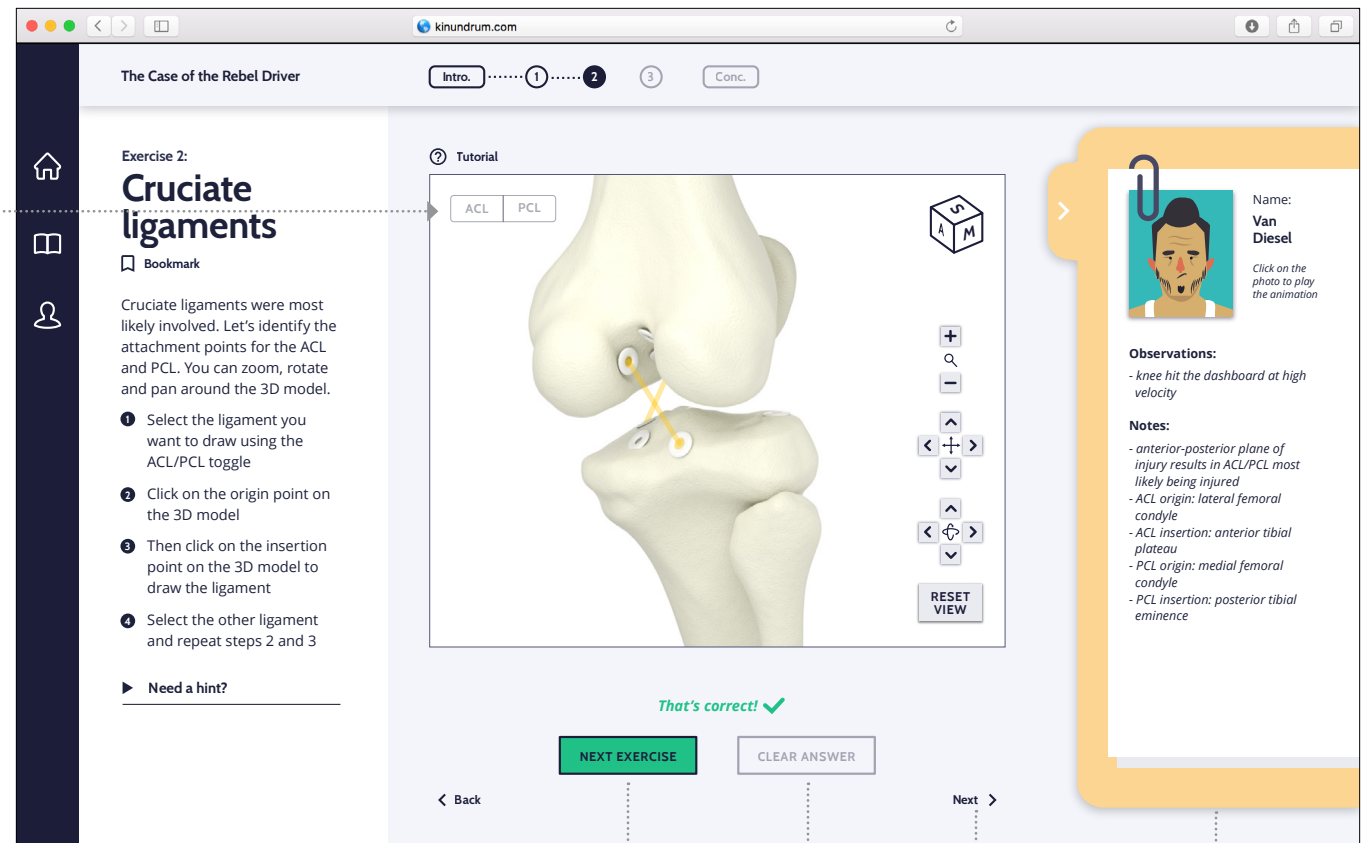
ACL toggle
button is now
inactive



Wireframes

CASE STUDY: 3D DRAW EXERCISE

Toggle buttons
are now inactive



Button becomes
green and text
changes to **NEXT
EXERCISE**. This
button now
links to the next
exercise

Button is inactive

Next
button
becomes
active

Patient folder
expands, and
updates with
new notes

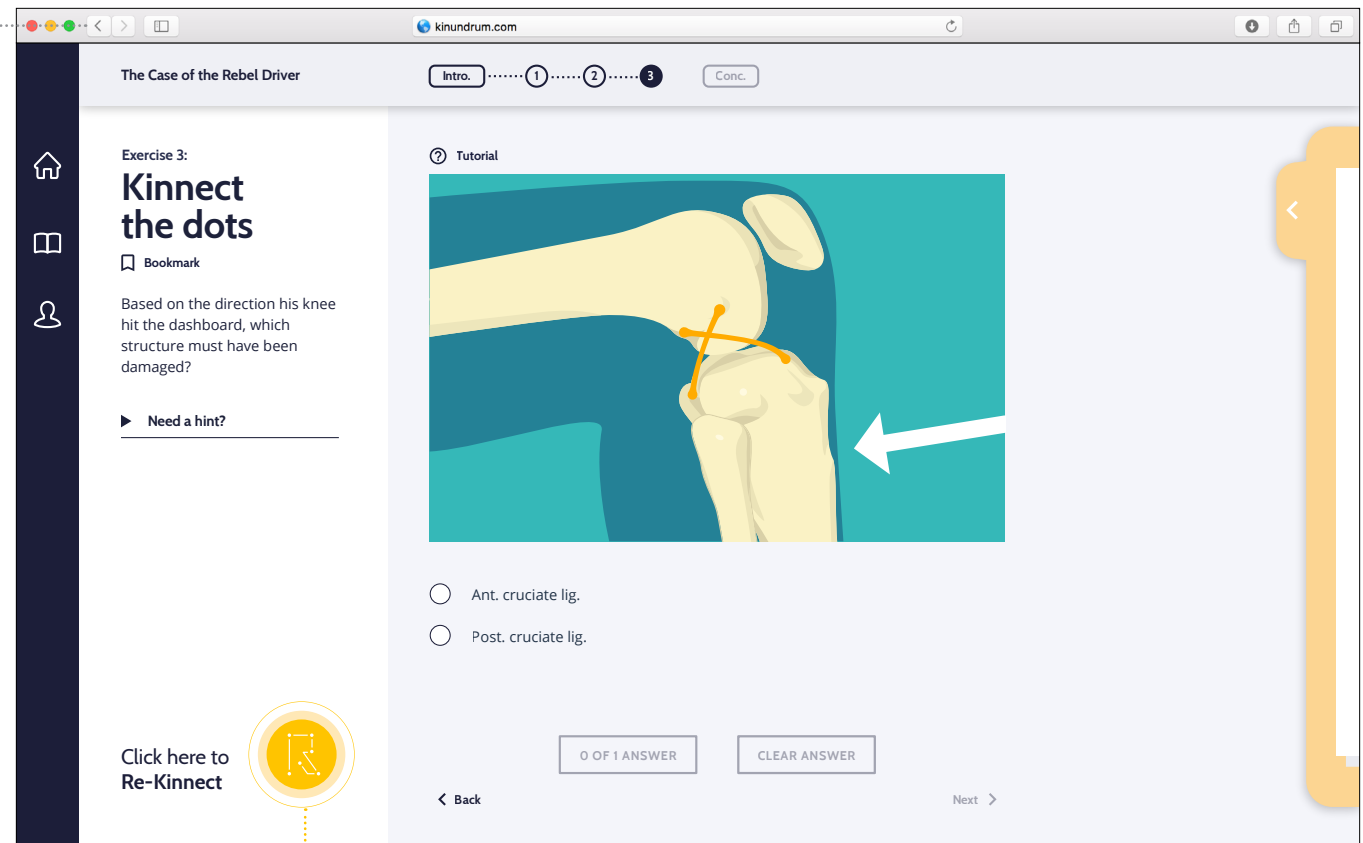
Wireframes

CASE STUDY: MULTIPLE CHOICE EXERCISE

The user clicks on a radio button to select the corresponding answer. Users can only select one answer choice.

BROWSER BACK BUTTON

Exercise 2 with correct feedback
(last state)



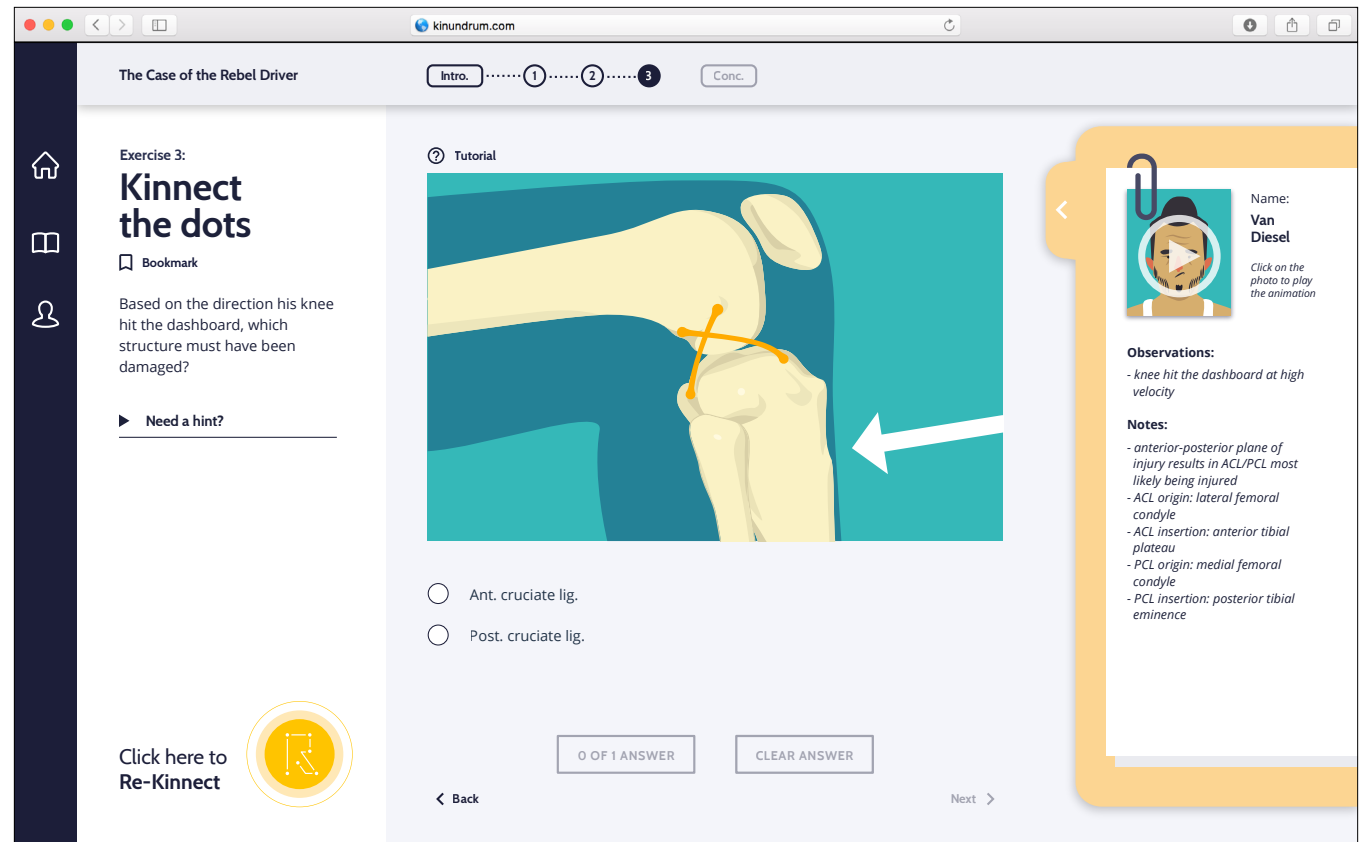
Clicking on the icon will take the user to the Re-kinnect exercise

Wireframes

CASE STUDY: MULTIPLE CHOICE EXERCISE

IF USER WANTS TO REWATCH THE INTRODUCTION ANIMATION...

The user can click on the patient folder tab to expand it. Clicking on the patient's picture will open a lightbox with the video player.

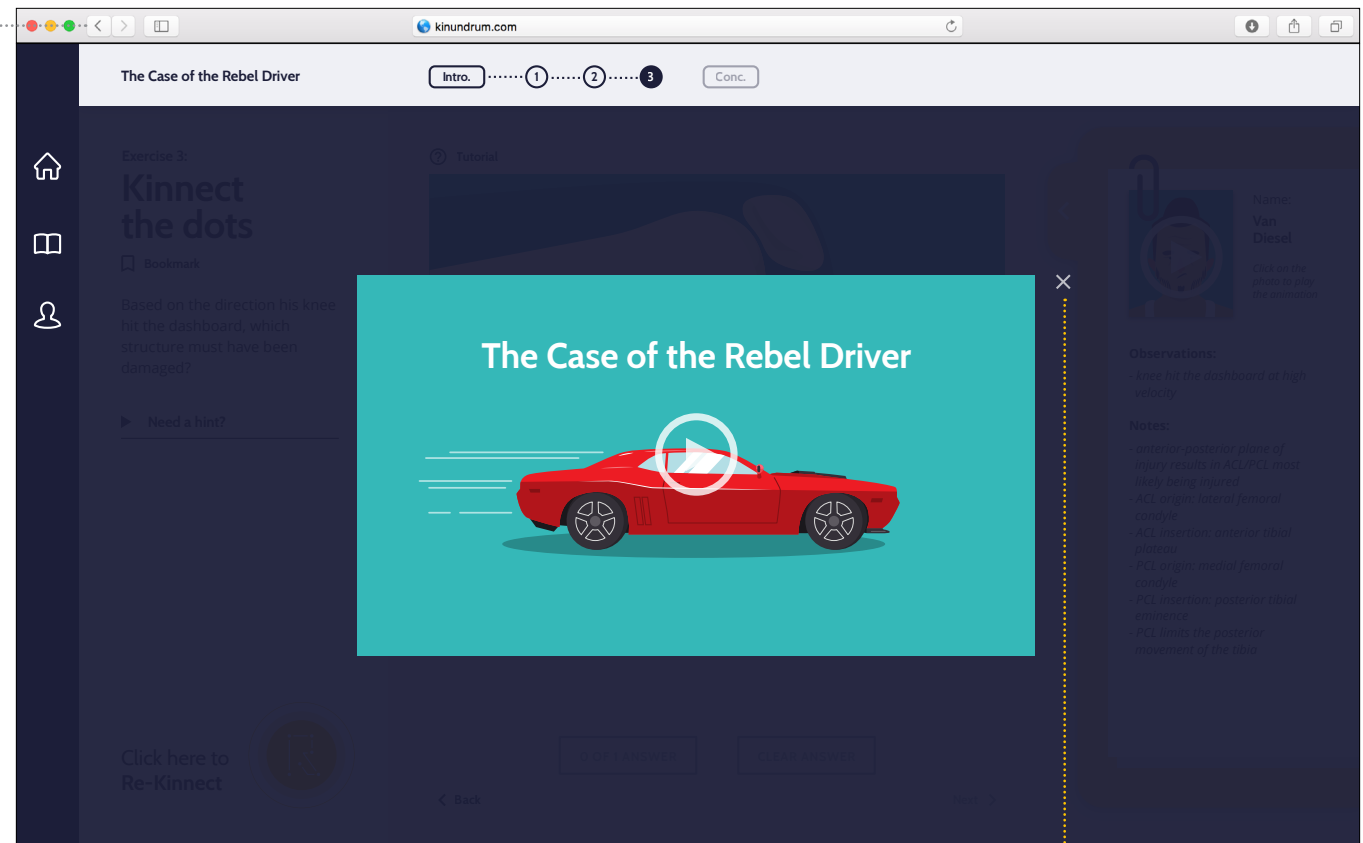


Wireframes

CASE STUDY: MULTIPLE CHOICE EXERCISE

BROWSER BACK BUTTON

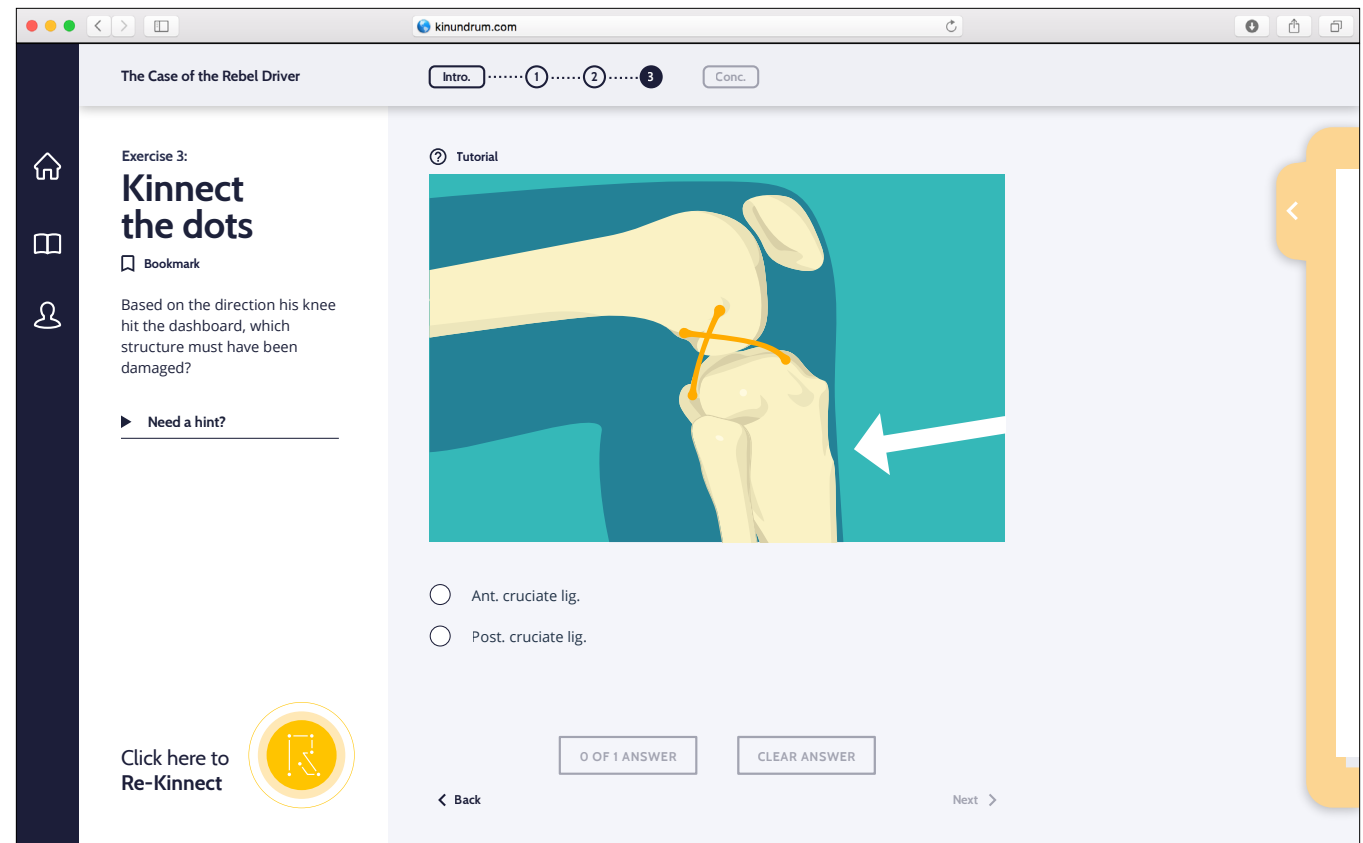
Exercise 3 with patient folder expanded (last state)



X to exit overlay and return to the exercise

Wireframes

CASE STUDY: MULTIPLE CHOICE EXERCISE

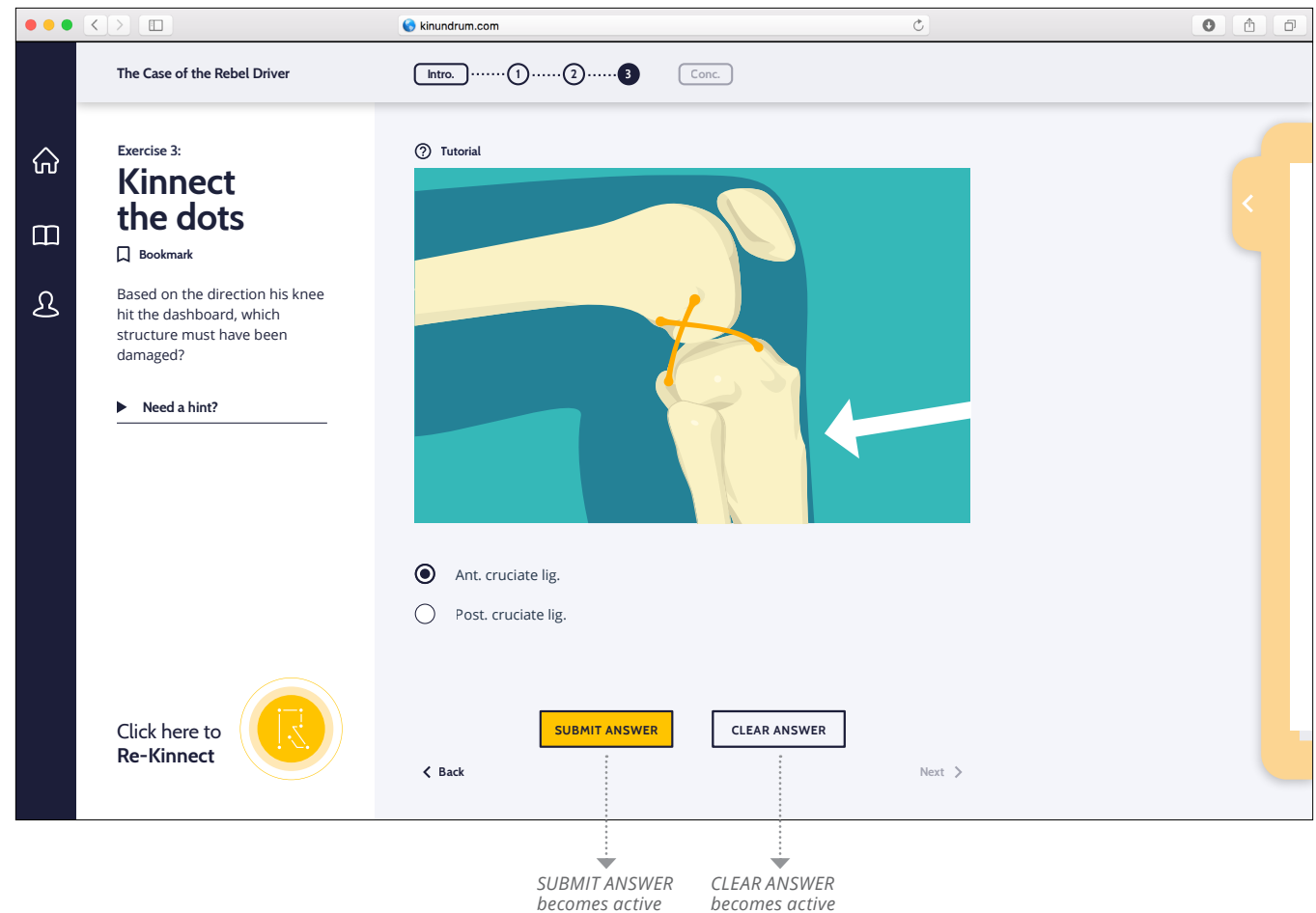


Wireframes

CASE STUDY: MULTIPLE CHOICE EXERCISE

IF USER WANTS TO DESELECT THEIR ANSWER...

The user can deselect their answer by clicking on the selected radio button, clicking on a different radio button, or clicking on CLEAR ANSWER.



Wireframes

CASE STUDY: MULTIPLE CHOICE EXERCISE

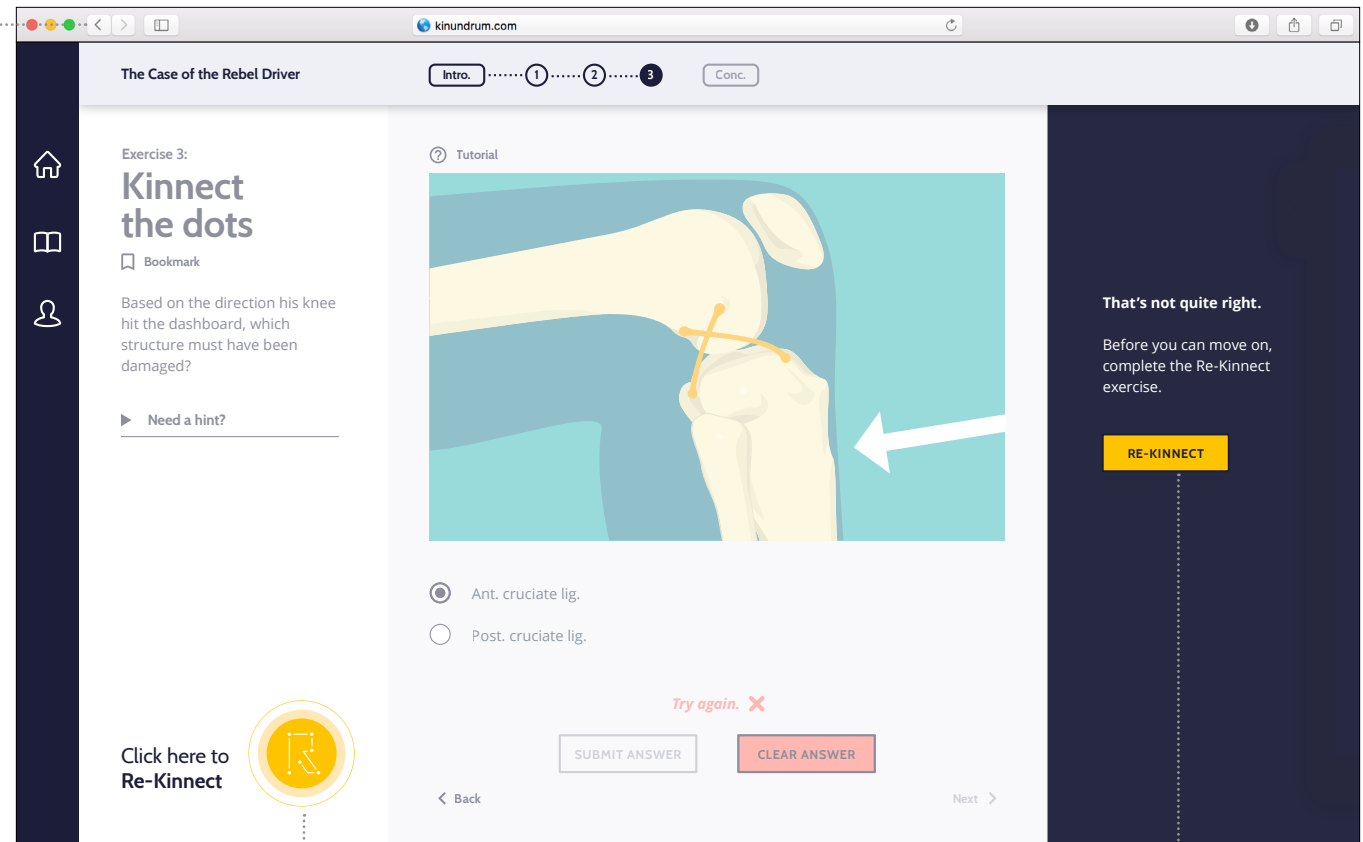
BROWSER BACK BUTTON

Exercise 2 with correct feedback

if user hits **Next > from Exercise 2, they will be taken back to this state*

Incorrect feedback

When the user answers incorrectly, a text overlay slides in from the right prompting users to click on RE-KINNECT or the icon in the question area. The rest of the screen is inactive which means the user can only continue once they complete the Re-Kinnect exercise.



Click here to
Re-Kinnect

The rest of the
interface is
disabled except
for Re-Kinnect
icon and button

On hover, the
ghost button
inverts

RE-KINNECT

Wireframes

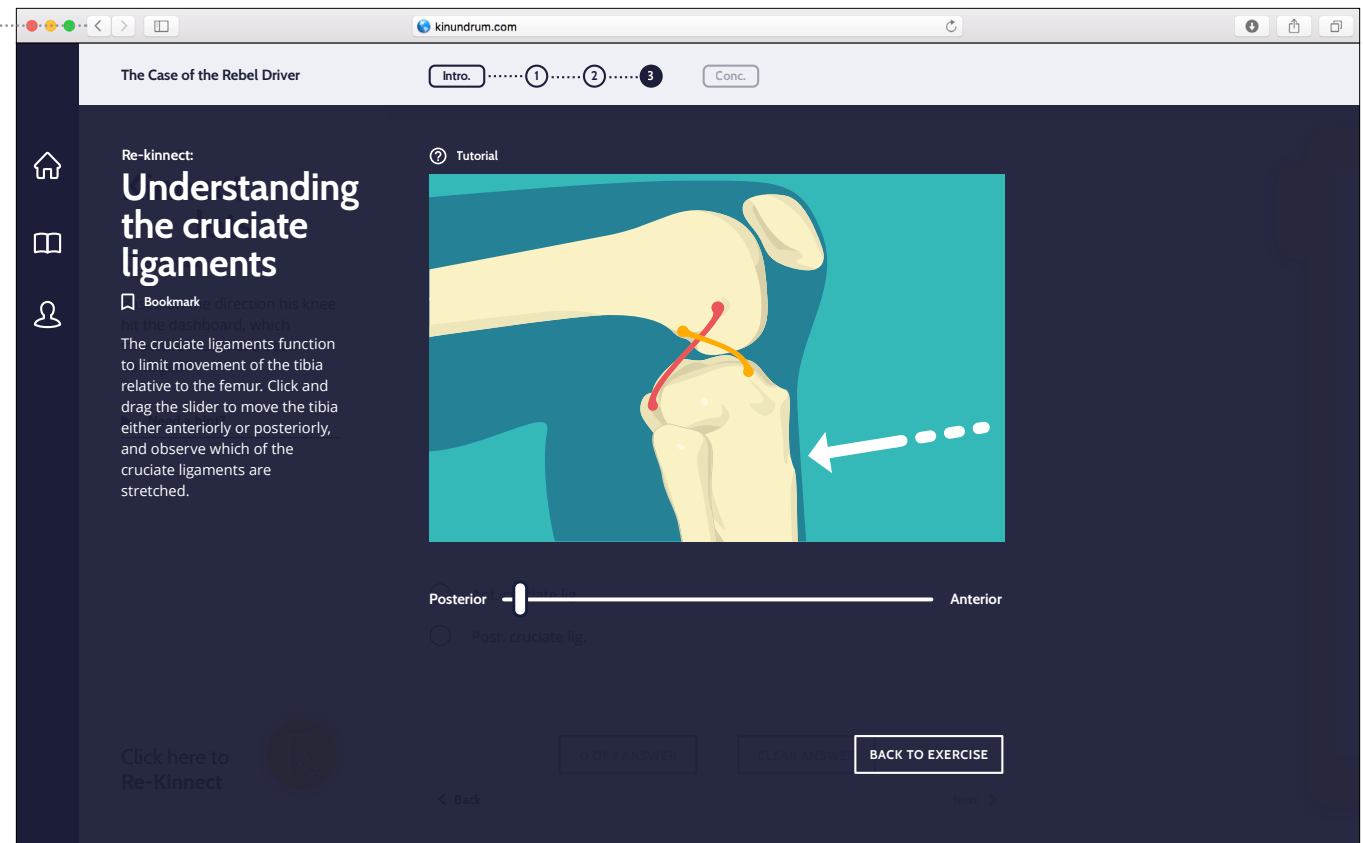
CASE STUDY: MULTIPLE CHOICE EXERCISE

BROWSER BACK BUTTON

Exercise 3 (last state)

Re-kinnect exercise

For this exercise, users are automatically directed to the Re-kinnect exercise if they answer the question incorrectly. The user can also access the Re-kinnect exercise from a linked icon on the exercise page. Similar to a regular exercise, there is a question area and an interactive area. The type of interactivity is a slider or an animation.

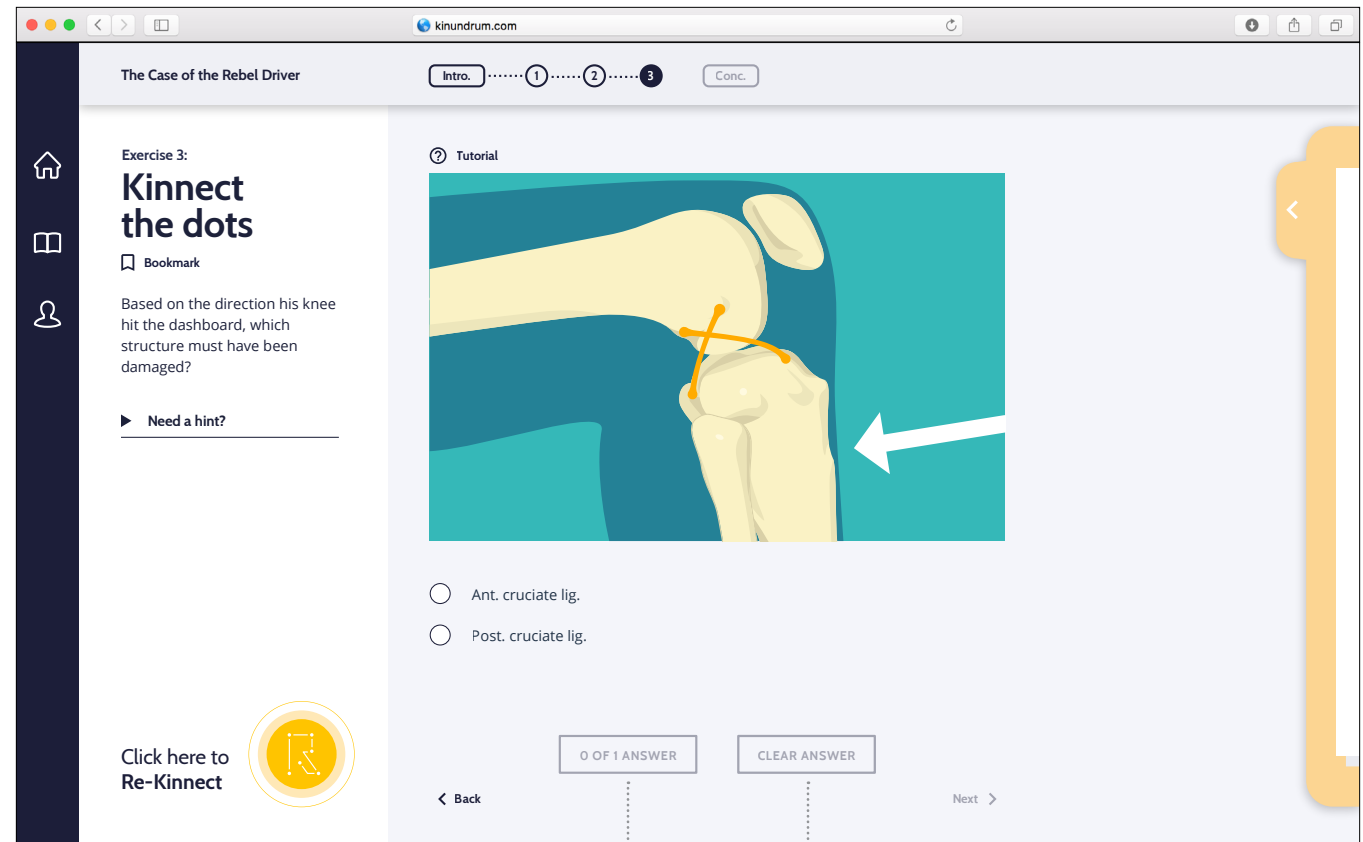


Wireframes

CASE STUDY: MULTIPLE CHOICE EXERCISE

IF USER WANTS TO GO BACK TO THE RE-KINNECT EXERCISE...

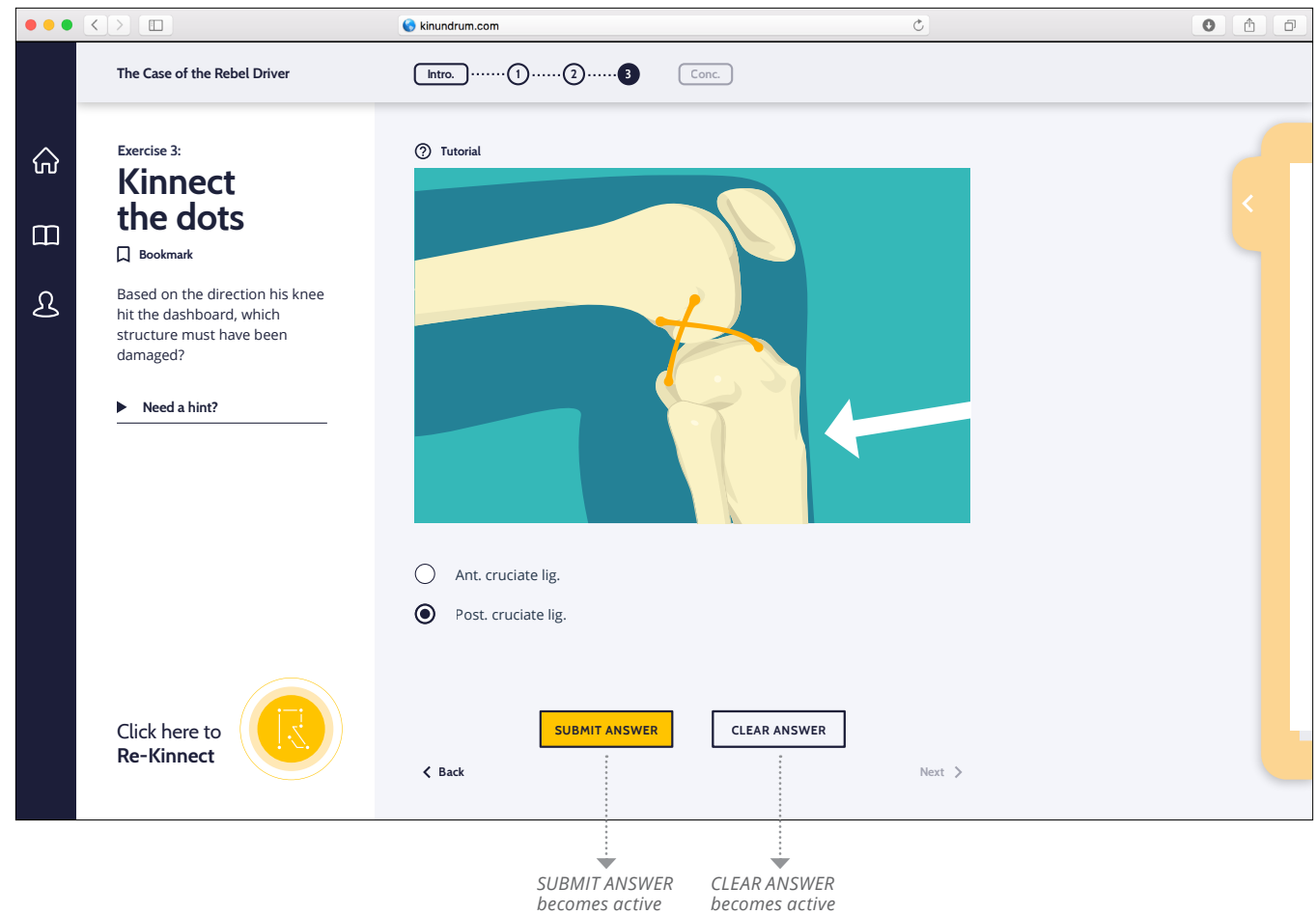
The user can click on the icon in the question area to go back to it.



When users return to the exercise after the Re-kinnect exercise, answers are cleared and the submission buttons revert back to their original state

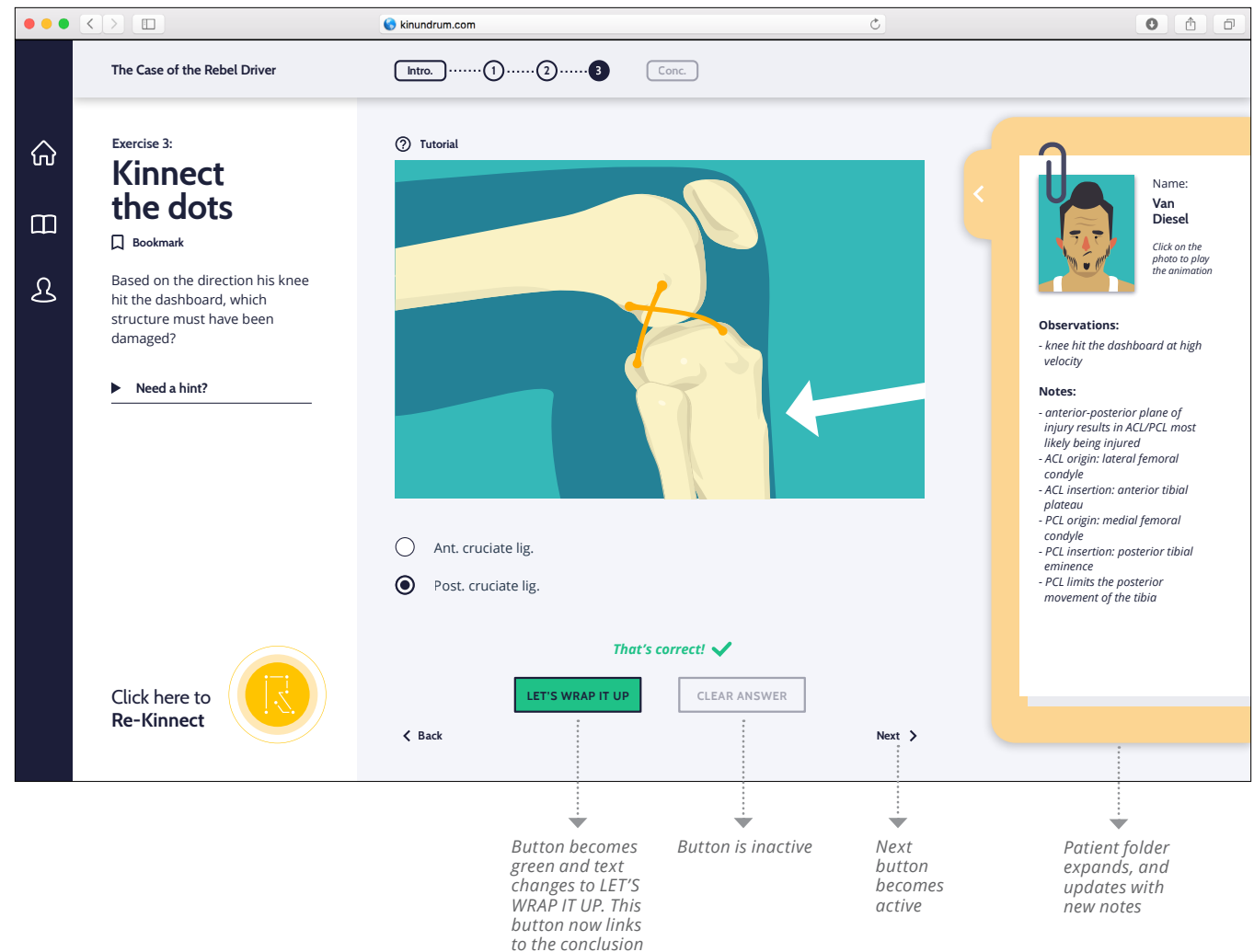
Wireframes

CASE STUDY: MULTIPLE CHOICE EXERCISE



Wireframes

CASE STUDY: MULTIPLE CHOICE EXERCISE



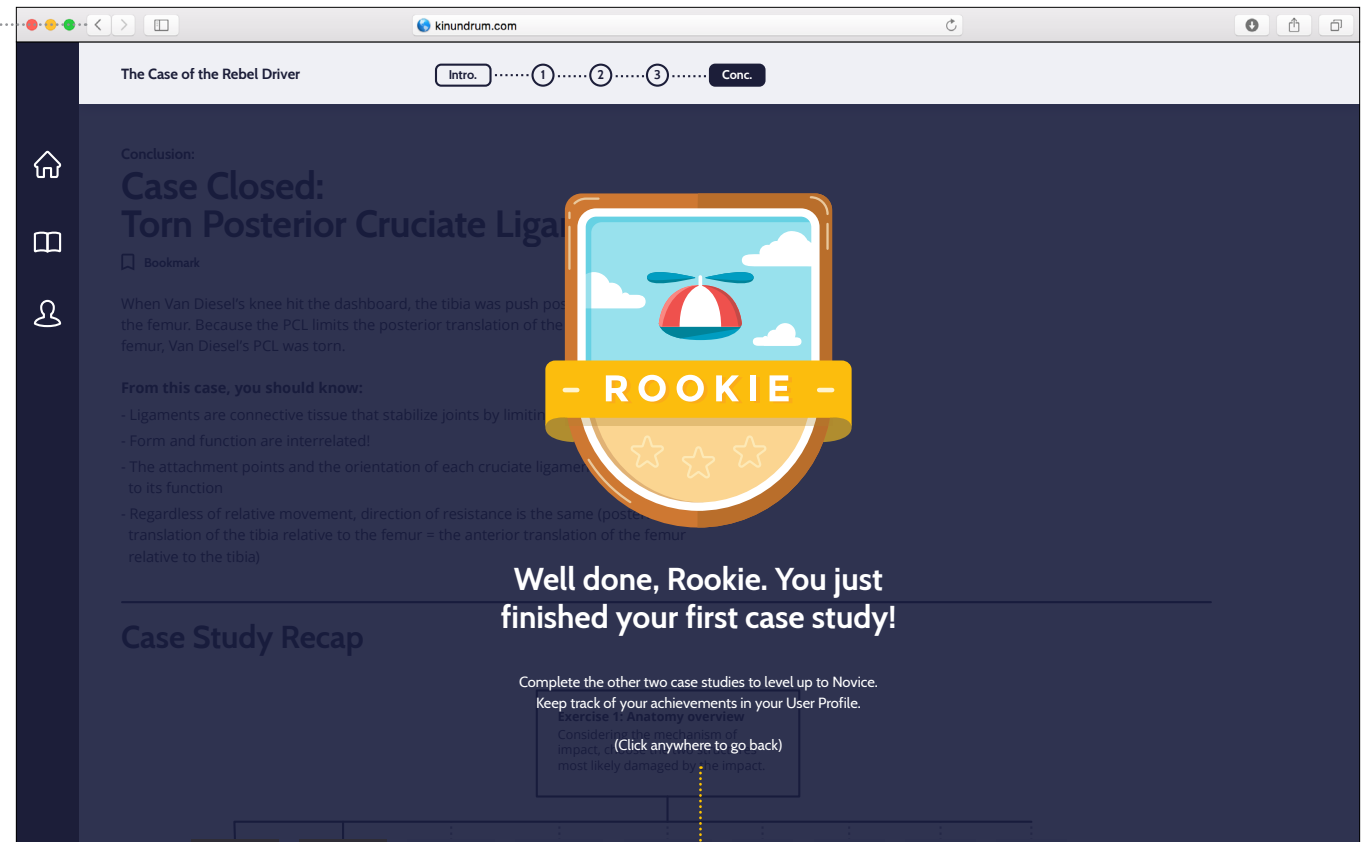
Wireframes

LEVEL UP: ROOKIE

When the user completes their first case study, they level up to Rookie and receive a Level Up badge. Users can view their badges in the **User Profile**.

BROWSER BACK BUTTON

Exercise 3 with correct feedback (last state)

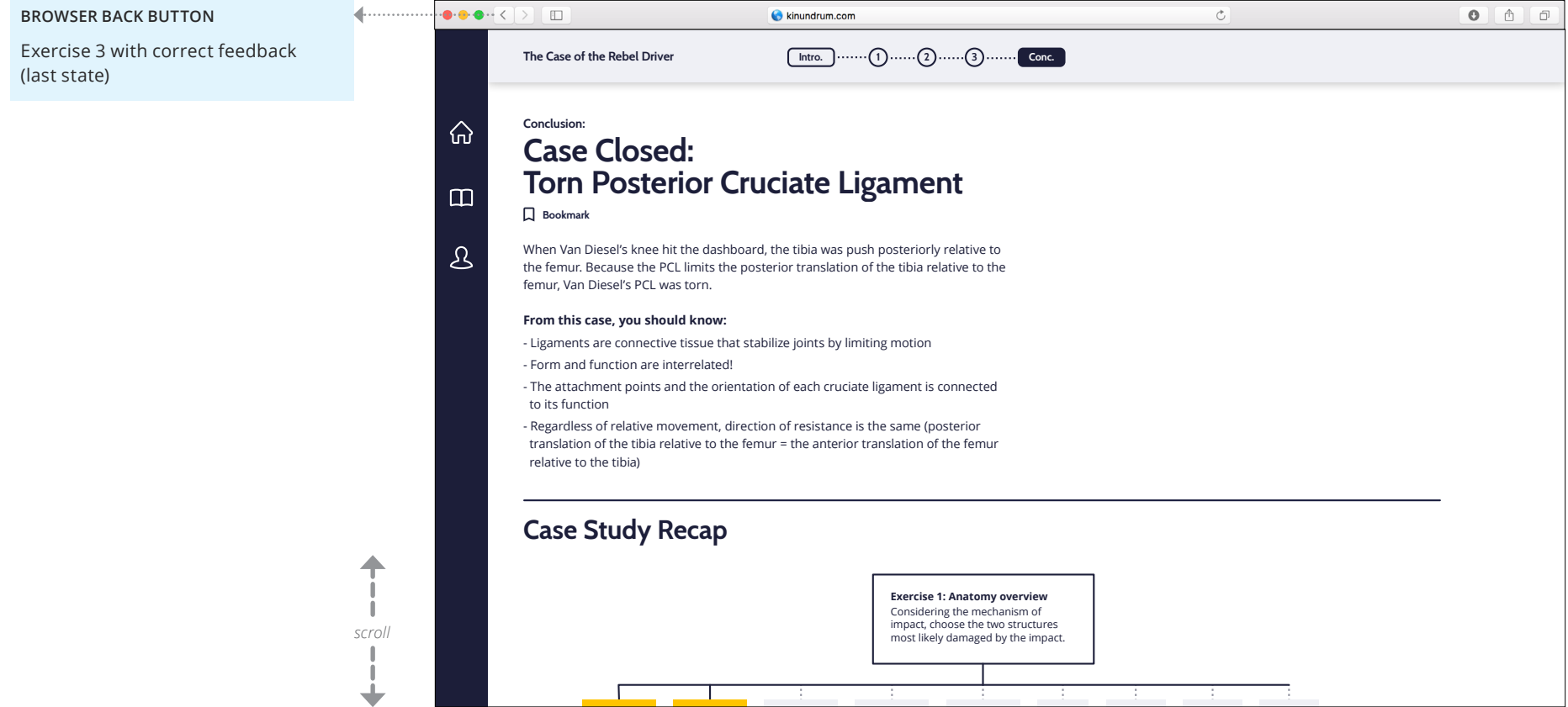


Users can click anywhere to exit the overlay

Wireframes

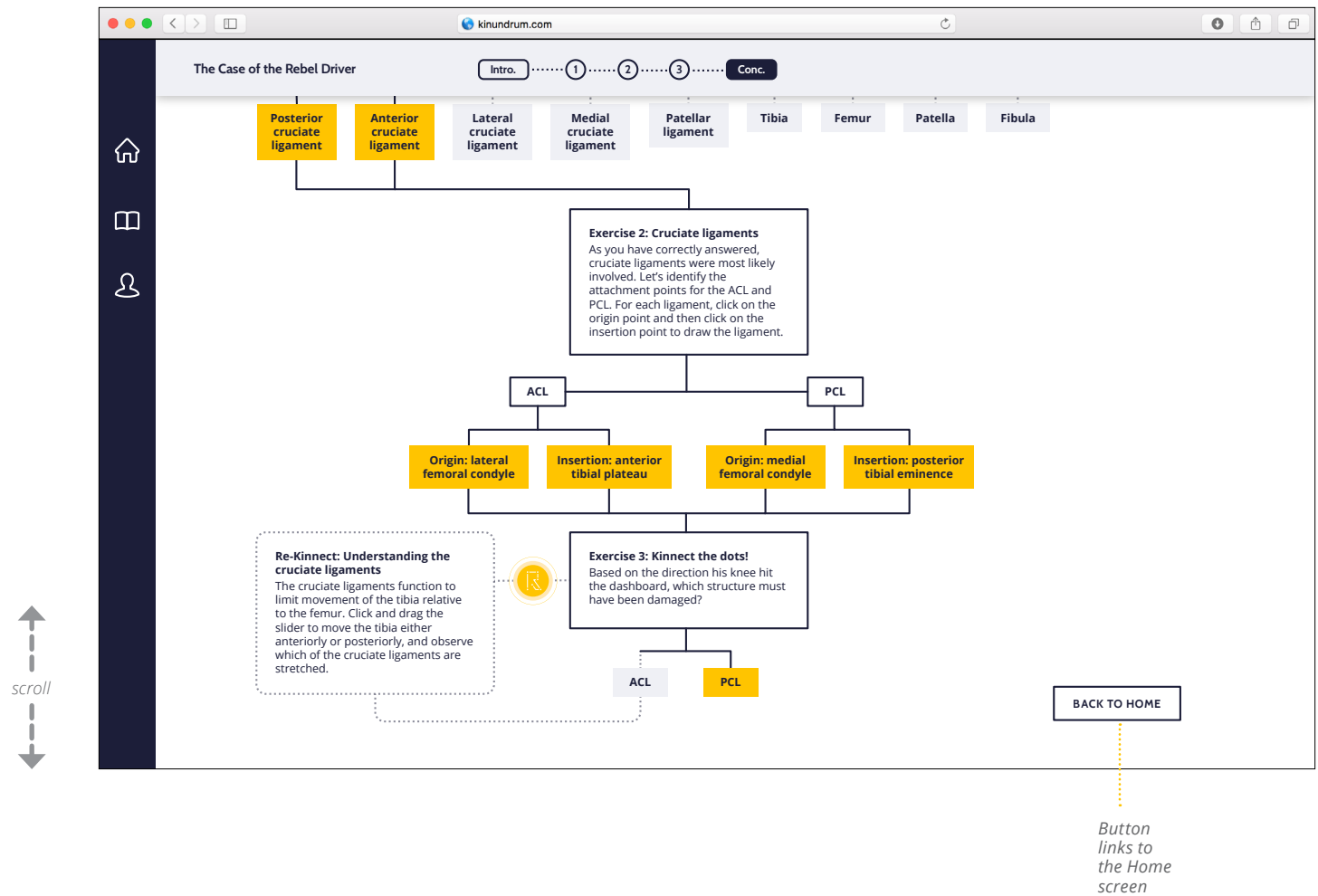
CASE STUDY: CONCLUSION

After completing all the exercises, the user is directed to **Case Study Conclusion**. Here, they can read the main takeaways and view the *Case Study Recap* flowchart for the case study.



Wireframes

CASE STUDY: CONCLUSION



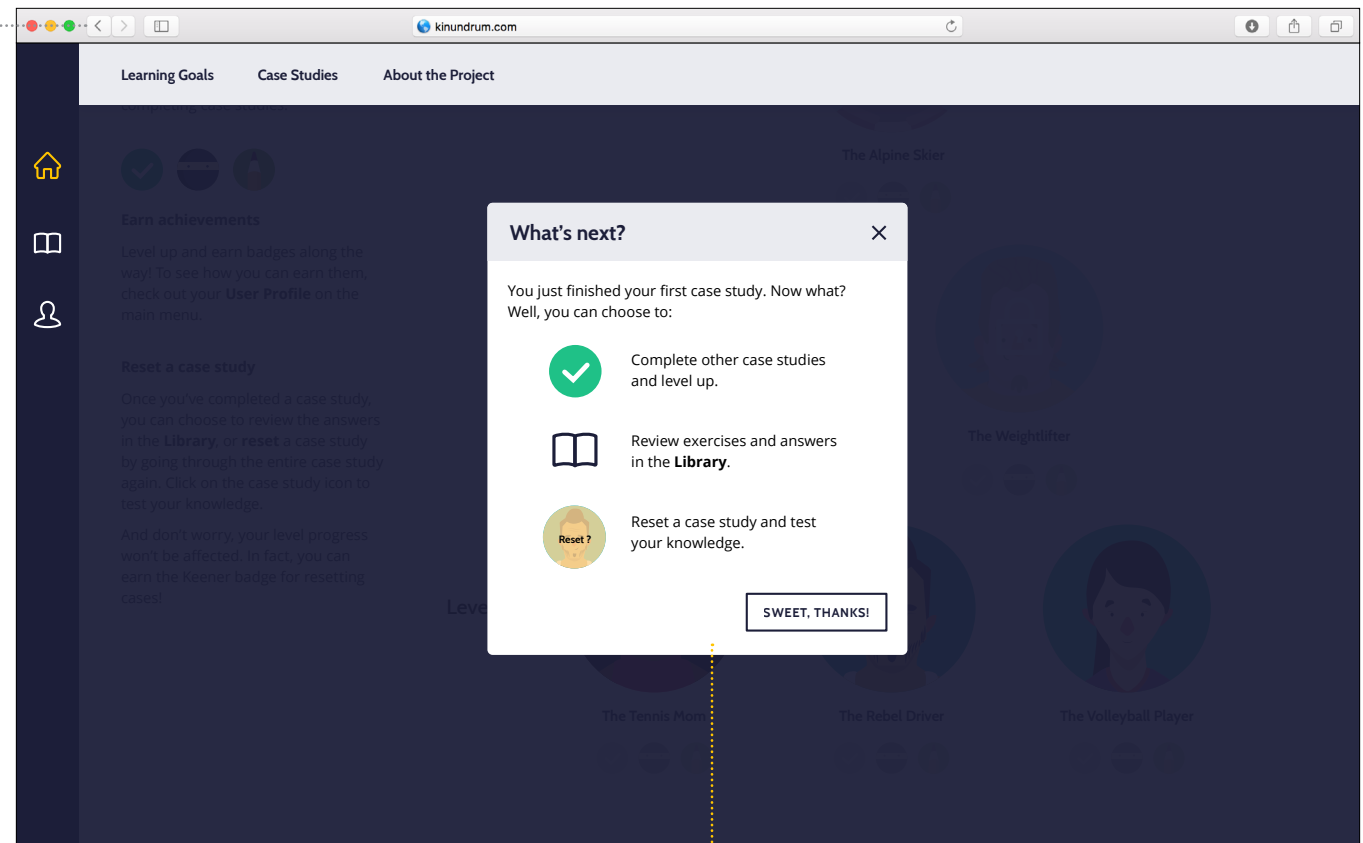
Wireframes

HOME SCREEN: COMPLETE CASE STUDY

After clicking on BACK TO HOME, users are taken back to the Home screen directly to the Case Studies section. The case study icon updates as completed. The user can also choose to review from the Library or RESET the case study.

BROWSER BACK BUTTON

Case Study Conclusion

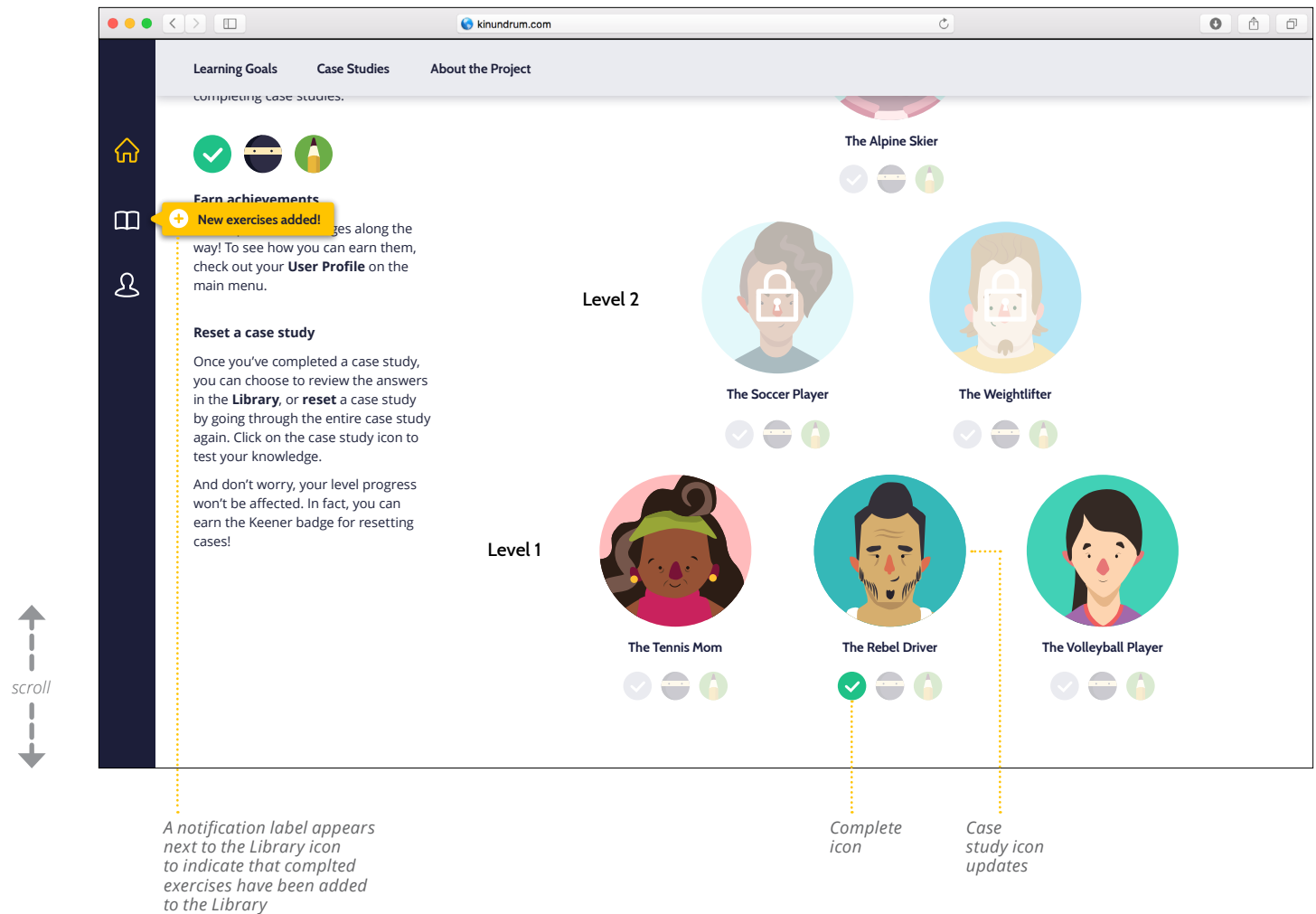


A modal window appears that explains what users can do now that they've completed a case study

*This only appears the first time the user completes a case study

Wireframes

HOME SCREEN: COMPLETE CASE STUDY



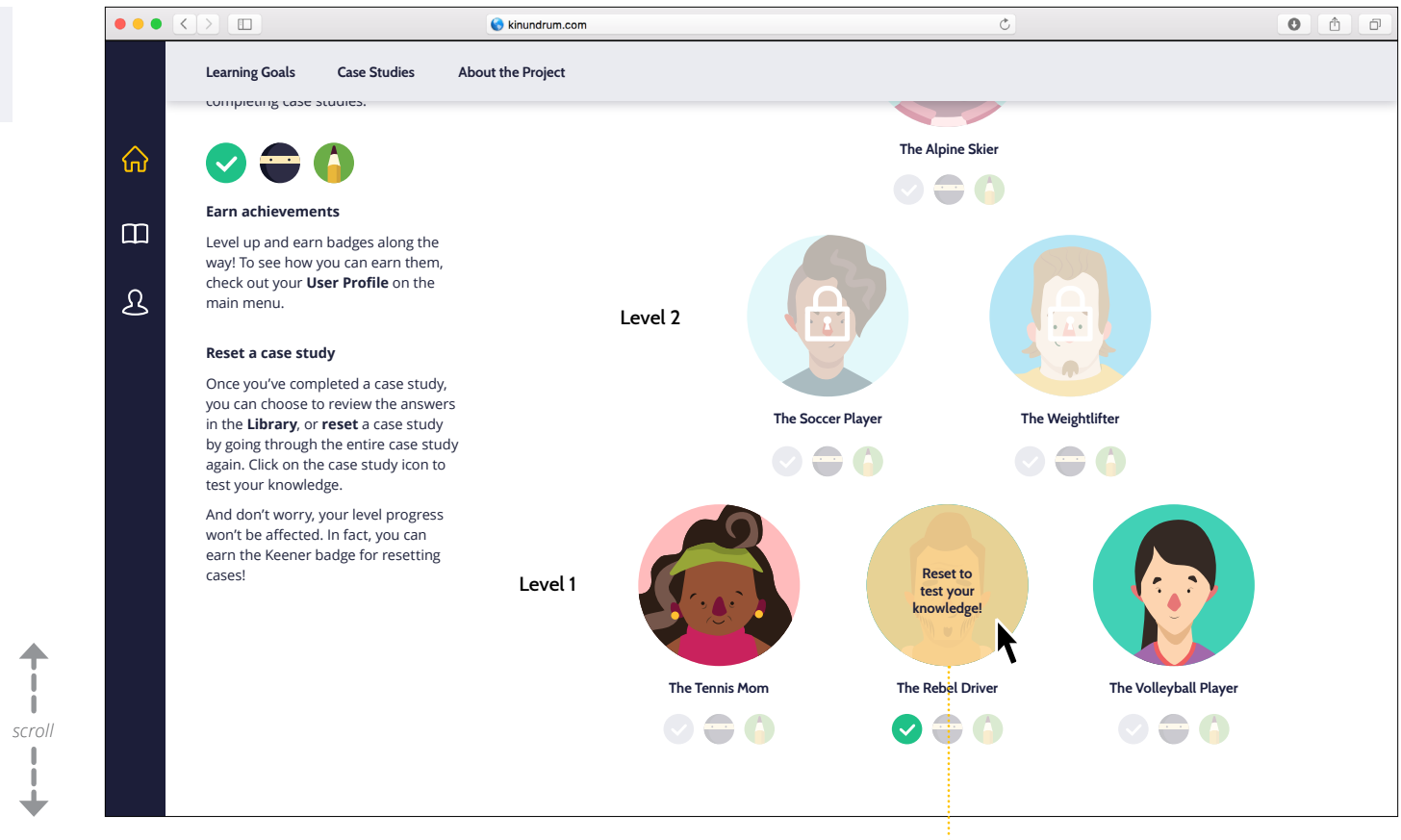
© Wireframes

RESETTING A CASE STUDY

When users click RESET on a case study icon, users are taken back to the completed case study but in **RESET mode**. In this mode, the case study exercises revert back to its original state.

IF USER WANTS TO RESET A CASE STUDY...

The user can click on the case study icon.



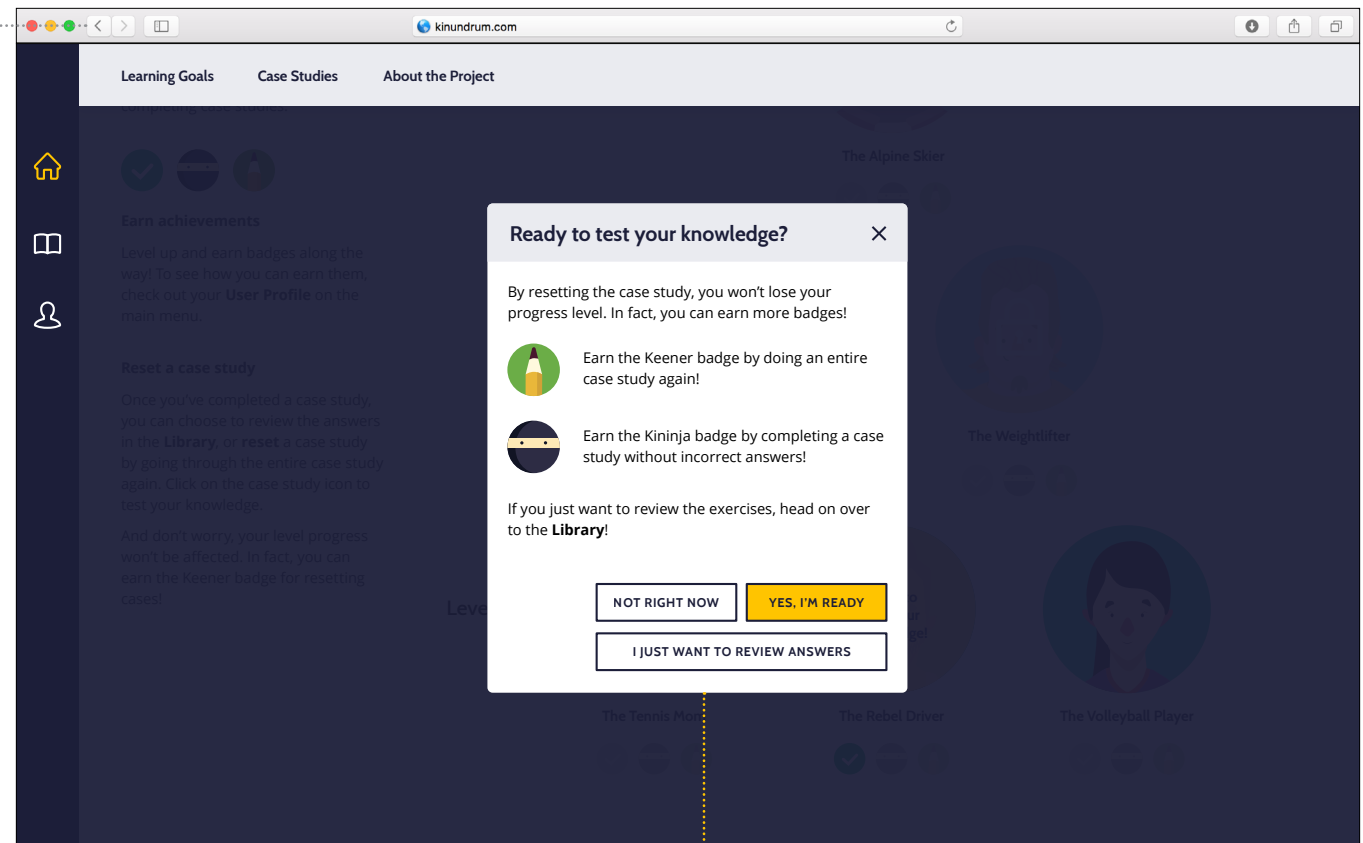
On hover, the case study icon displays the "RESET" option

Wireframes

RESET MODE

BROWSER BACK BUTTON

Home screen, Case Studies section



A dialog box appears notifying the user that they are about to go into Redo mode

Wireframes

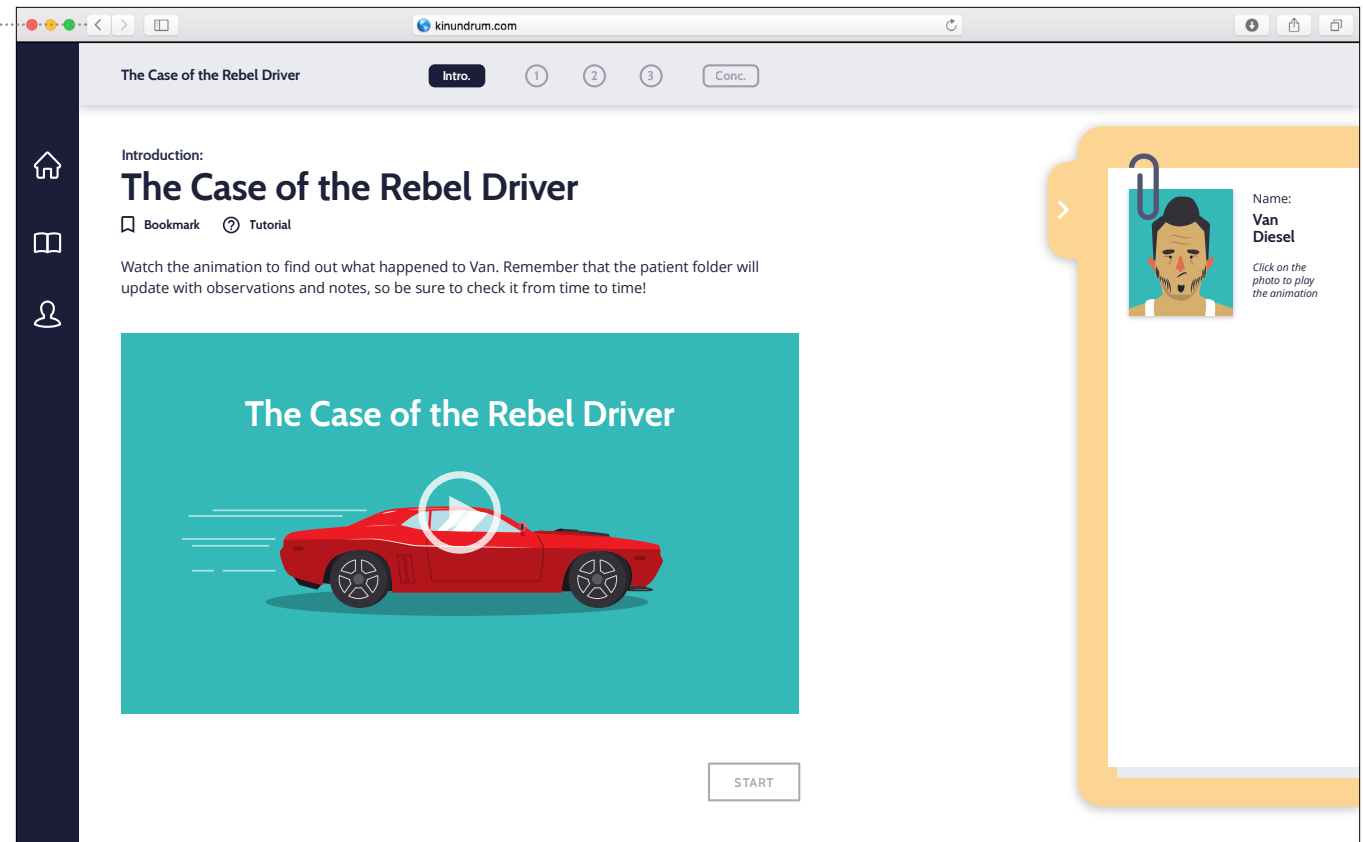
RESET MODE: CASE STUDY EXERCISE

BROWSER BACK BUTTON

Home screen, Case Studies section

Reset mode

In this mode, all answers and notes are cleared. The user goes through the entire case study in the same way they had gone through it the first time.

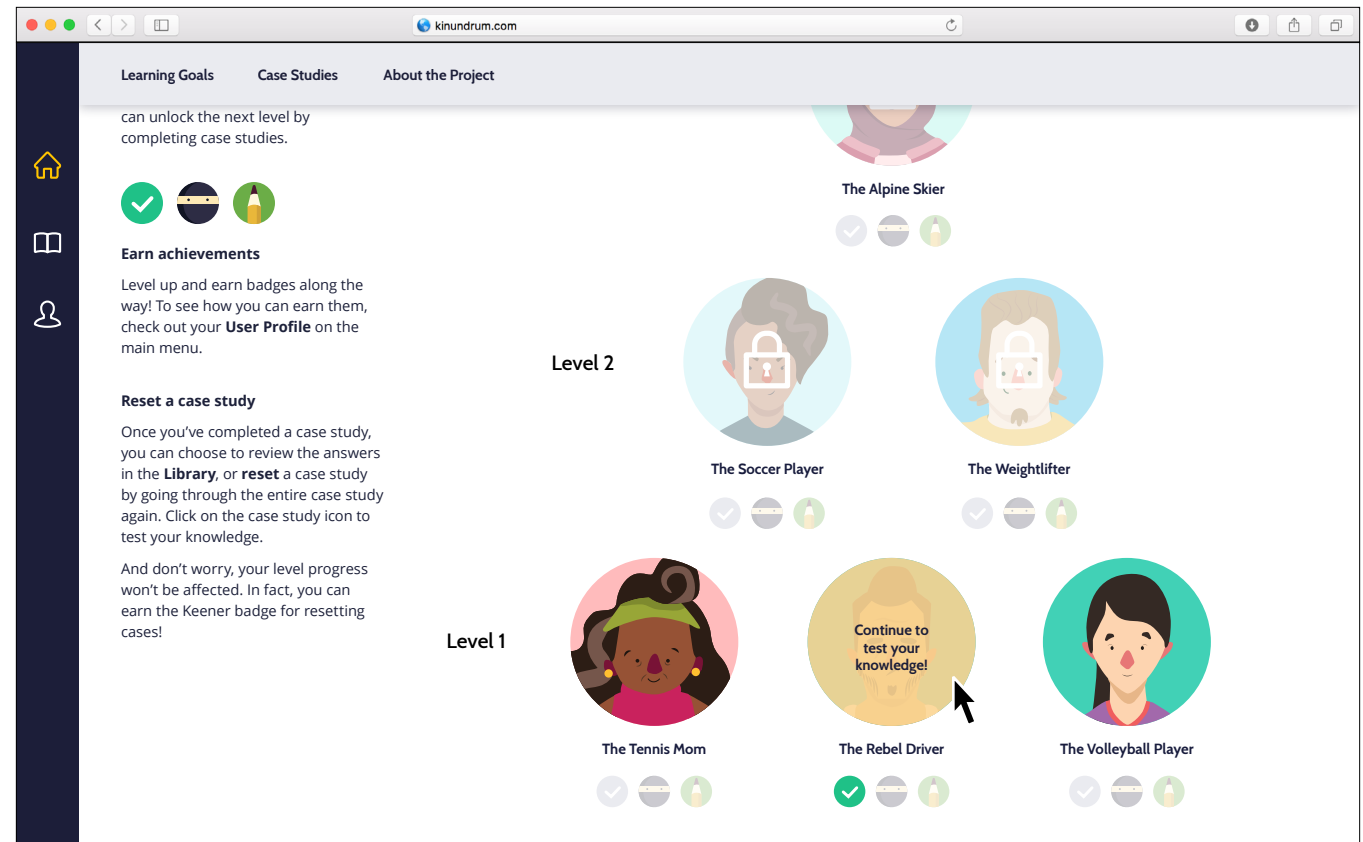


Wireframes

RESET MODE

IF USER WANTS TO EXIT THE CASE STUDY AND THEN GO BACK INTO IT...

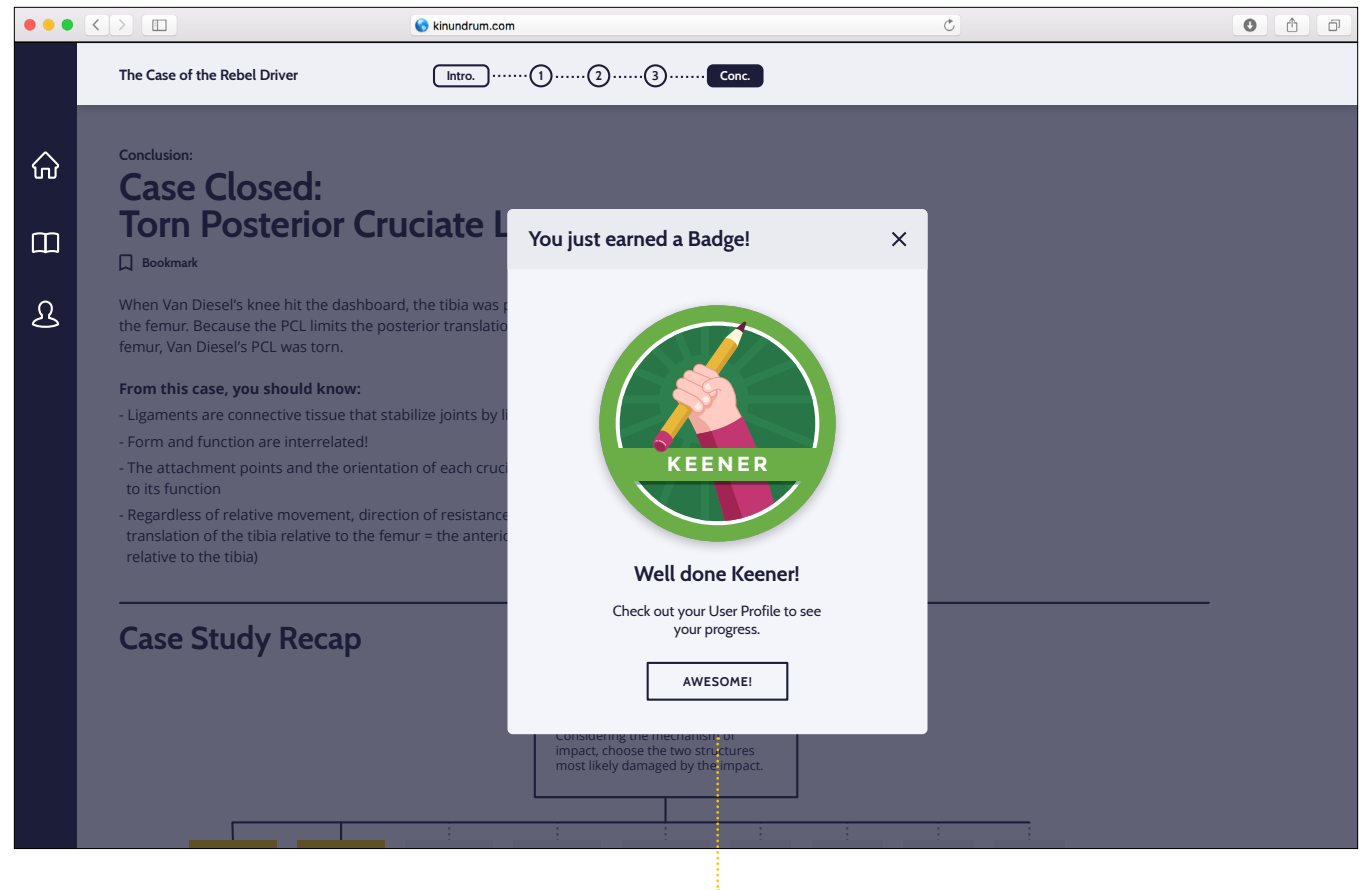
The user can go back to the case study by clicking on the case study icon. They will be taken back to the last exercise they were in the process of completing.



Wireframes

RESET MODE: KEENER BADGE

When users complete a case study in Reset mode, they can earn the Keener and Kininja badges. Users can earn both badges only once per case study.



A dialog box appears notifying the user that they have just earned the Keener badge

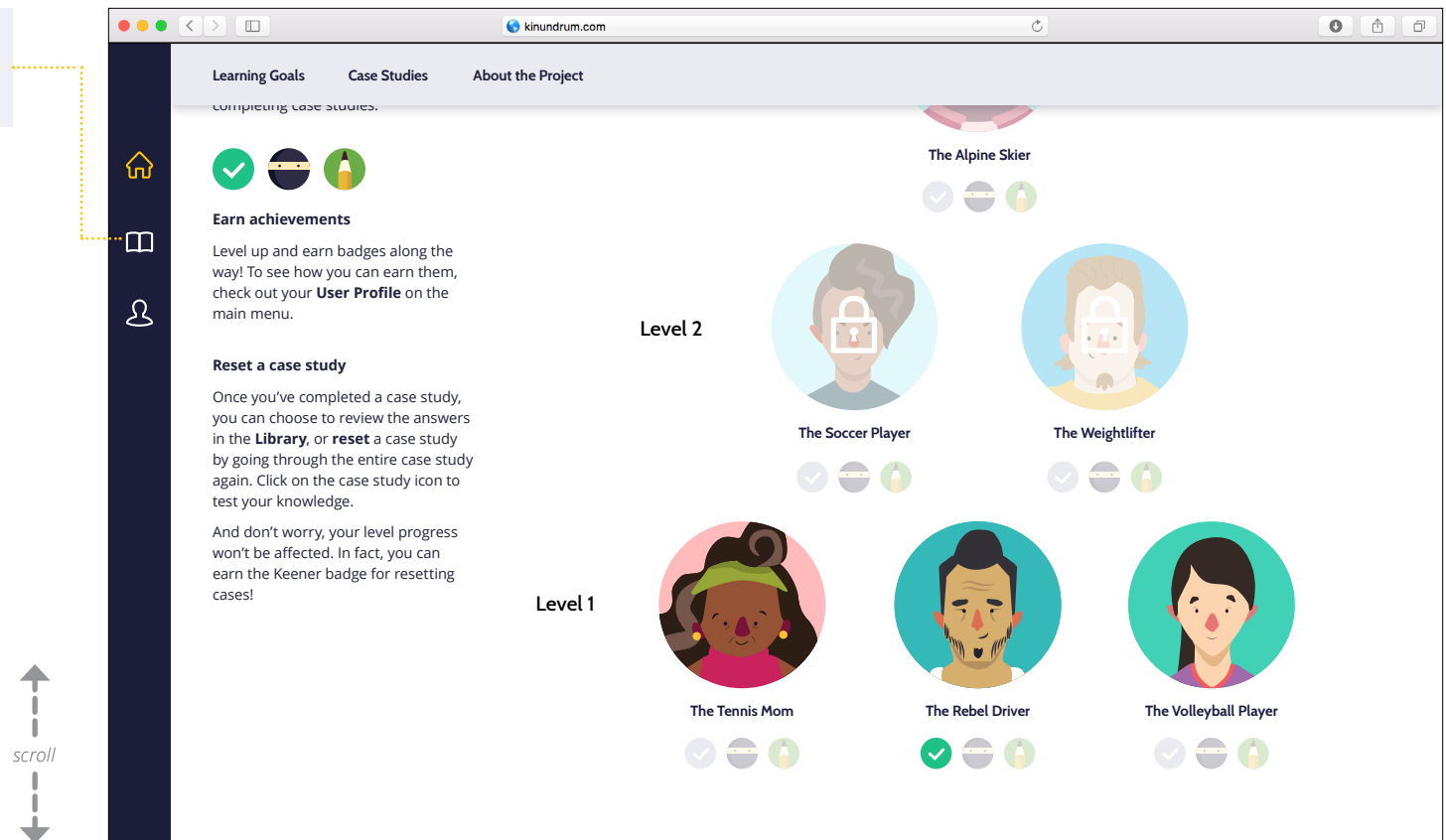
© Wireframes

REVIEWING COMPLETED EXERCISES

After completing a case study, exercises are added to the Library. Users can access specific exercises and answers by visiting the Library.

IF USER WANTS TO REVIEW EXERCISES...

The user can go to the Library to review exercises and answers.



Wireframes

LIBRARY TUTORIAL (FIRST-TIME)

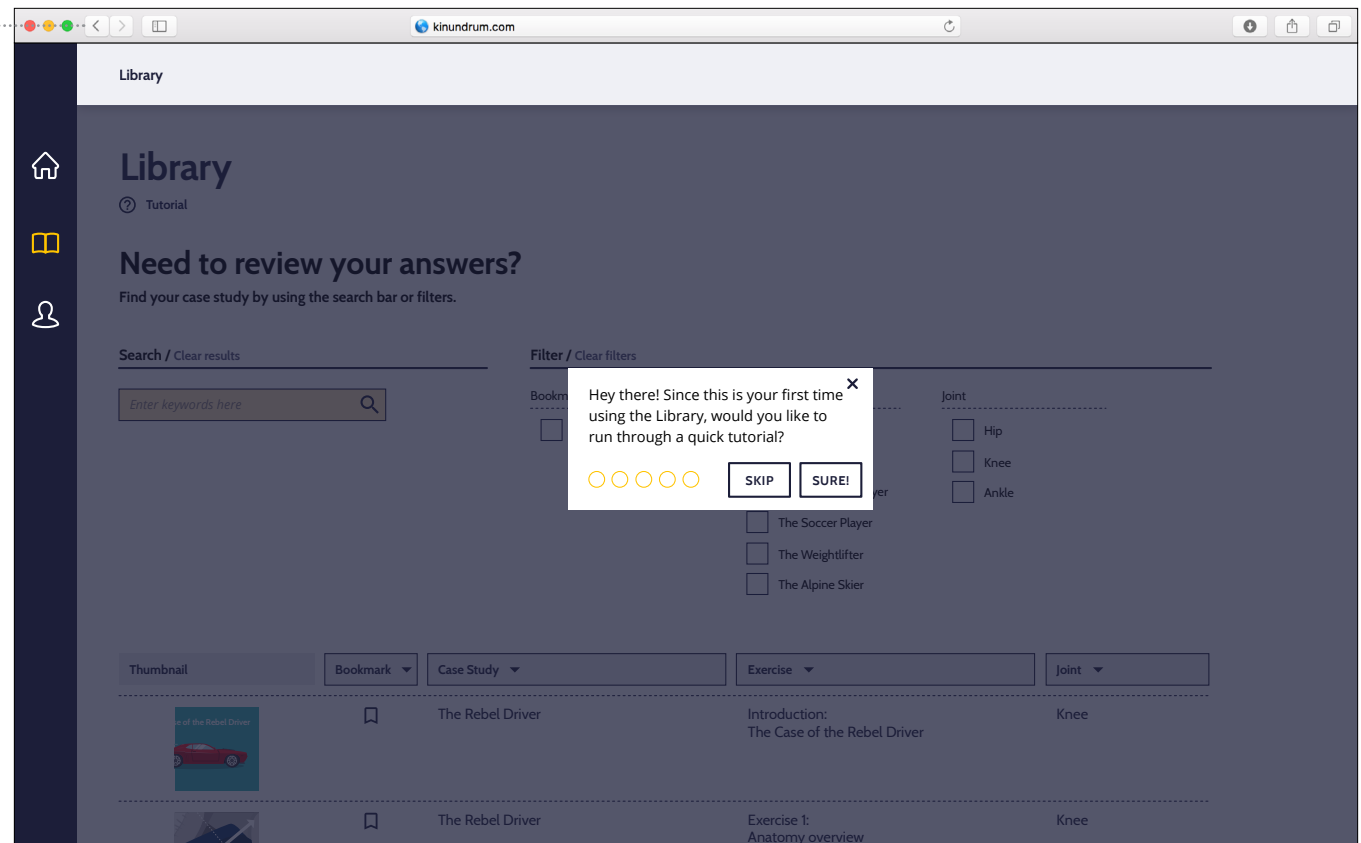
The Library lists all completed case study exercises. Users are notified when new exercises are added to the Library.

BROWSER BACK BUTTON

Home screen

Library

Only completed exercises are listed in the Library. Users can find an exercise using the search bar, filters, or by sorting using the tabs.



Wireframes

LIBRARY TUTORIAL (FIRST-TIME)

Find an exercise using the search bar

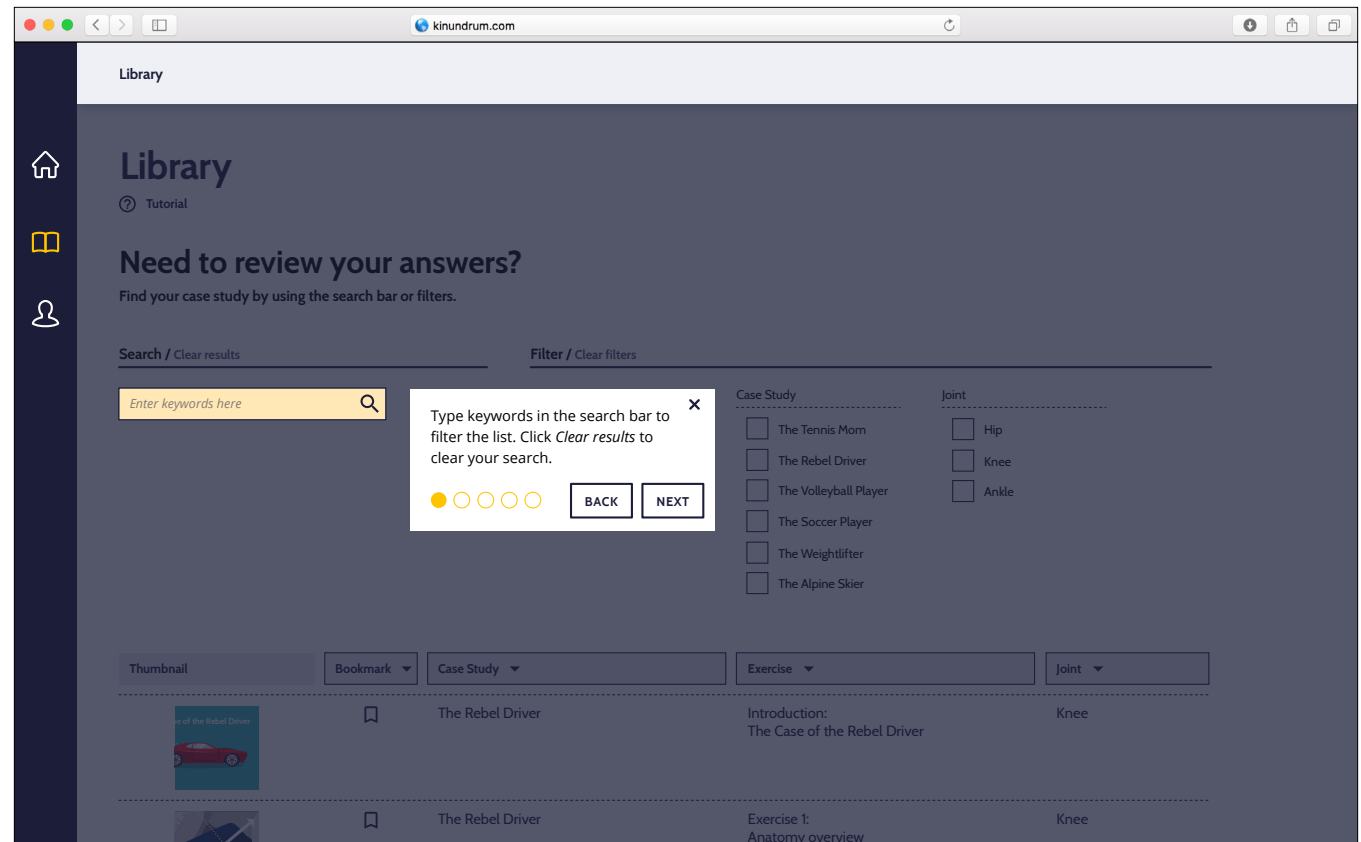
When users enter a keyword, **only** exercises tagged with that keyword show on the list.

IF SEARCH QUERY DOES NOT MATCH ANY TAGGED KEYWORDS...

An error message will notify the user.

Search / Clear results

No results found. Try different keywords.



Wireframes

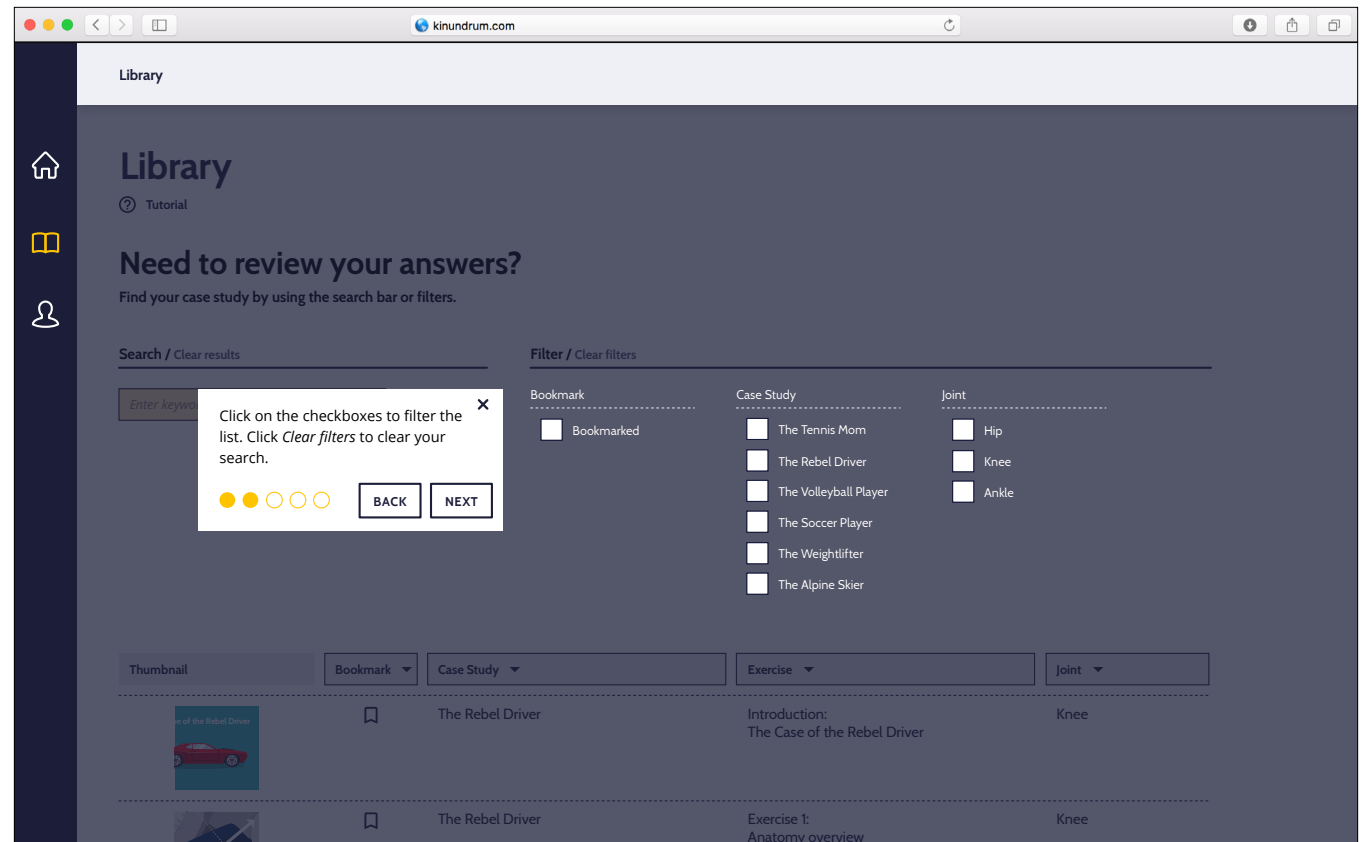
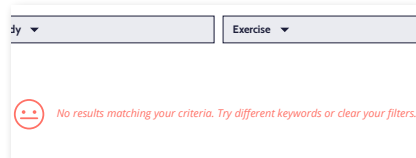
LIBRARY TUTORIAL (FIRST-TIME)

Find an exercise using filters

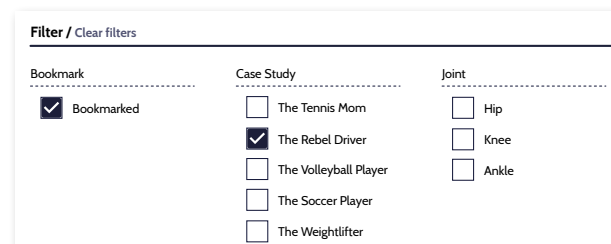
When users select filters, **only** exercises tagged with that filter show on the list.

IF SELECTED FILTERS DON'T YIELD ANY RESULTS...

An error message will notify the user.



Users can select multiple filters. List updates as user selects filters



Wireframes

LIBRARY TUTORIAL (FIRST-TIME)

Sort using tabs

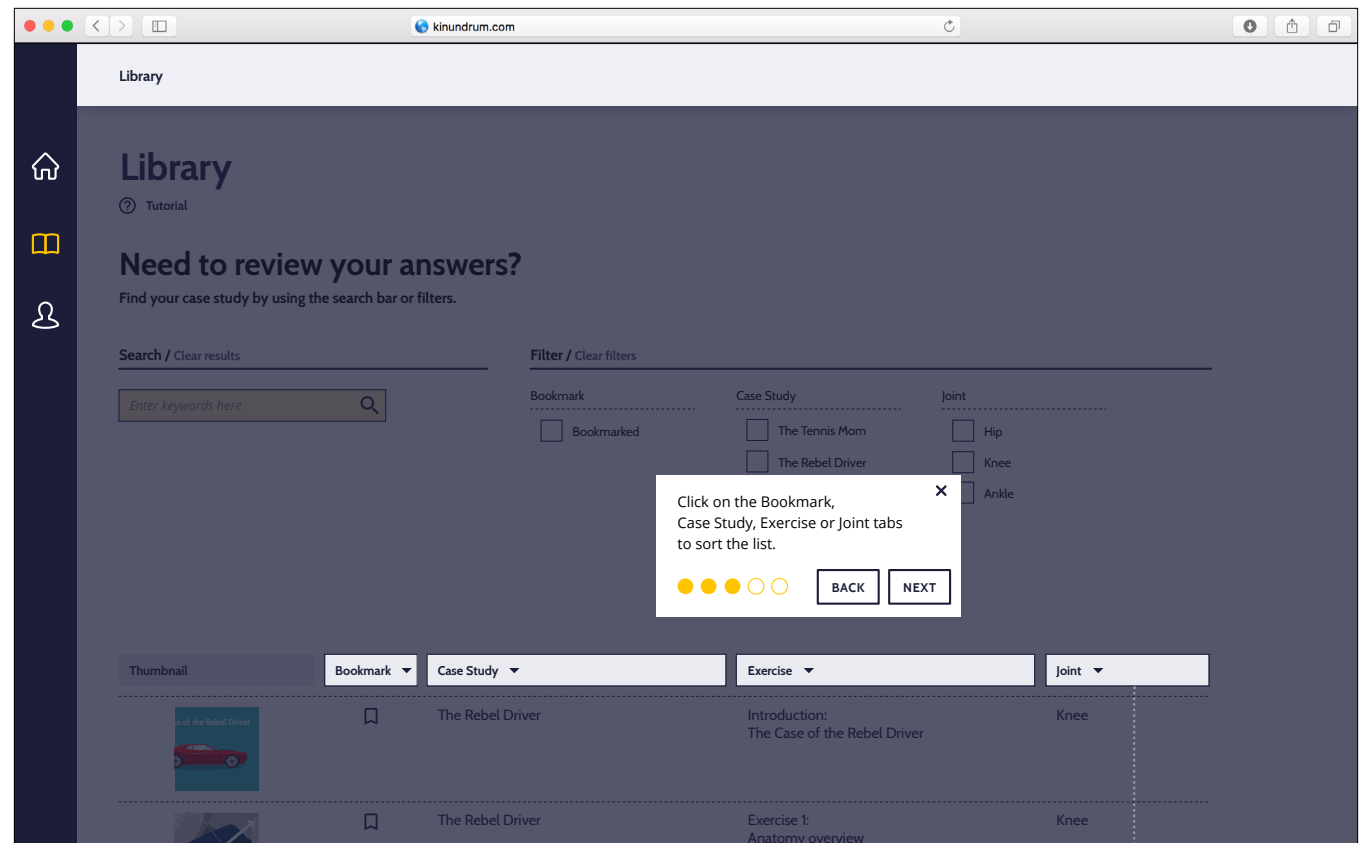
Users can sort the list by using the tabs.

IF USER SORTS BY BOOKMARK...

Bookmarked exercises will sort to the top of the list.

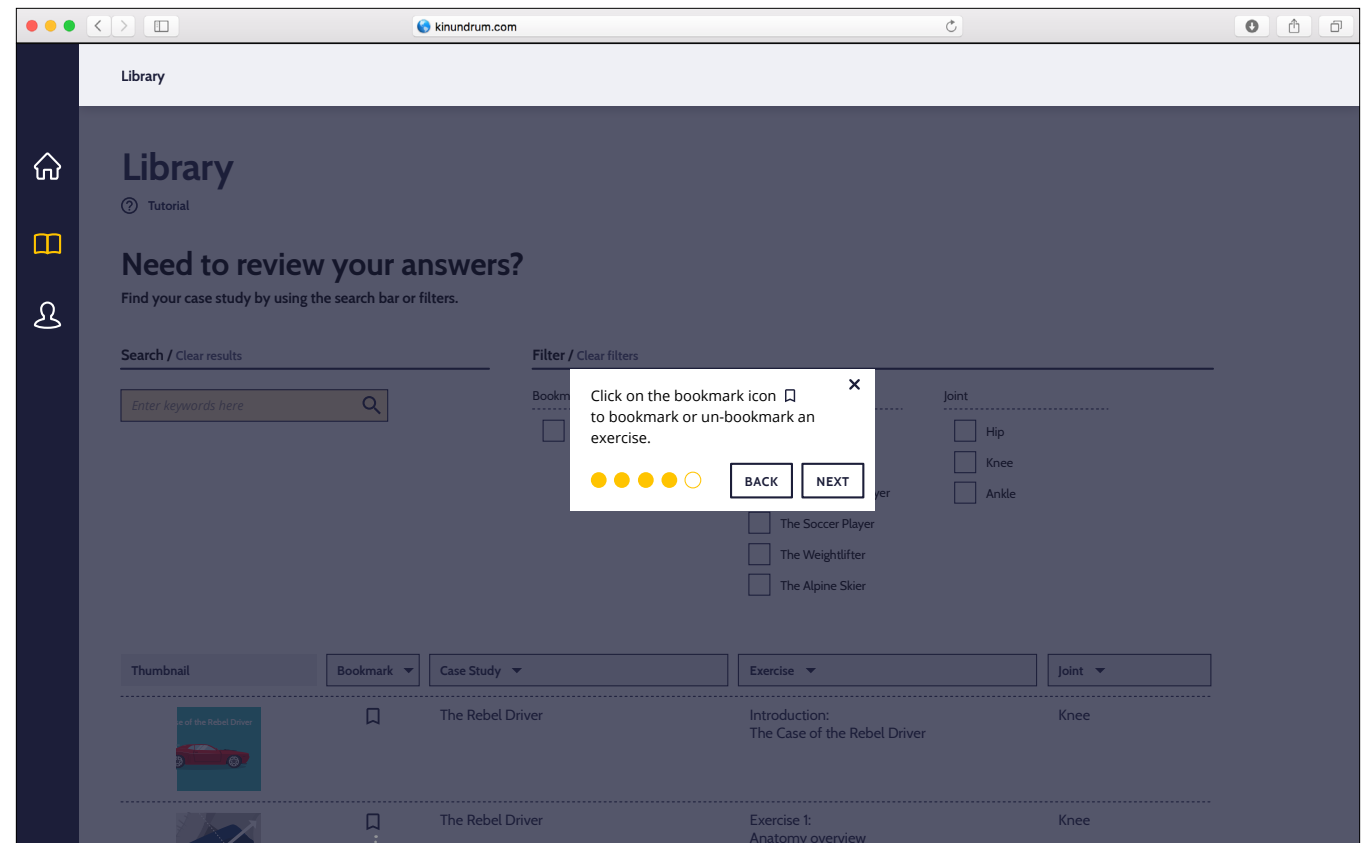
IF USER SORTS BY CASE STUDY, EXERCISE OR JOINT...

Case study names, exercises and joints will sort alphabetically.



Wireframes

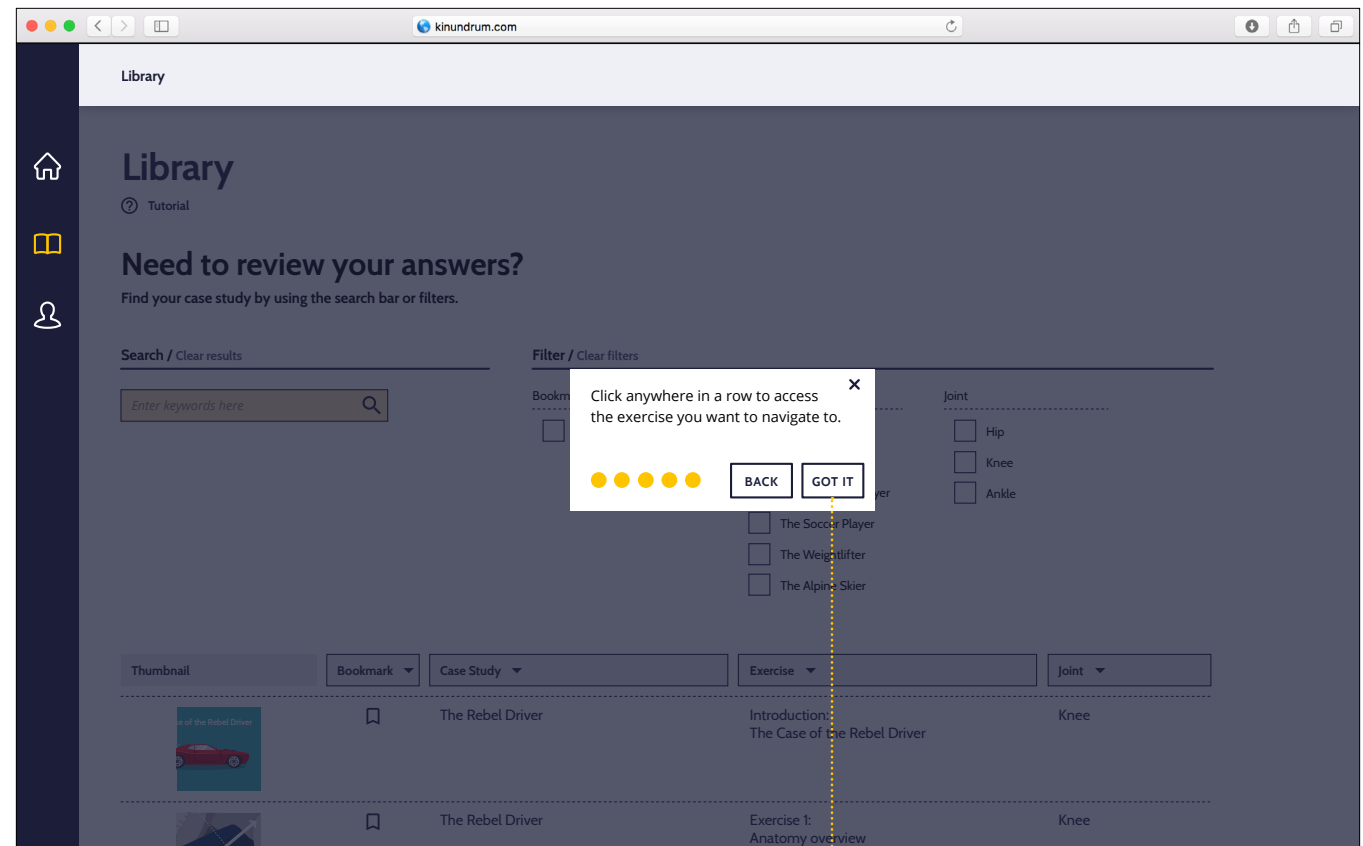
LIBRARY TUTORIAL (FIRST-TIME)



Users can click on the icon to bookmark, or click again to un-bookmark

Wireframes

LIBRARY TUTORIAL (FIRST-TIME)



On the last prompt, users can click on the GOT IT button to exit the tutorial

Wireframes

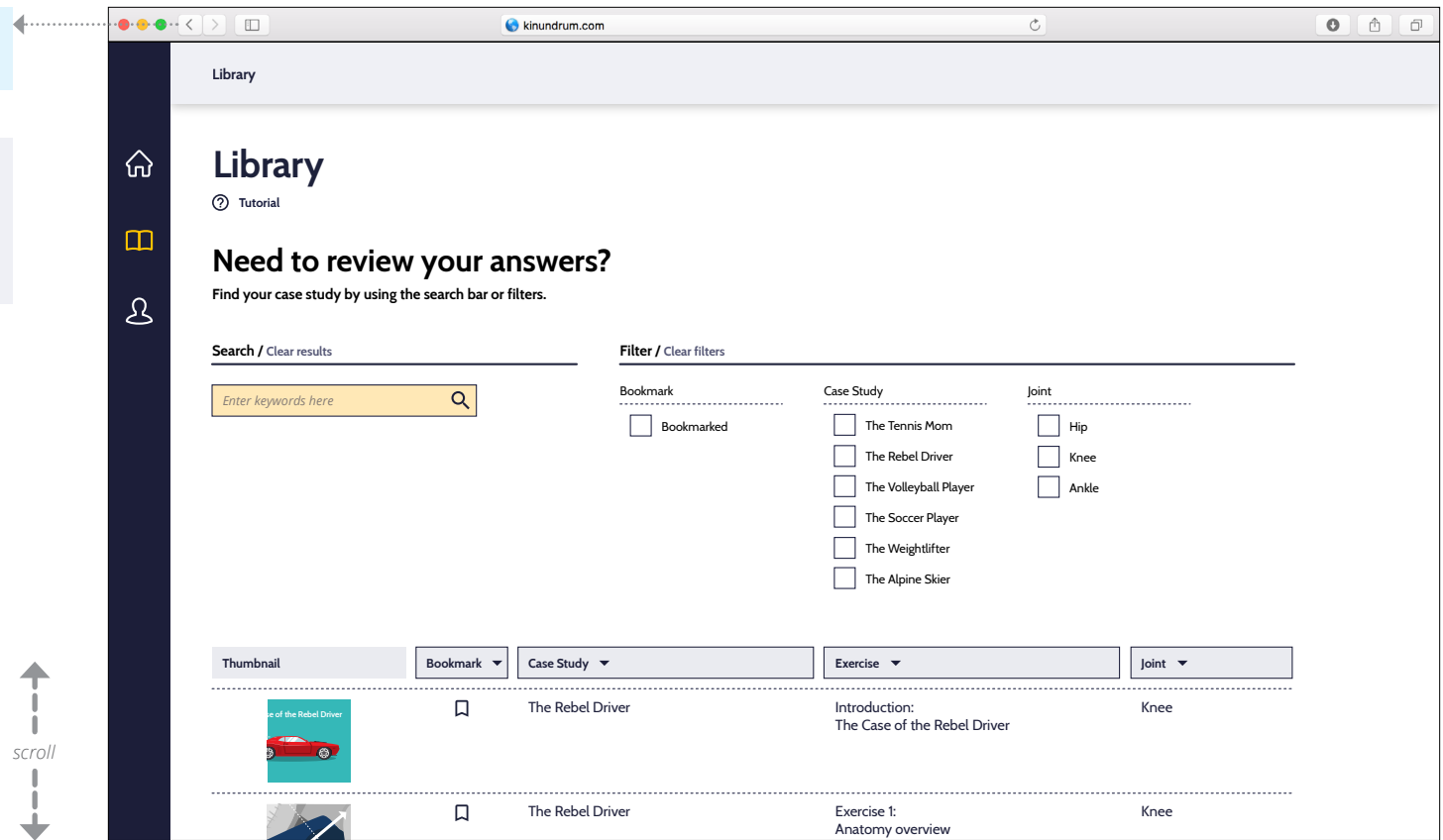
LIBRARY

The **Library** lists all completed case study exercises. Users are notified when new exercises are added to the Library.

BROWSER BACK BUTTON
Home screen (last state)

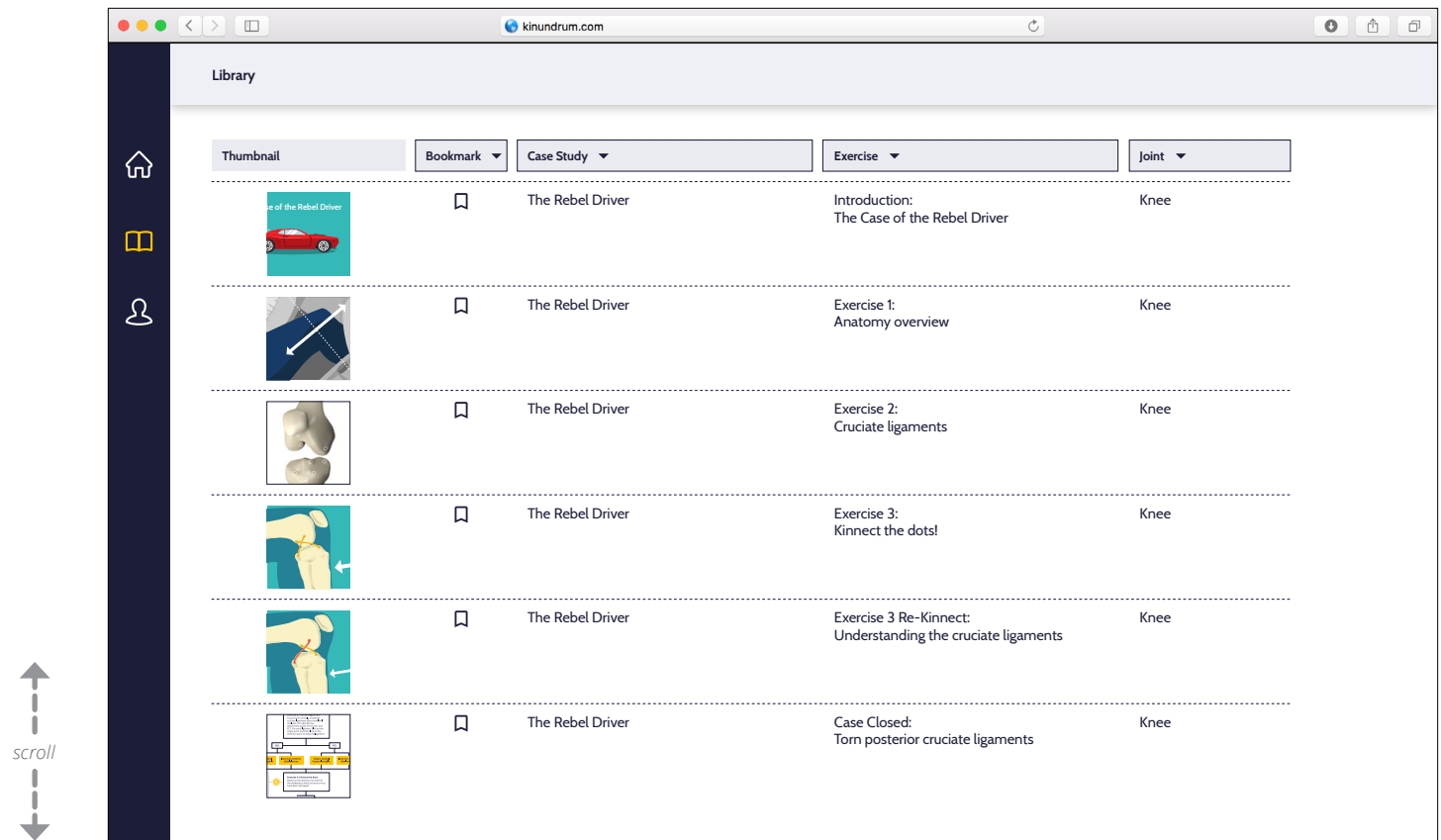
IF USER ACCESSES THE LIBRARY FROM THE SIDE BAR...

The default order of the Library list is sorted by most recently completed exercises.



Wireframes

LIBRARY



Wireframes

LIBRARY MODE: CASE STUDY EXERCISE

Case study exercises accessed from the Library include an option to show answers. Users can navigate to the previous and next exercises using the *Back* and *Next* links.

BROWSER BACK BUTTON

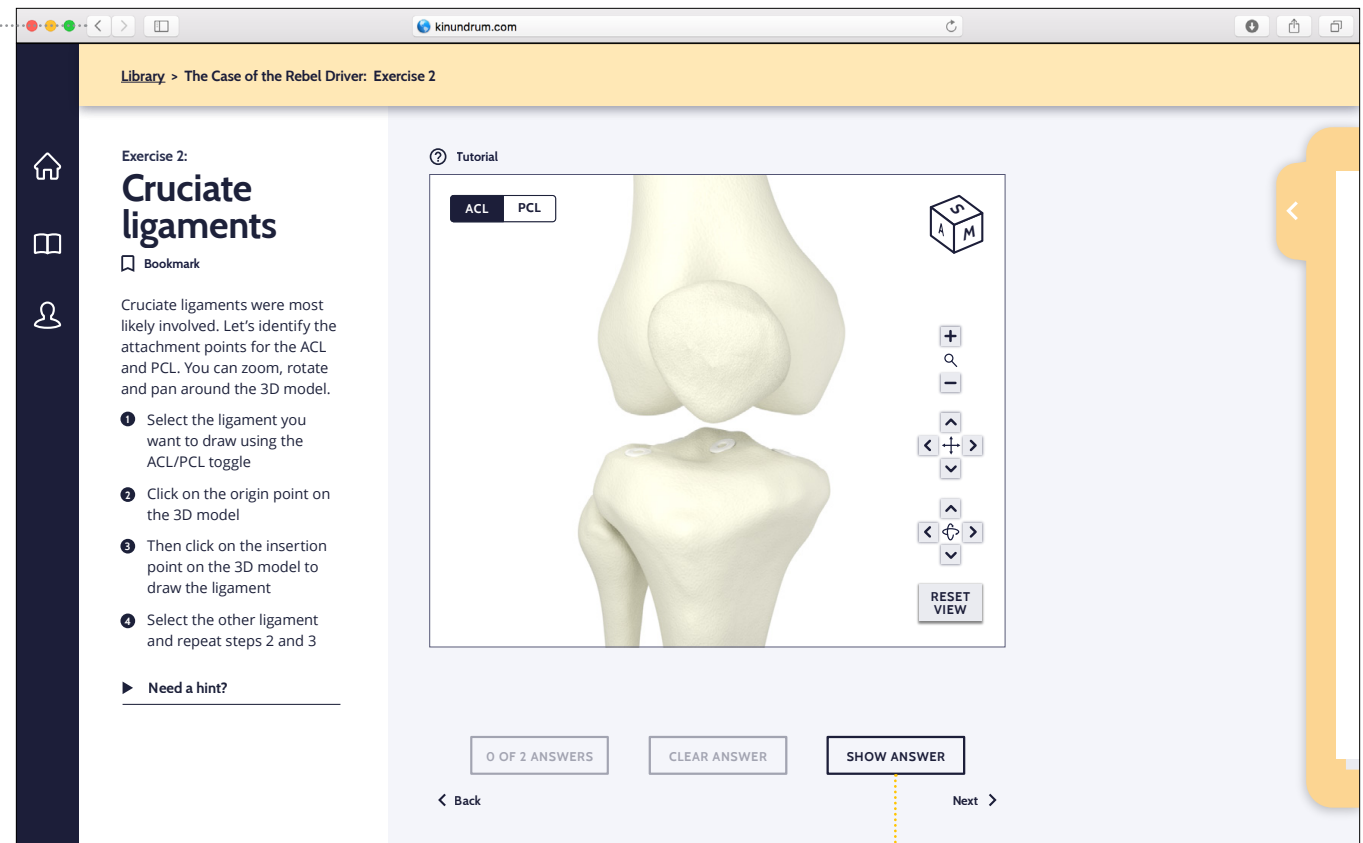
Library (last state)

Library mode

The user is taken to the exercise with the answers hidden. Clicking on the SHOW ANSWER button will revert the exercise back to the same state as the user's last session (which shows the correct answer). Users can also choose to complete the exercise again.

In the Library mode, the header is yellow and only displays breadcrumbs back to the Library. The progress bar does not appear in the Library mode.

To navigate back to the Library, the user can click on a link on the header, or the Library icon on the side bar.



SHOW ANSWER

On hover, the button inverts

HIDE ANSWER

The button toggles between SHOW and HIDE

Wireframes

LIBRARY MODE: CASE STUDY EXERCISE

IF USER ANSWERS INCORRECTLY...

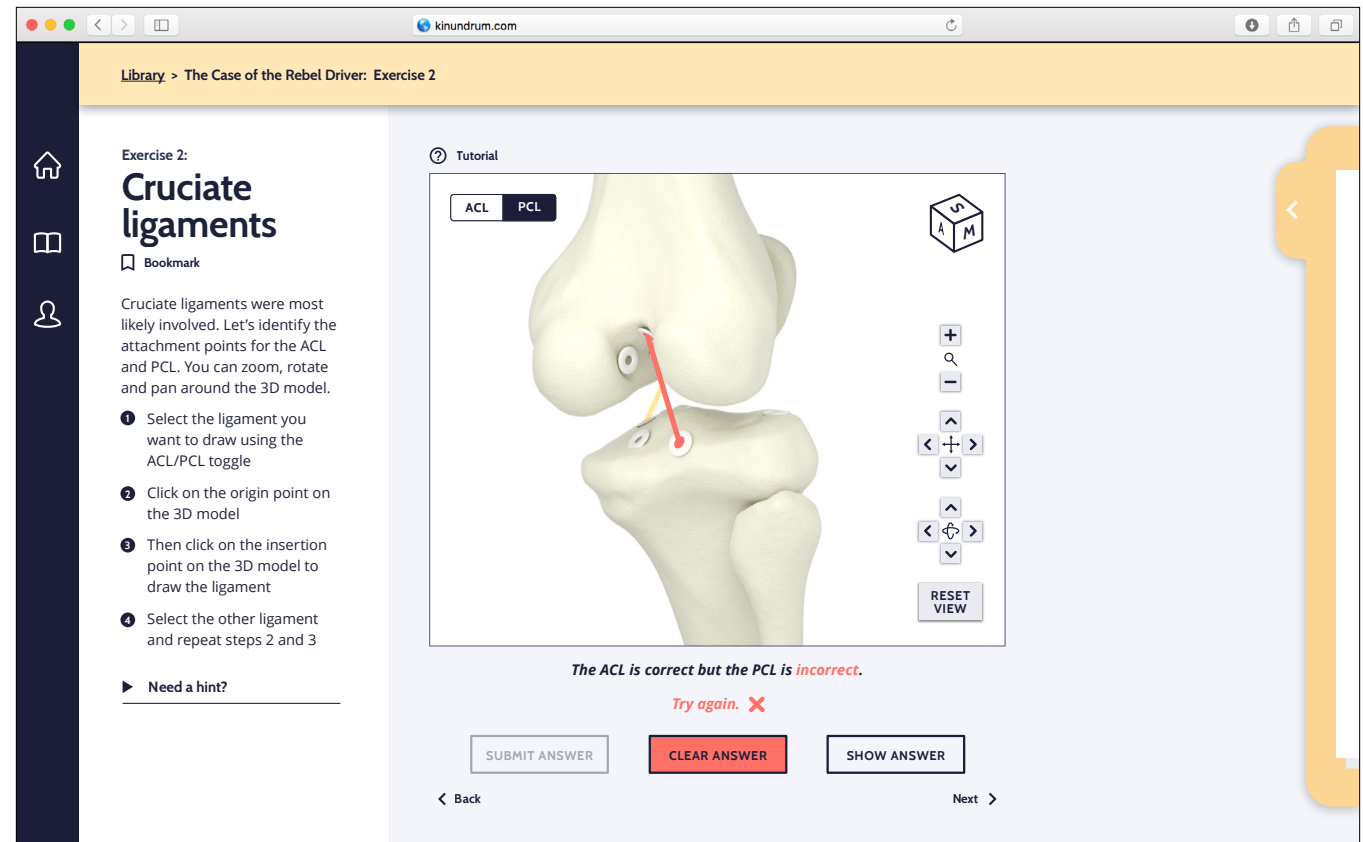
They will receive the same incorrect feedback as in the case study mode.

IF USER ANSWERS CORRECTLY...

They will receive the same correct feedback as in the case study mode, except that SUBMIT ANSWER will not change to NEXT EXERCISE, and CLEAR ANSWER will remain active.

That's correct! ✓

SUBMIT ANSWER CLEAR ANSWER SHOW ANSWER



Wireframes

LIBRARY MODE: CASE STUDY EXERCISE

IF USER WANTS TO SHOW ANSWERS AFTER SUBMITTING AN ANSWER...

SHOW ANSWER will override all user submissions and revert the interactive area to the correct feedback state.

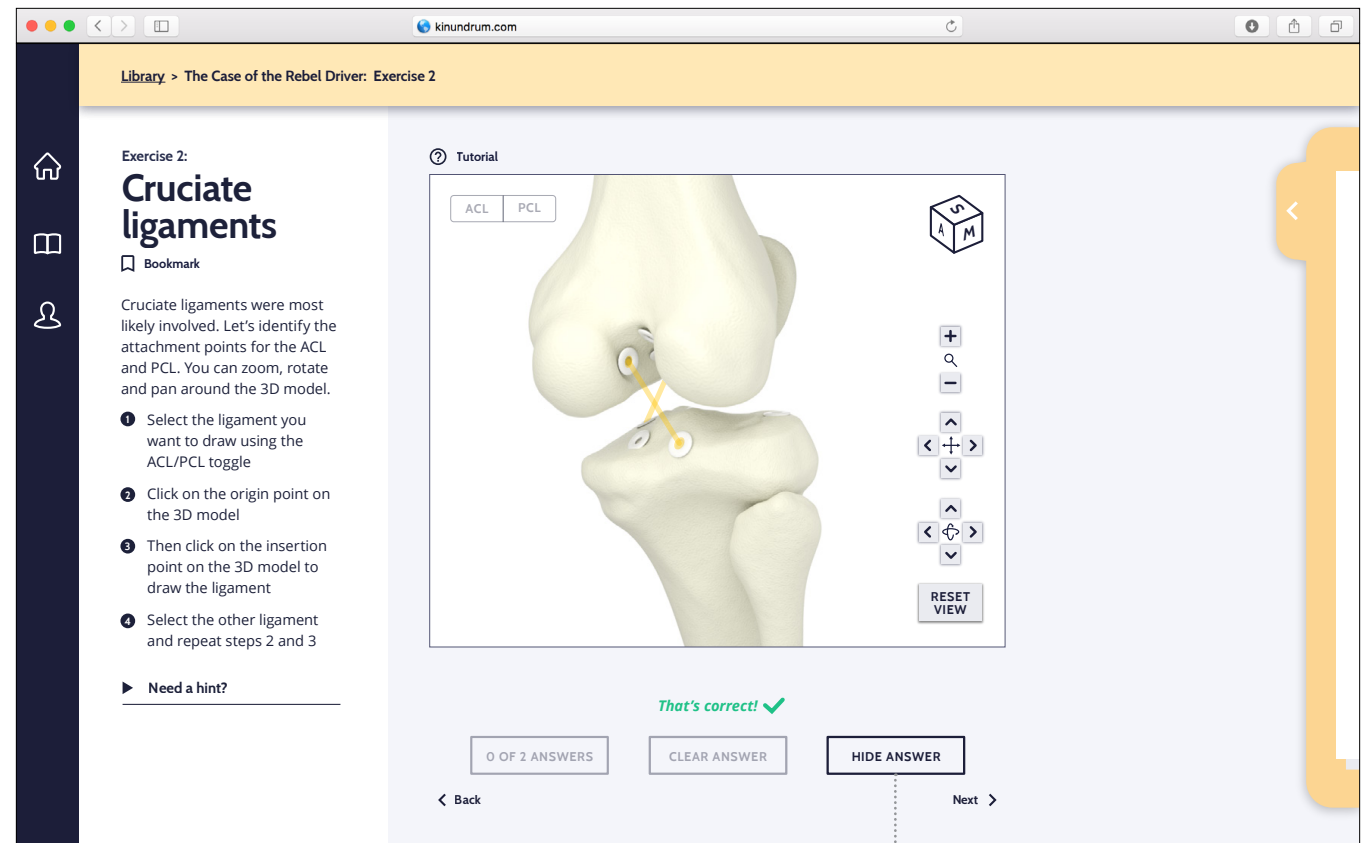
Because users are only viewing the correct answer, the interactive area and submission buttons will be disabled. To submit an answer, users must click on HIDE ANSWER first to activate the interactive area again.

IF USER WANTS TO HIDE ANSWER...

HIDE ANSWER will reset the interactive area and revert submission buttons back to original state. Interactive area will be active and no longer disabled.

IF USER GOES TO THE NEXT EXERCISE AND COMES BACK TO THIS EXERCISE...

The exercise will be in the last state the user has left it in.



HIDE ANSWER

On hover, the button inverts

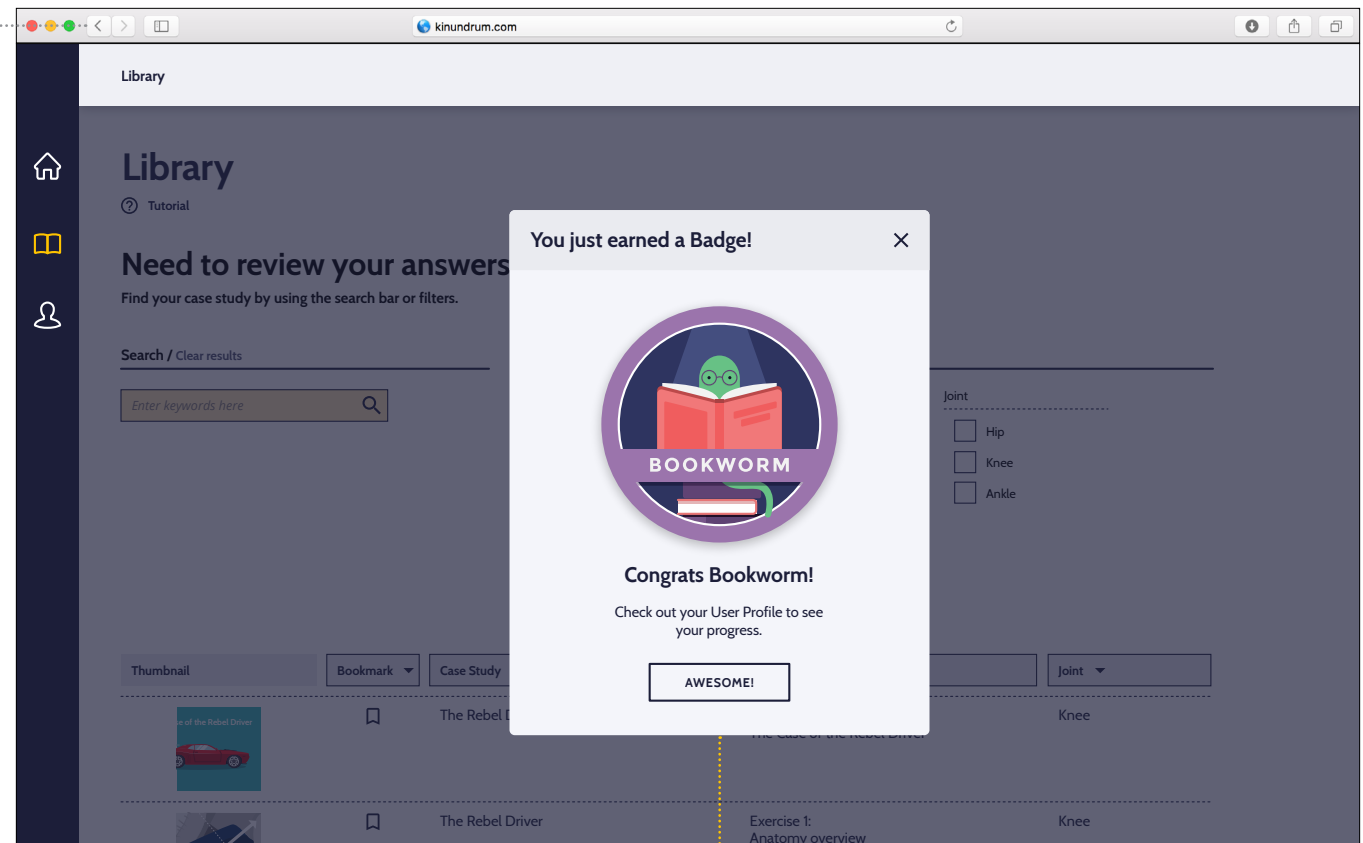
© Wireframes

LIBRARY MODE: BOOKWORM BADGE

While users are in Library mode, they have the opportunity to earn the Bookworm Badge for every 3 exercises they review. An exercise counts toward the badge if the user clicks SUBMIT ANSWER or SHOW ANSWER.

BROWSER BACK BUTTON

Most recent exercise reviewed
(last state)

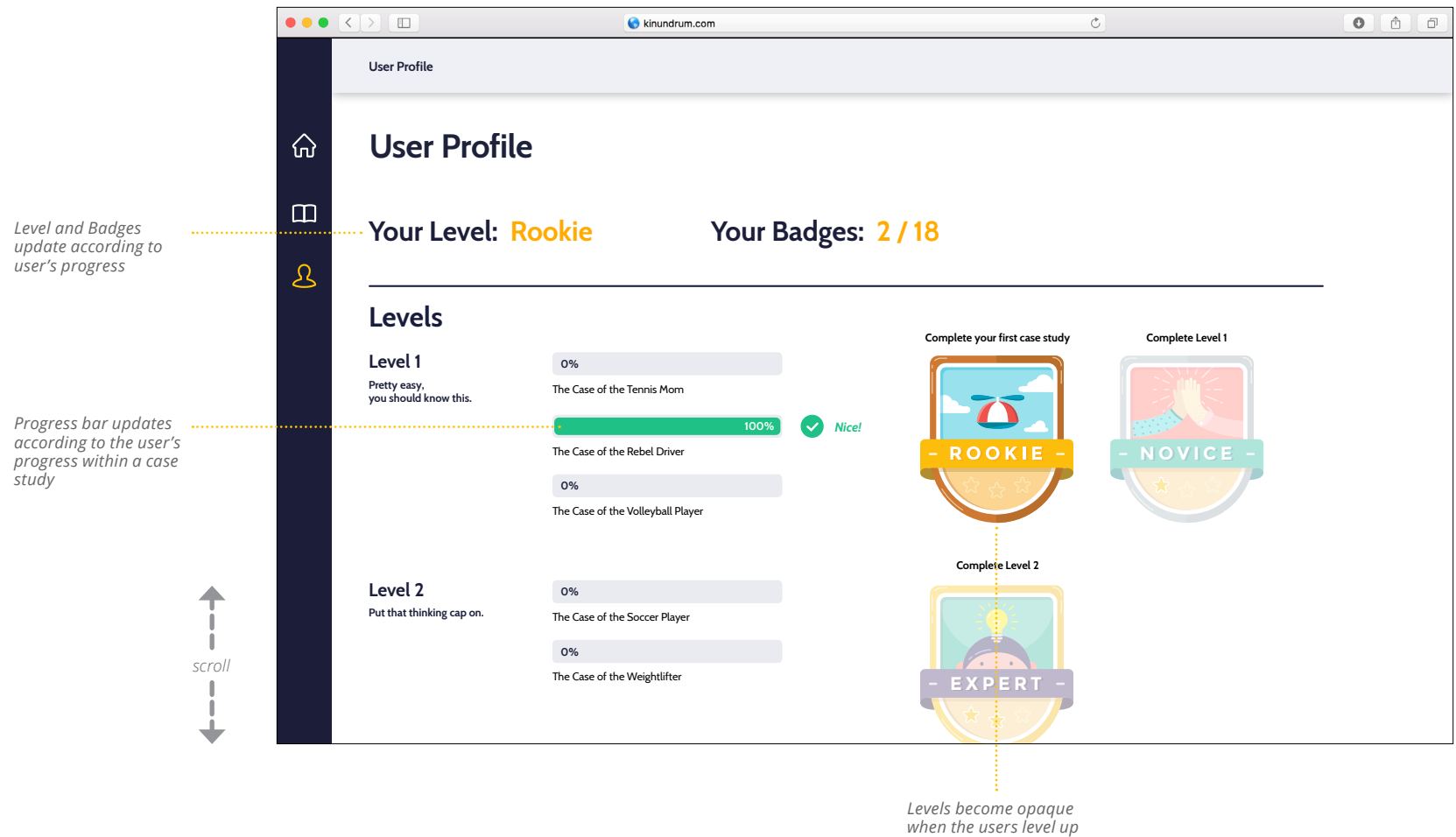


A dialog box appears notifying the user that they have just earned the Bookworm badge

Wireframes

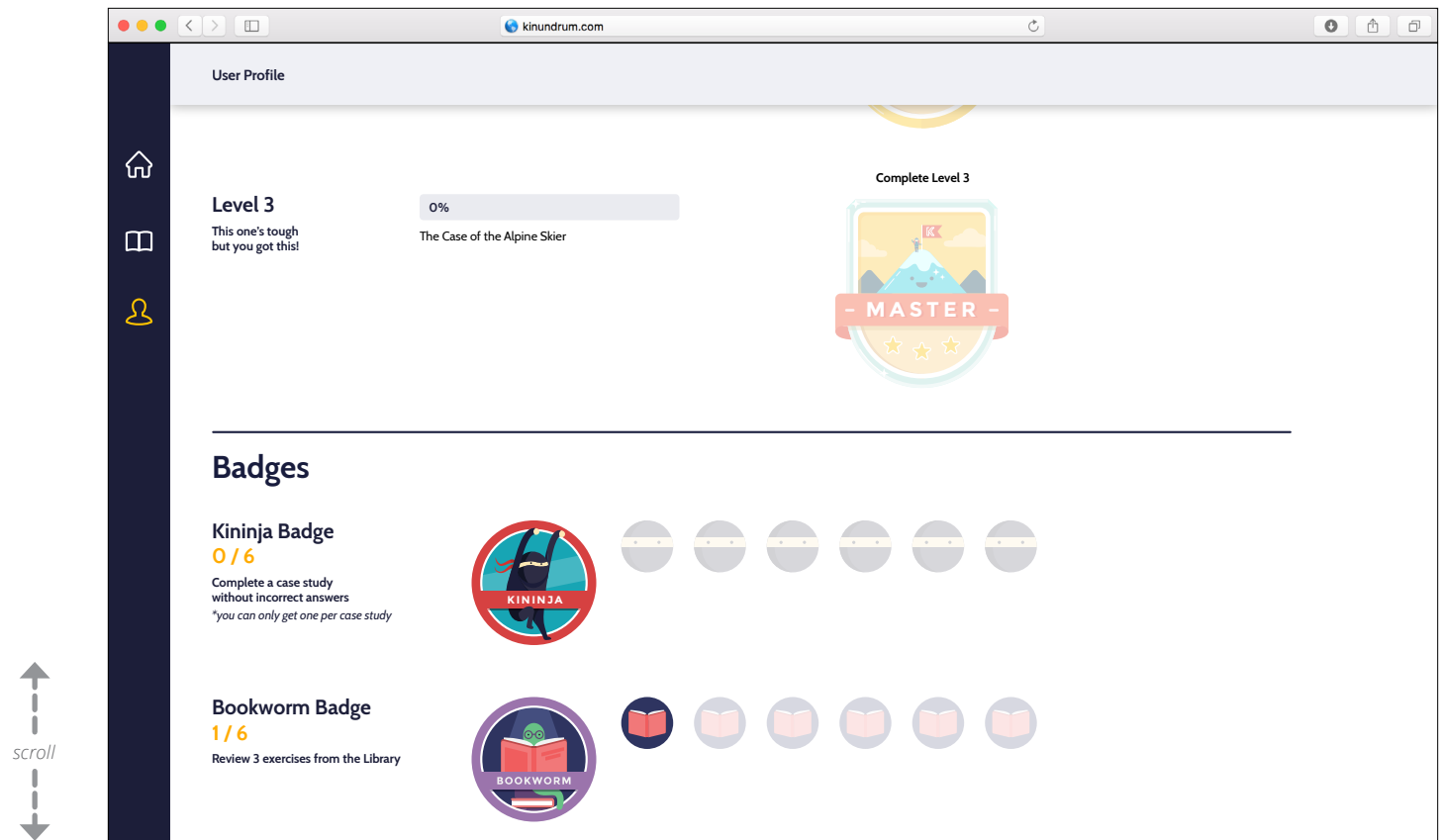
USER PROFILE

Users can visit their User Profile to track level progress and badges earned.



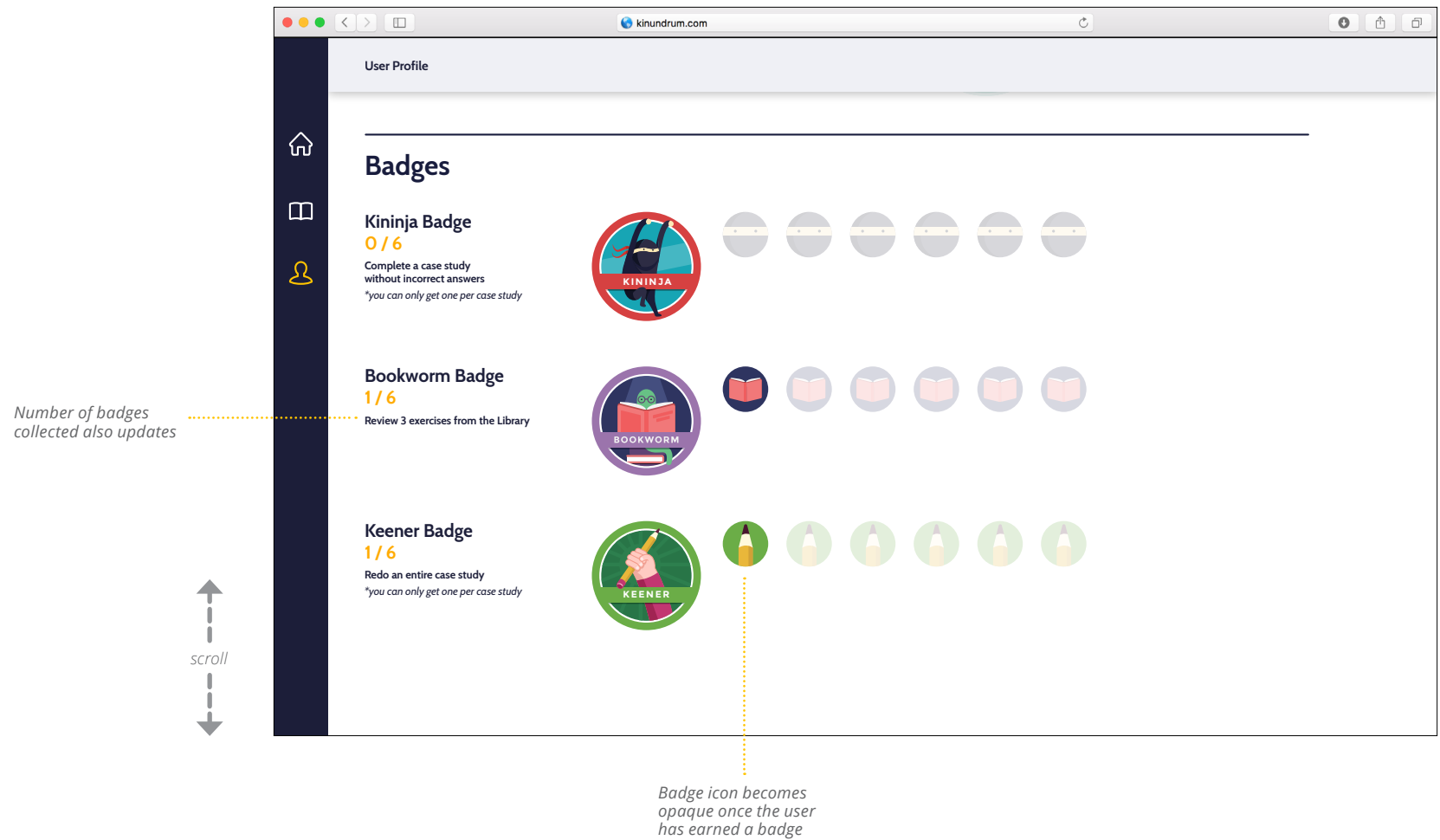
Wireframes

USER PROFILE



Wireframes

USER PROFILE



Section 2:

Style Guide

- A. Brand Identity
- B. Graphic Approach
- C. Layout
- D. Typography
- E. Colours
- F. Buttons
- G. Achievements

A Brand Identity



A Brand Identity

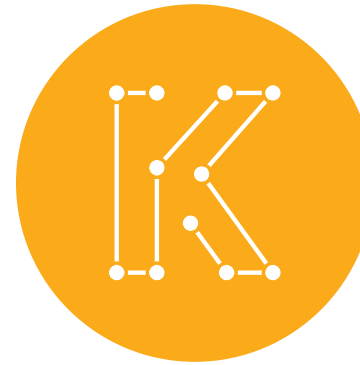
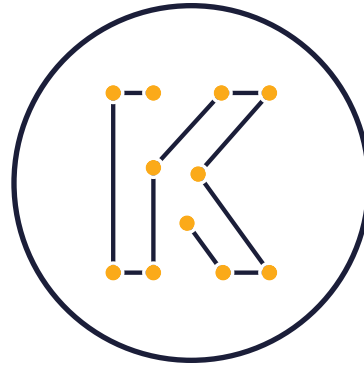


A Brand Identity

We approached the logo design wanting to represent the problem-solving aspect of Kinundrum's format. But the more the application took shape, the more we realized that "connecting the dots" was our underlying theme. This is carried throughout the application conceptually and visually. The resulting brand communicates the process of problem solving and the idea of bridging the learning gap between anatomical education and clinical application.

The following designs are variations of the logo using Kinundrum's brand colours.

The icons below depict the hip, knee and ankle joints which are the focus of the case studies. These illustrations will be integrated into the animation on the home screen.



B Graphic Approach

The goal of this living document is to create a fun and communicative visual language that allows for a meaningful, engaging and unified learning experience for our undergraduate audience.

The design elements that follow are developed with Kinundrum's conversational voice and exploratory tone in mind.

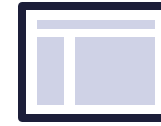
Kinundrum's overall look and feel is guided by four design principles:

- **Simplicity and comfort**
- **Modular spaces**
- **Semi-flat design**
- **Bright graphics**



SIMPLICITY AND COMFORT

With the amount of learning content Kinundrum houses, it is important to ensure that information is easy and manageable to consume. By adopting an interface design that is white-dominated and minimalist, this approach puts the primary textual and visual content front and center.



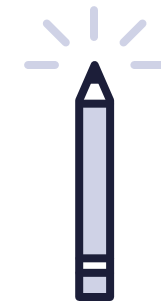
MODULAR SPACES

Kinundrum's content is divided and organized into semantic and functional areas. The goal is to build a clear hierarchy of information that will optimize the use of the application's features.



SEMI-FLAT DESIGN

Flat design is minimalistic and emphasizes usability. This simplistic approach conveys messages more quickly than detailed graphics. The addition of subtle drop shadows creates an illusion of depth that separates functional spaces from one another.



BRIGHT GRAPHICS

Kinundrum's graphic approach includes a friendly and playful illustration style that reflects the application's colloquial tone. Scientific images that accompany exercise questions are approachable and simplified, only relaying relevant anatomical information.

Layout

STRUCTURE

The application uses a 12-column grid layout. Although Kinundrum is a web application intended for desktop platforms only, the layout must be flexible across different screen and window sizes.

Fixed side bar

Margins

Gutter

Columns

Fixed side bar: 60px

Margins: 40px

Gutters: 40px

*Columns:

screen width - 60px - (2 margins x 40px) - (11 gutters x 40px) / 12

**these values will vary according to the screen size*

For screen widths < 1280px:

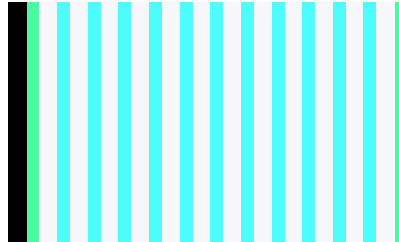
Horizontal scrolling will be active

For screen widths > 1440px:

A background image will fill the rest of the screen area

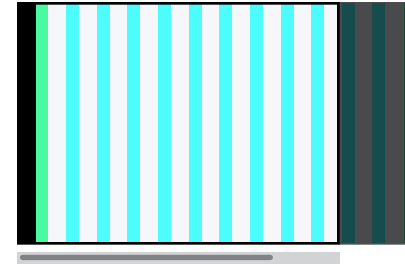
1280 x 768px (min. width)

(11% in use worldwide, websitedimensions.com)



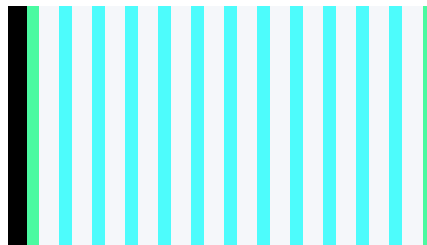
1024 x 768px (< 1280px)

(3% in use worldwide, websitedimensions.com)



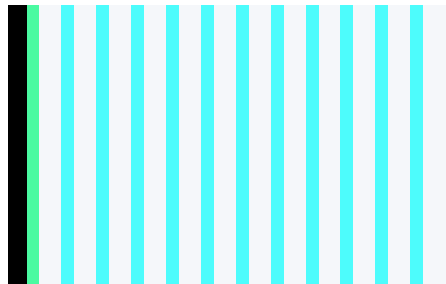
1366 x 768px

(35% in use worldwide, websitedimensions.com)



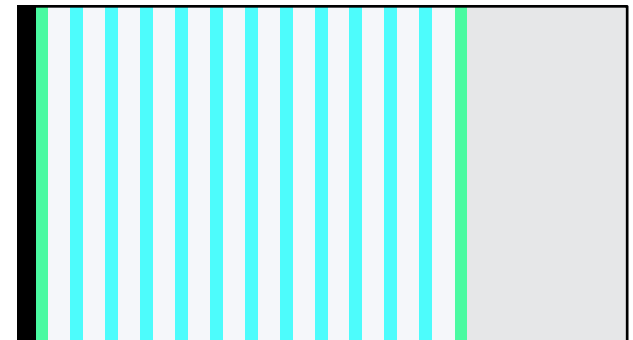
1440 x 900px (max. width)

(6% in use worldwide, websitedimensions.com)



1920 x 1080px (> 1440px)

(20% in use worldwide, websitedimensions.com)



© Layout *(continued...)*

Global elements include a permanent fixed side bar for global navigation, and a header for local navigation, progress bar and breadcrumbs.

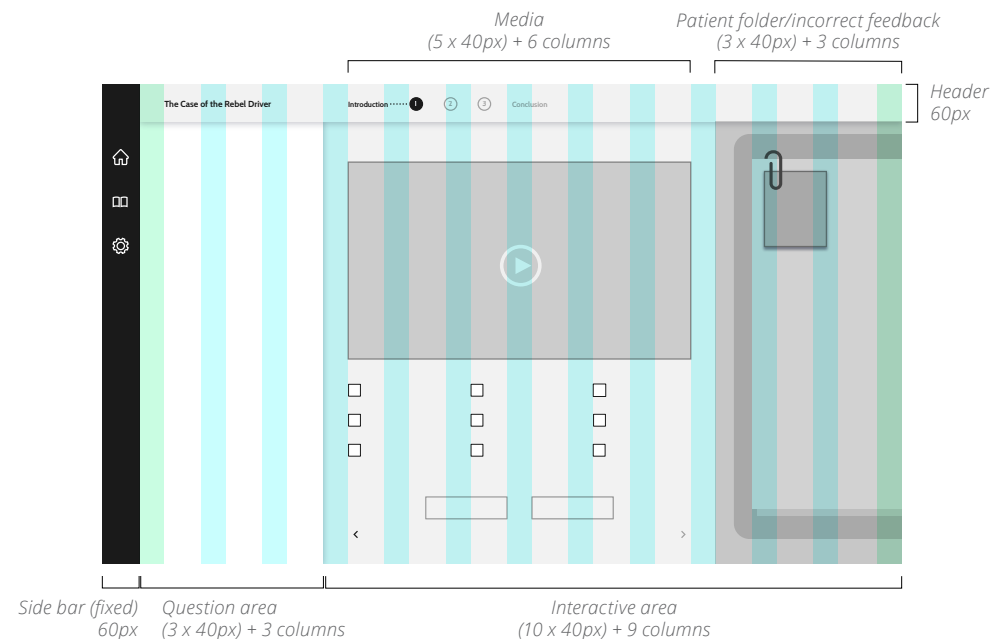
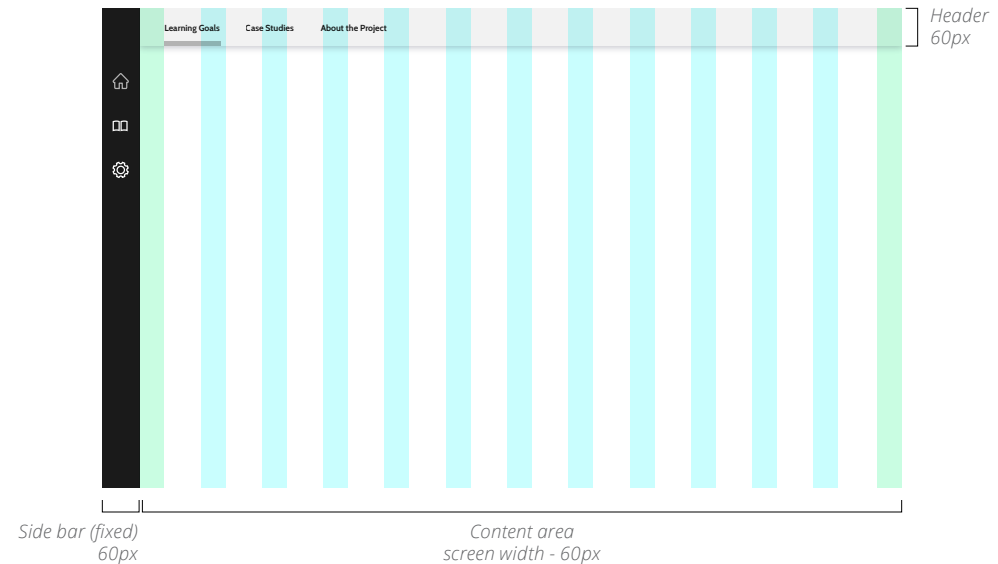
The application has two major template types: **nonmodular** and **modular**.

The **nonmodular template** is used for the Home screen and Case Study conclusions. The interface is divided into:

- Side bar (global navigation)
- Header (local navigation)
- Content area

The **modular template** is used for Case Study introductions and exercises, as well as the Library and User Profile. The interface is divided into:

- Side bar (global navigation)
- Header (local navigation)
- Question area
- Interactive area
 - Media (includes visual assets, answer options and submission area)
 - Patient folder
 - Incorrect feedback overlay



D Typography

TYPEFACES

Google fonts **Cabin** and **Open Sans** are the typefaces for the Kinundrum interface.

Cabin is a humanist sans serif typeface that incorporates modern and geometric proportions. Its bold weight is clear, approachable, and ideal for headings and buttons.

Open Sans is also a humanist sans serif typeface that has excellent legibility characteristics in its letterforms. Optimized for web interfaces, this typeface is ideal for body copy.

LINE LENGTH

The number of characters in a single line directly contributes to the readability and pacing of copy.

The maximum line length is **78 characters**.

Aa

Cabin

ABCDEFGHIJKLMNOPQRSTUVWXYZ
abcdefghijklmnopqrstuvwxyz
1234567890

Aa

Open Sans

ABCDEFGHIJKLMNOPQRSTUVWXYZ
abcdefghijklmnopqrstuvwxyz
1234567890

D Typography *(continued...)*

Heading 1

48px (36pt)

Cabin, bold

(for main exercise titles)

Heading 2

40px (30pt)

Cabin, bold

(for content area subheadings, achievement titles)

Subheading

19px (14pt)

Cabin, bold

(for exercise subheadings)

Body copy 1

19px (14pt)

Open Sans, regular

(for all main content copy)

Body copy 2

16px (12pt)

Open Sans, regular

(for library filter options, achievement text, patient folder notes)

GHOST BUTTON

16px (12pt)

Cabin, bold, all caps

(for ghost button text)

Link 1

19px (14pt)

Cabin, bold

(for header local navigation links and 'Need a hint?' link)

Link 2

16px (12pt)

Cabin, bold

(for progress bar, tutorial, bookmark, back/next, clear results/filters)

E Colours

Different values have specific roles on the application interface (listed on the next page).

Kinundrum Yellow

The brand's colour. These values are used to invite users to explore the application's learning tools such as the Patient Folder and Re-Kinnect module.

Payne's Grey and other neutral values

Kinundrum's interface is predominantly neutral with cooler muted values that push forward the brighter Case Study visuals.

Other colours

Other colours used on the Kinundrum interface are used for error messages, correct and incorrect feedback, and icons indicating the status of case studies.



brand-01
#ffab00



brand-02
#ffc400



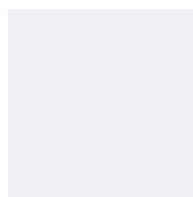
brand-03
#fcd592



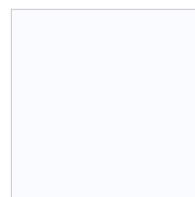
brand-04
#ffe8b6



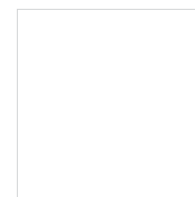
ui-01
#1c1e39



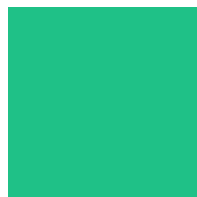
ui-02
#eff0f5



ui-03
#fafbff



ui-04
#ffffff













positive
#1fc187



negative
#ff7166

E Colours *(continued...)*

ROLES











Colour	Role(s)	Value	
brand-01	Primary brand Hover colour for links	#ffab00	
brand-02	Secondary brand Active icons on side bar Active links on header Active submit button Primary colour for Re-Kinnect icon	#ffc400	
brand-03	Patient folder background	#fcd592	
brand-04	Light background Field background	#ffe8b6	
ui-01	Headings, body copy, links and buttons on a light background Side bar background Strokes Overlay (@ 95% opacity)	#1c1e39	
ui-02	Header background	#eff0f5	
ui-03	Interactive area background	#fafbff	
ui-04	Headings, body copy, links and buttons on a dark background Question and content area background	#ffffff	
positive	Correct feedback Complete icon	#1fc187	
negative	Incorrect feedback Error message	#ff7166	

LEGIBILITY

	Value	Opacity	Contrast ratio
Dark text on light backgrounds			
Text	#1c1e39	100%	16.2
Text	#1c1e39	100%	15.7
Header text/link	#1c1e39	100%	14.3
Link (disabled)	#1c1e39	38%	n/a
Link (disabled)	#1c1e39	38%	n/a
Link (disabled)	#1c1e39	38%	n/a
Link (hover)	#ffab00	100%	1.9
Link (hover)	#ffab00	100%	1.8
Light text on dark backgrounds			
Text on overlay	#ffffff	100%	14.1
BUTTON (hover/active)	#ffffff	100%	16.2
Link (hover)	#ffc400	100%	10.2
Text on coloured backgrounds			
SUBMIT (active)	#1c1e39	100%	10.2
NEXT EXERCISE (active)	#1c1e39	100%	7
CLEAR ANSWER (active)	#1c1e39	100%	6
Type here	#1c1e39	70%	5.5

F Buttons

Button types are identified based on their usage. The table to the right lists the different button types and their visual properties.

Button type	Purpose	Disabled	Active	Hover
Ghost button	Flat boxes with text (Button, see Type Hierarchies). Used primarily on action items, such as LOG IN, START, SUBMIT ANSWER...	Opacity @ 38% 	Opacity @ 100% 	Invert 
Link with icon	Icons are paired with text (Link 2); used for: <ul style="list-style-type: none"> Tutorial Bookmark 		Opacity @ 100% 	Colour change to #ffab00 
Link	Text only (Link 1 and 2); used for: <ul style="list-style-type: none"> Forgot your password? Local navigation on header Back and Next Need a hint? Clear results/filters 	Opacity @ 38% 	Opacity @ 100% 	Colour change to #ffab00 
Icon	Icon only, no text; used for: <ul style="list-style-type: none"> Global navigation on side bar Re-Kinnect exercise Case Studies 		Opacity @ 100% 	Colour change to #ffc400 

G Achievements

With Kinundrum, we hope to develop an application user experience that is fun and engaging. To contribute to this goal, we will be incorporating an achievements system that includes level completions and badges for when specific tasks are performed.

LEVELS

The case studies are divided into three levels of difficulty. To introduce the achievement system, as well as provide additional incentive to complete case studies, the user levels up to Rookie once the first case study has been completed. To level up to Master, the user must complete all three levels.

Completing the first case study:



Completing Level 1:



Completing Level 2:



Completing Level 3:



G Achievements

BADGES

To complete the game in its entirety, in addition to the levels, students must collect 6 of each of the following badges.

Reviewing 3 exercises from the Library:

**exercises can only count towards the badge if users click on SUBMIT ANSWER or SHOW ANSWER*



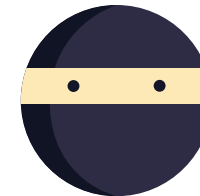
Re-doing an entire case study:

**users can only earn 1 per case study*



Completing a case study without incorrect answers:

**users can only earn 1 per case study*



Section 3:

Pre-production Assets

A. Character Design

B. Animations

A Character Design

Our graphic approach includes a bright, friendly and playful illustration style that reflects the application's colloquial tone. All illustrations are designed to be approachable and simplified, only relaying relevant anatomical information. This simplistic approach conveys messages more quickly than detailed graphics allowing the user to focus on big concepts.

The characters are designed in such a way to be diverse, relatable and fun. It is important for them to have distinct personalities yet remain simple in their design. The characters should look cartoony yet be proportionally correct so that mechanism of injuries can be depicted accurately.

Primary Characters



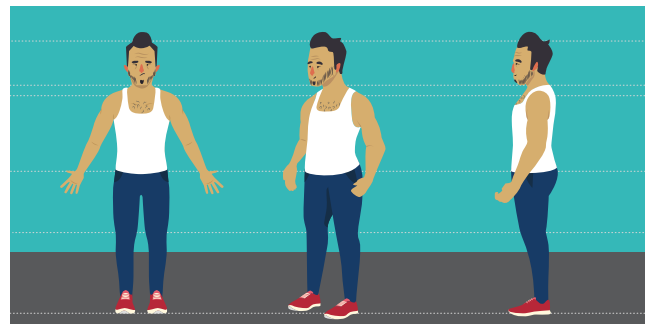
Secondary Characters



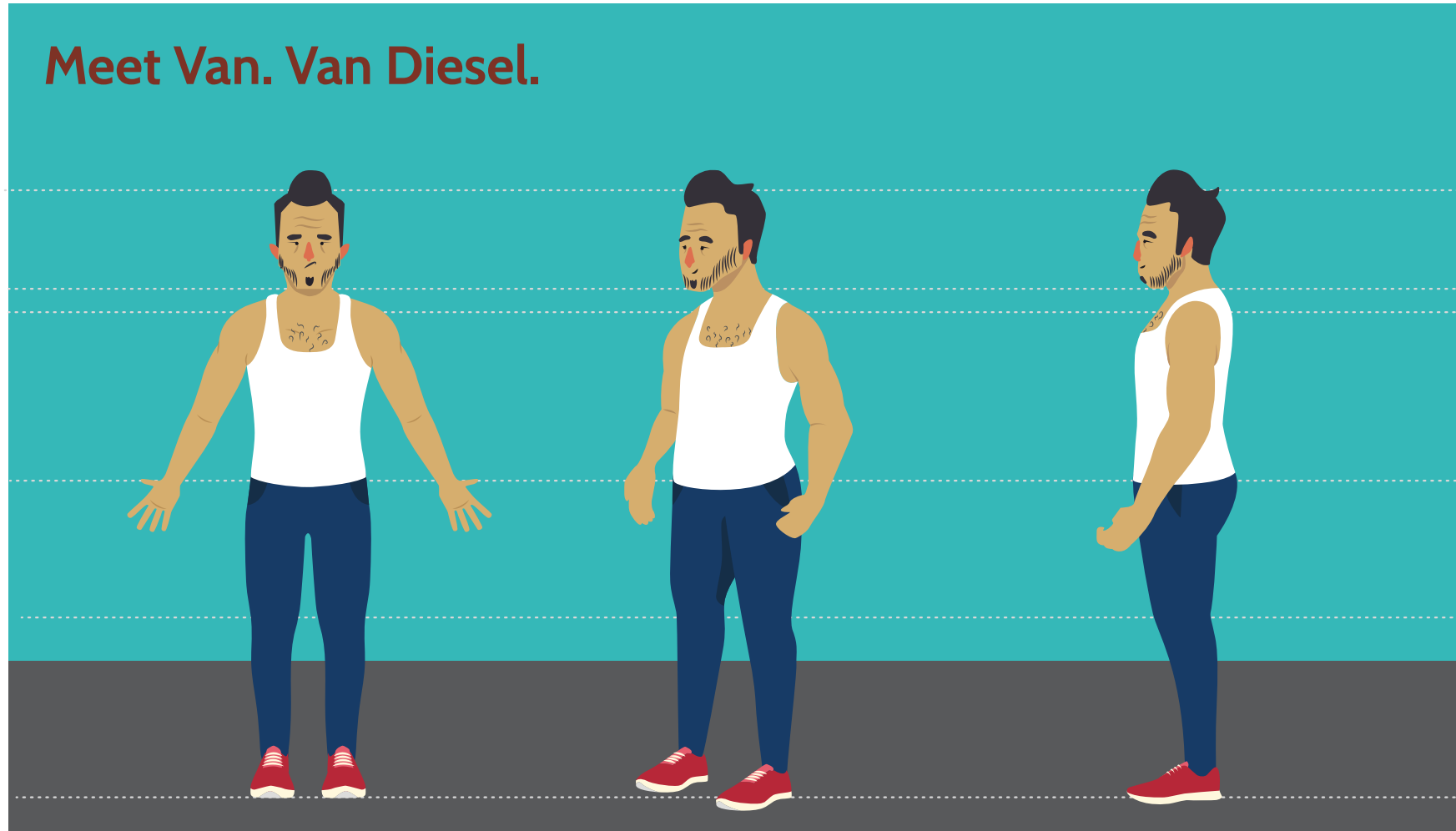
A Character Design

The background layouts are a combination of semi-flat design and painted textures. The slight texture allows the characters to stand distinctly in the foreground. Each animation has a distinct colour story and a title sequence.

Background layout for the Case of the Rebel Driver:



A Character Design



Primary

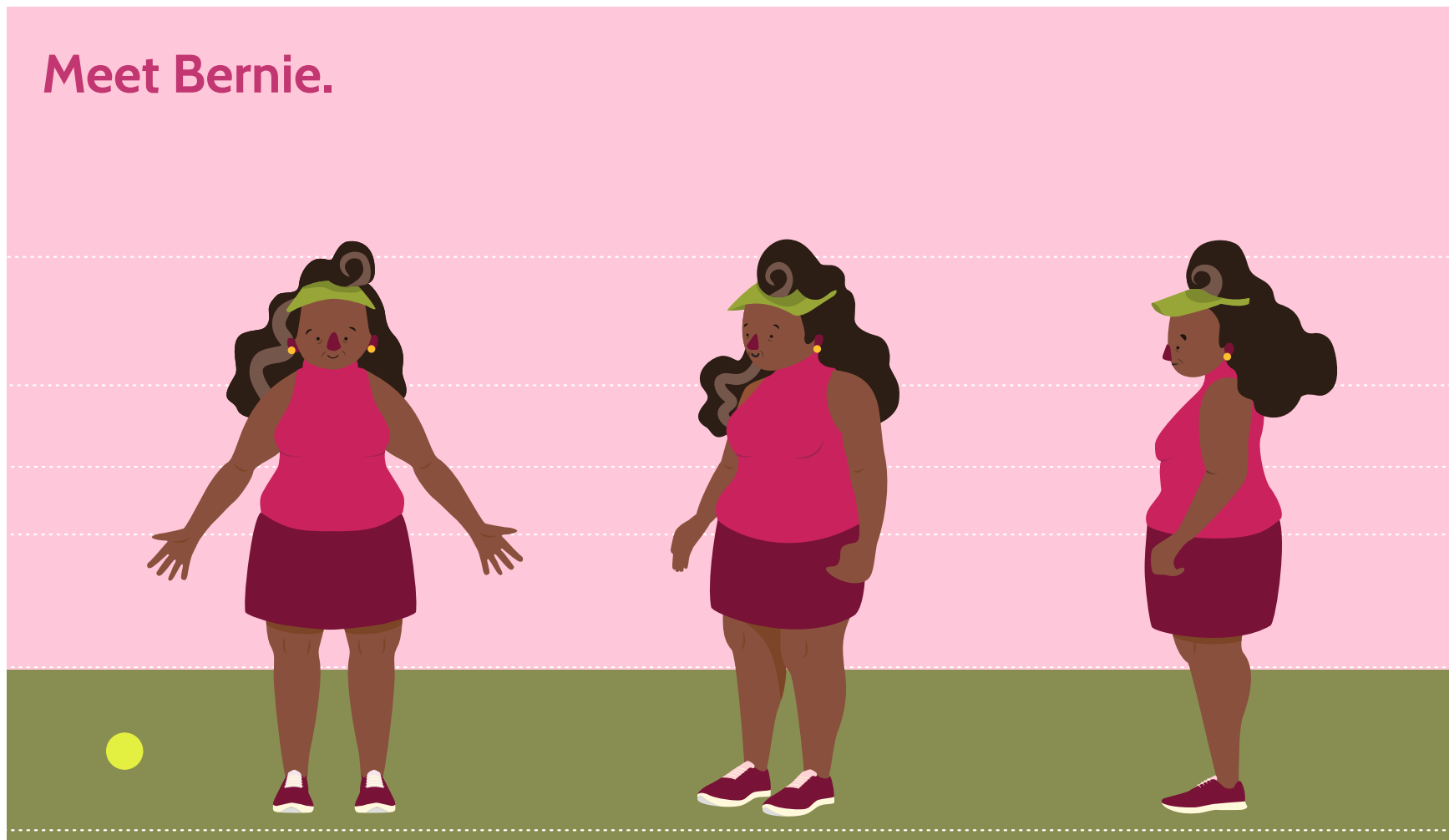


Secondary



A Character Design

Meet Bernie.



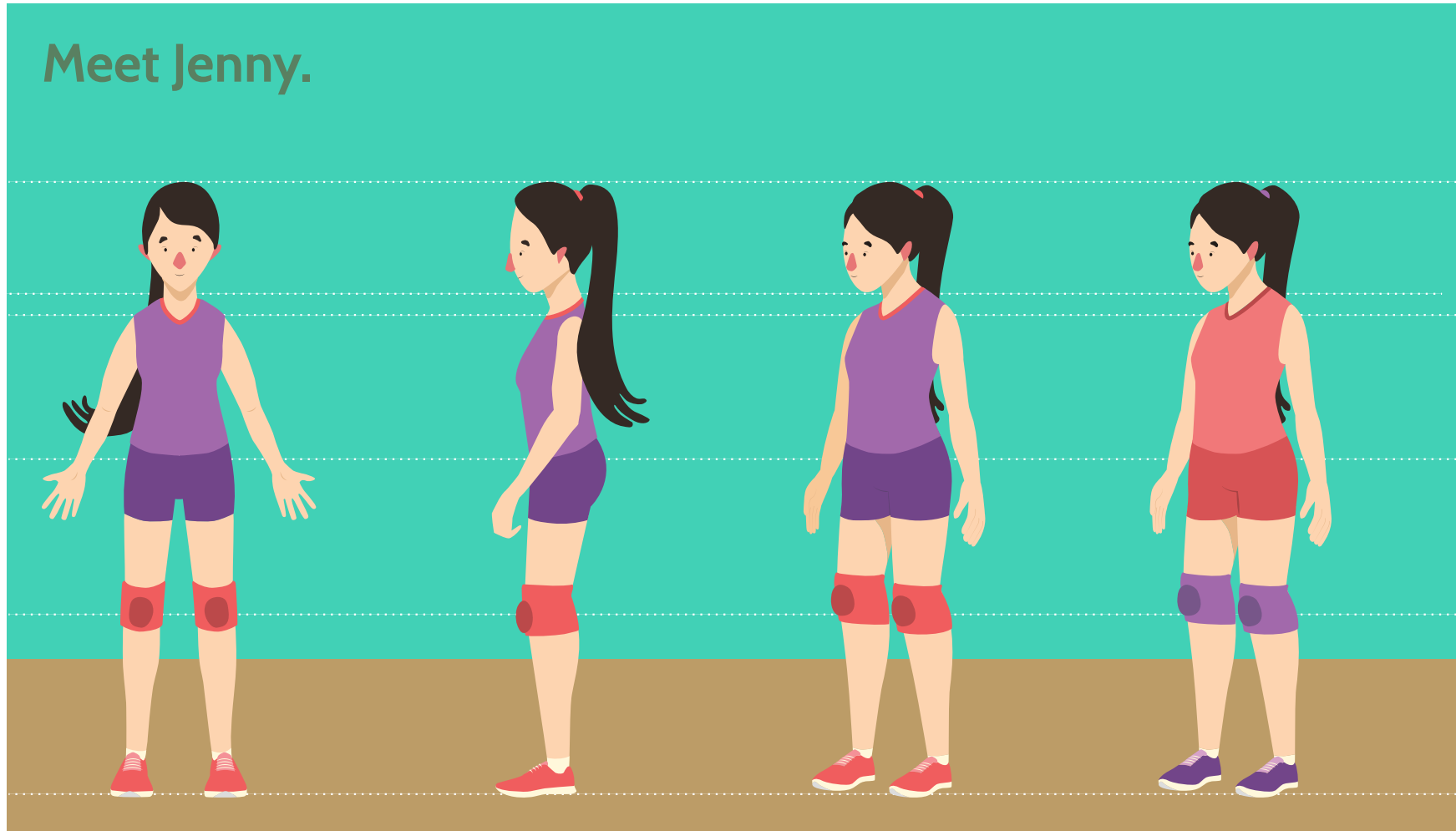
Primary



Secondary



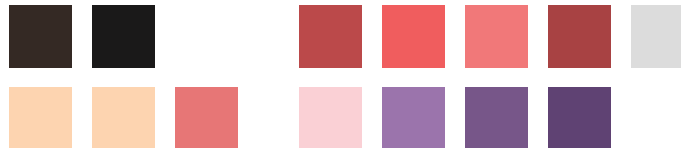
A Character Design



Primary

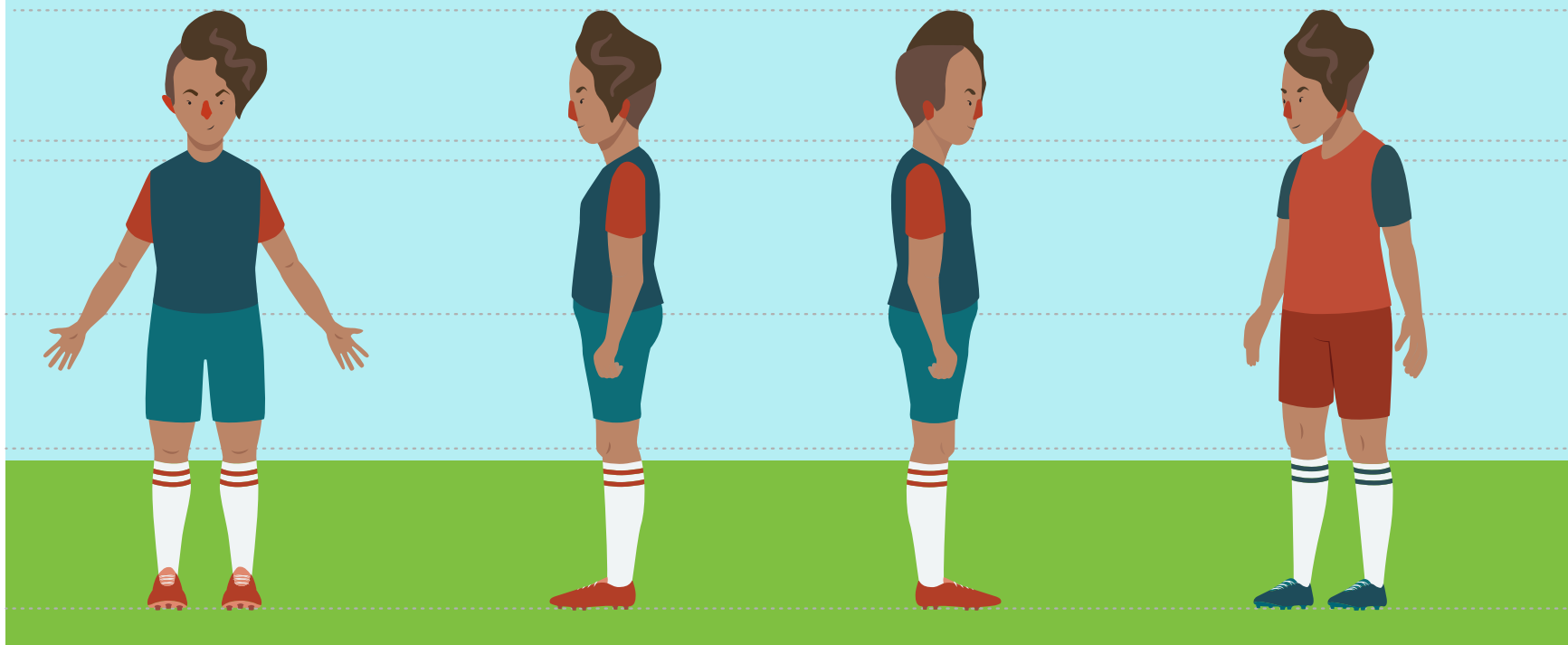


Secondary



A Character Design

Meet Alex.



Primary

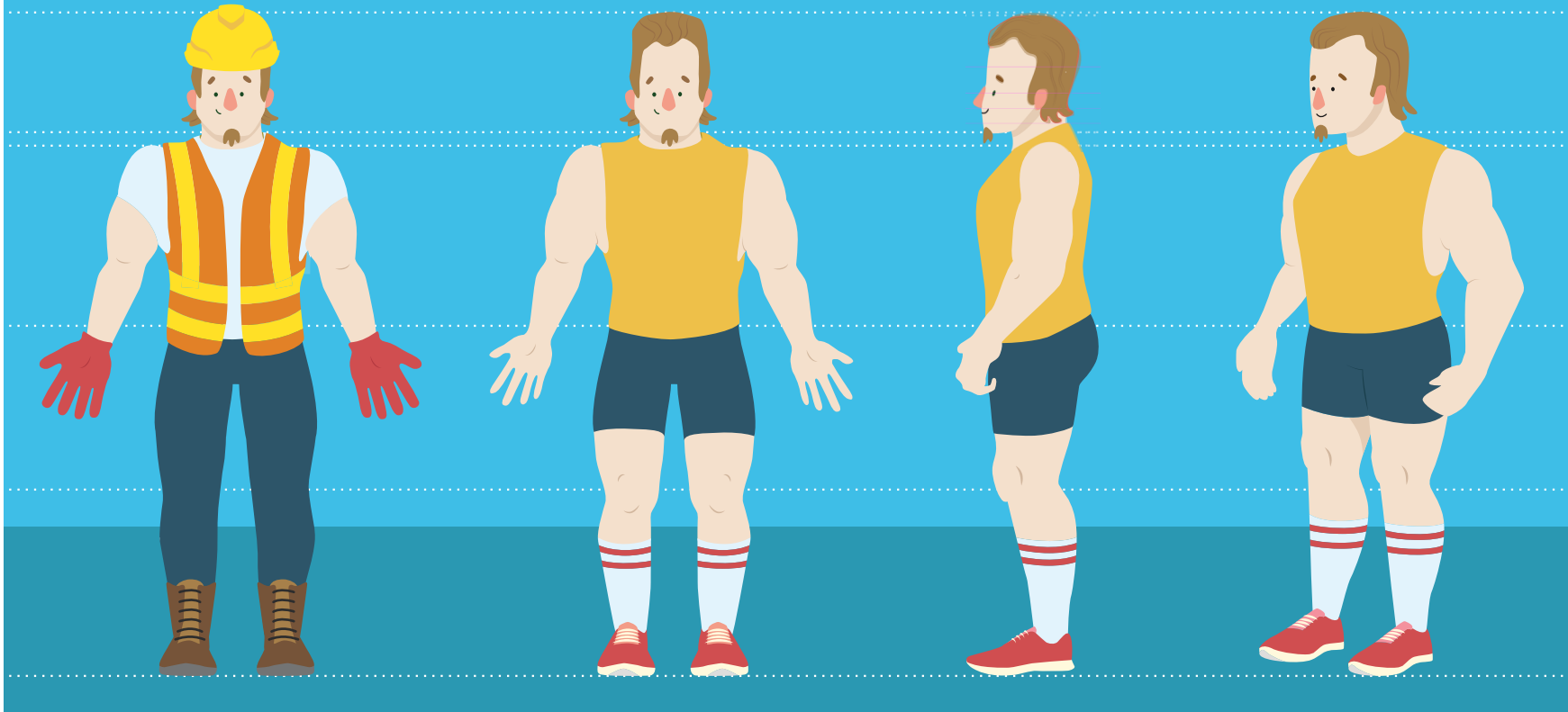


Secondary



A Character Design

Meet Fred.



Primary

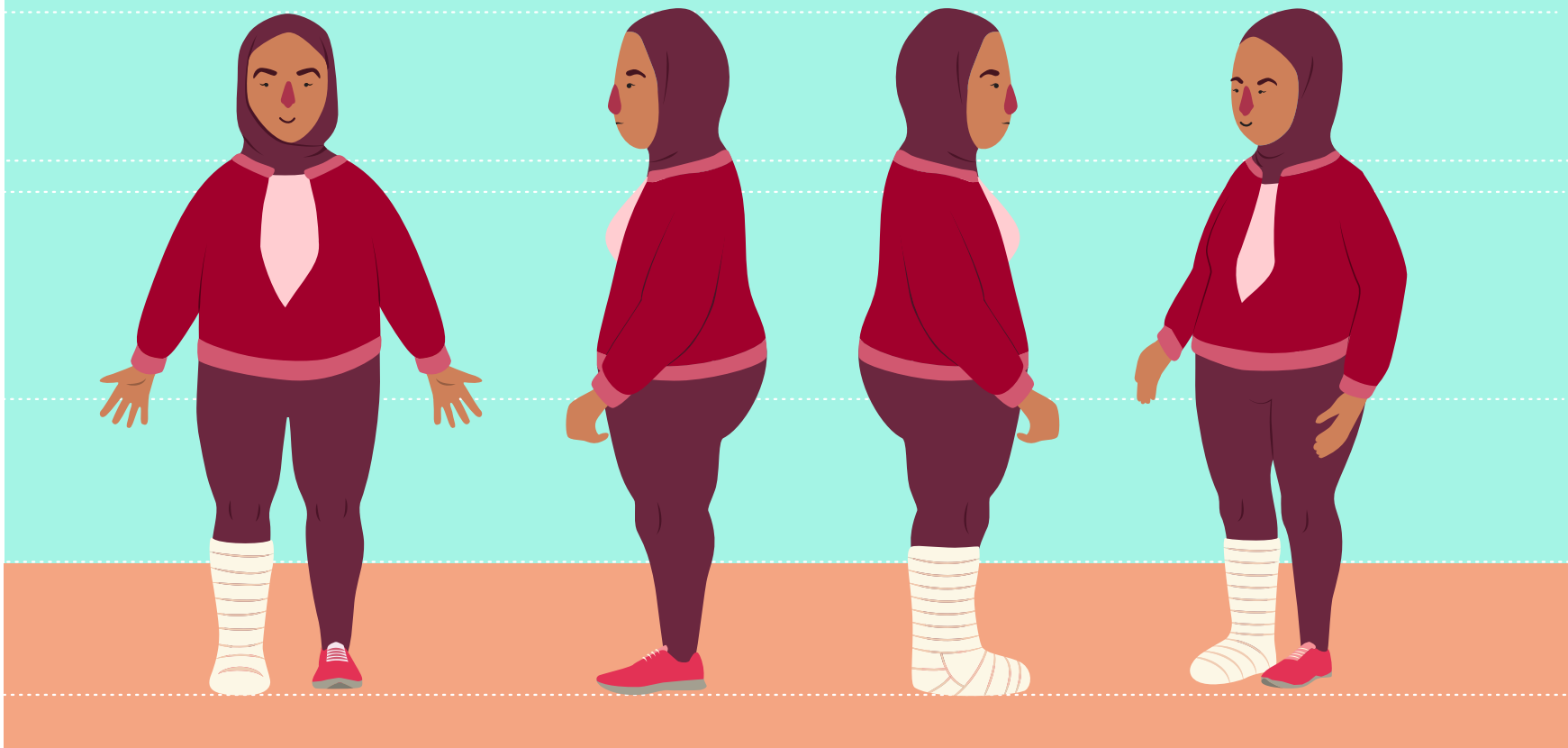


Secondary



A Character Design

Meet Maryem.



Primary

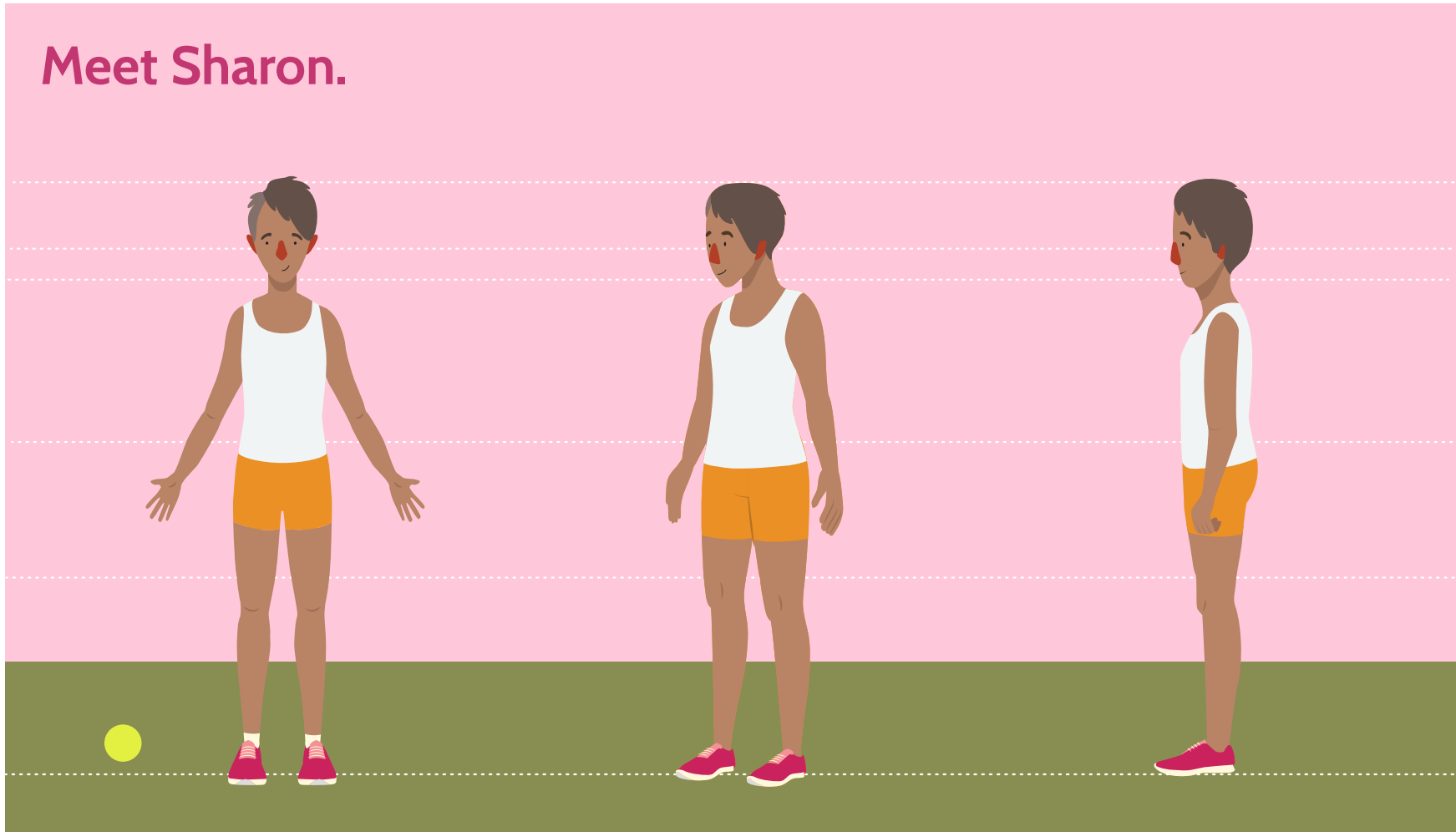


Secondary



A Character Design

Meet Sharon.



Primary

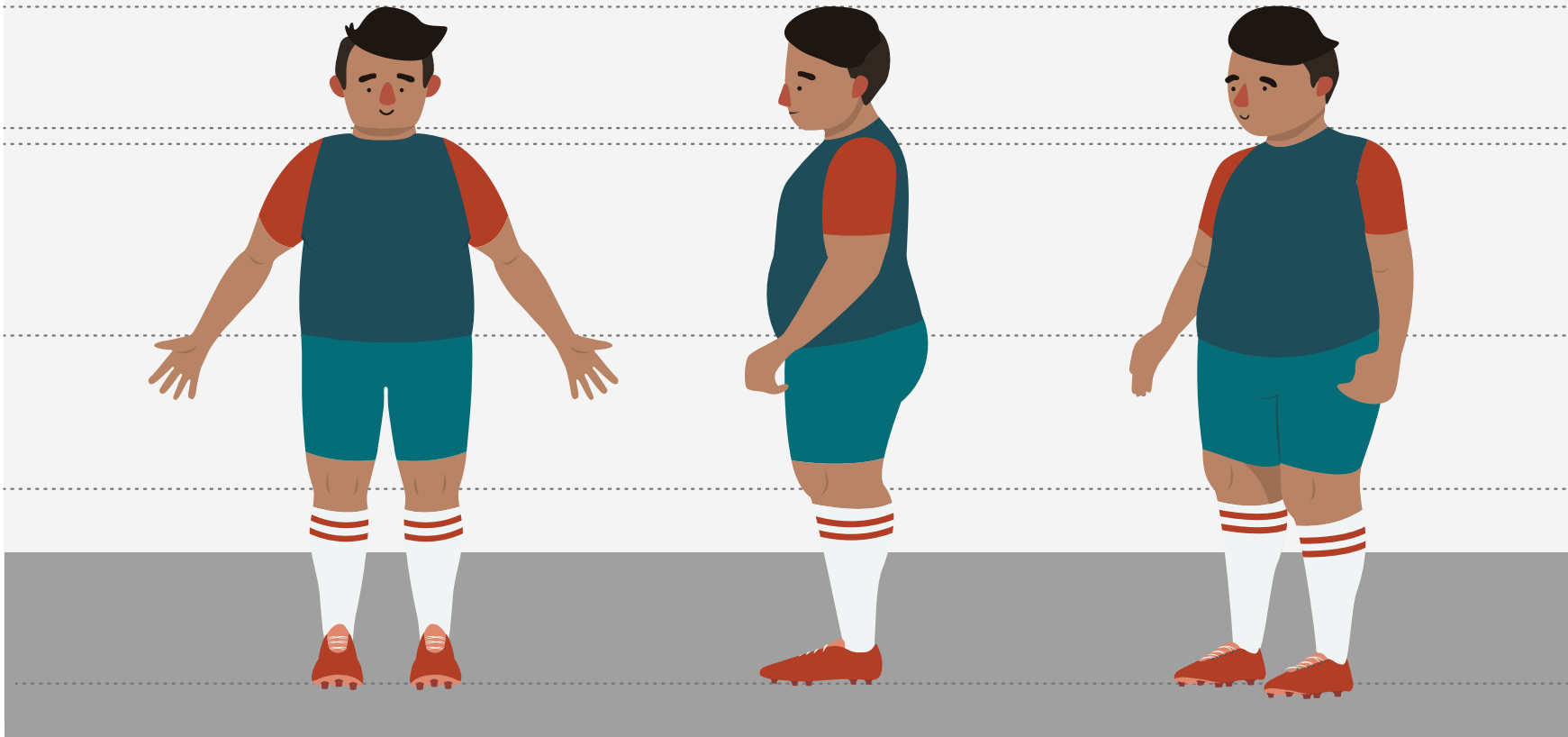


Secondary



A Character Design

Meet Character A.



Primary

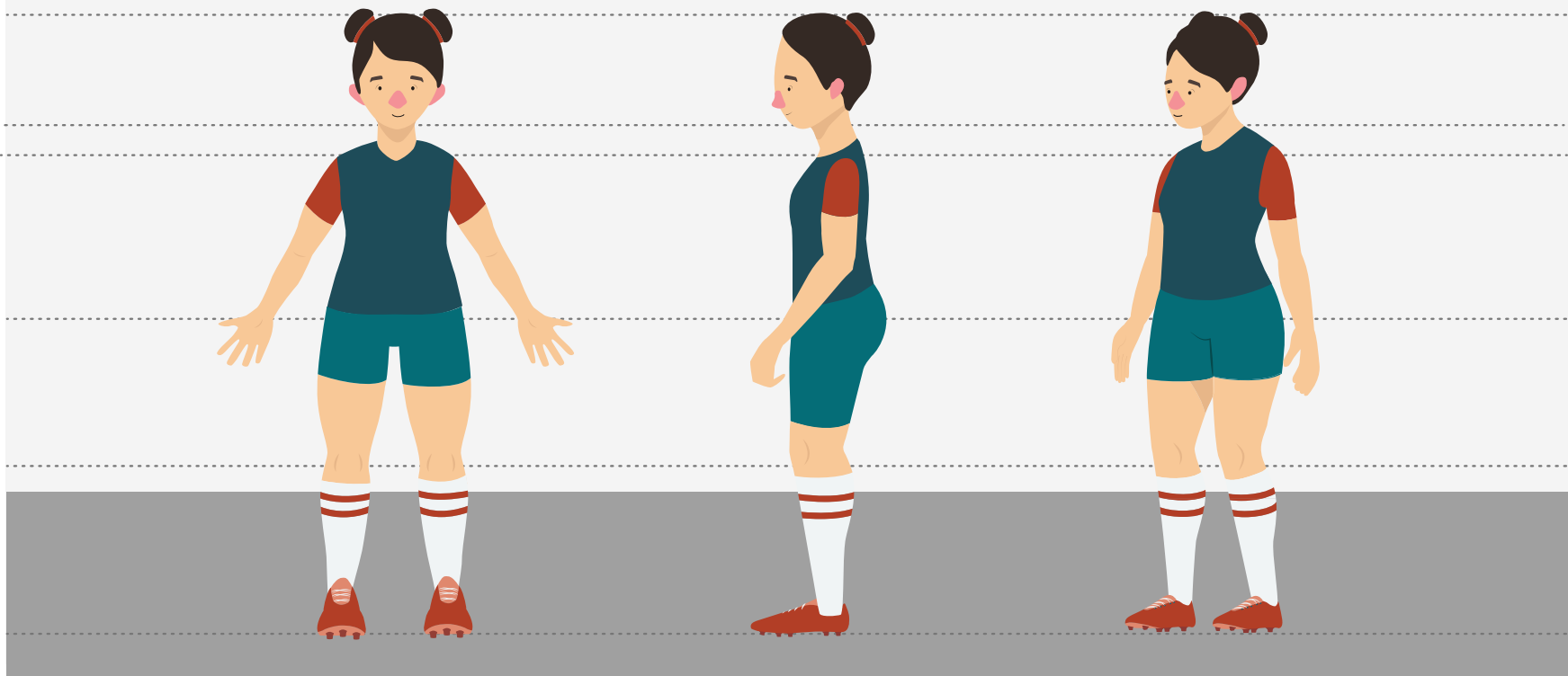


Secondary



A Character Design

Meet Character B.



Primary

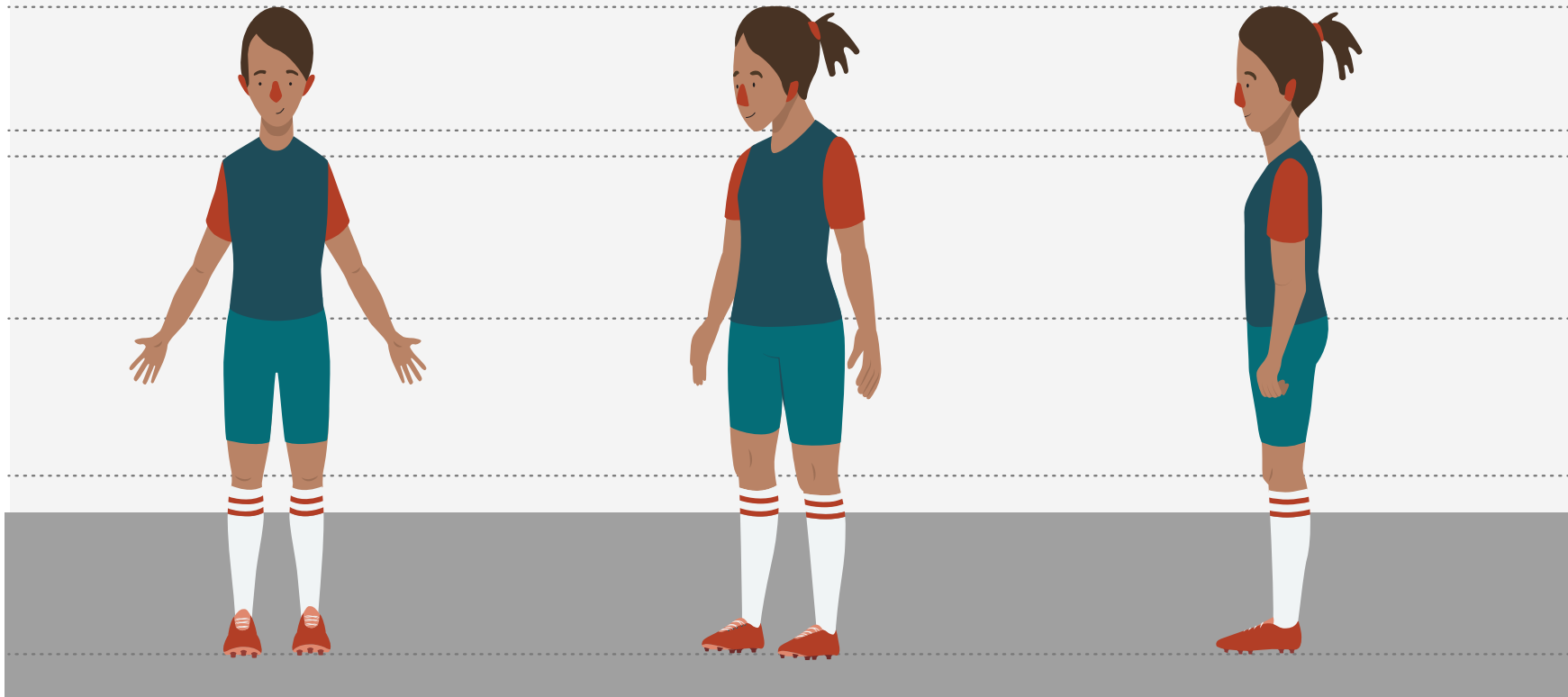


Secondary



A Character Design

Meet Character C.



Primary

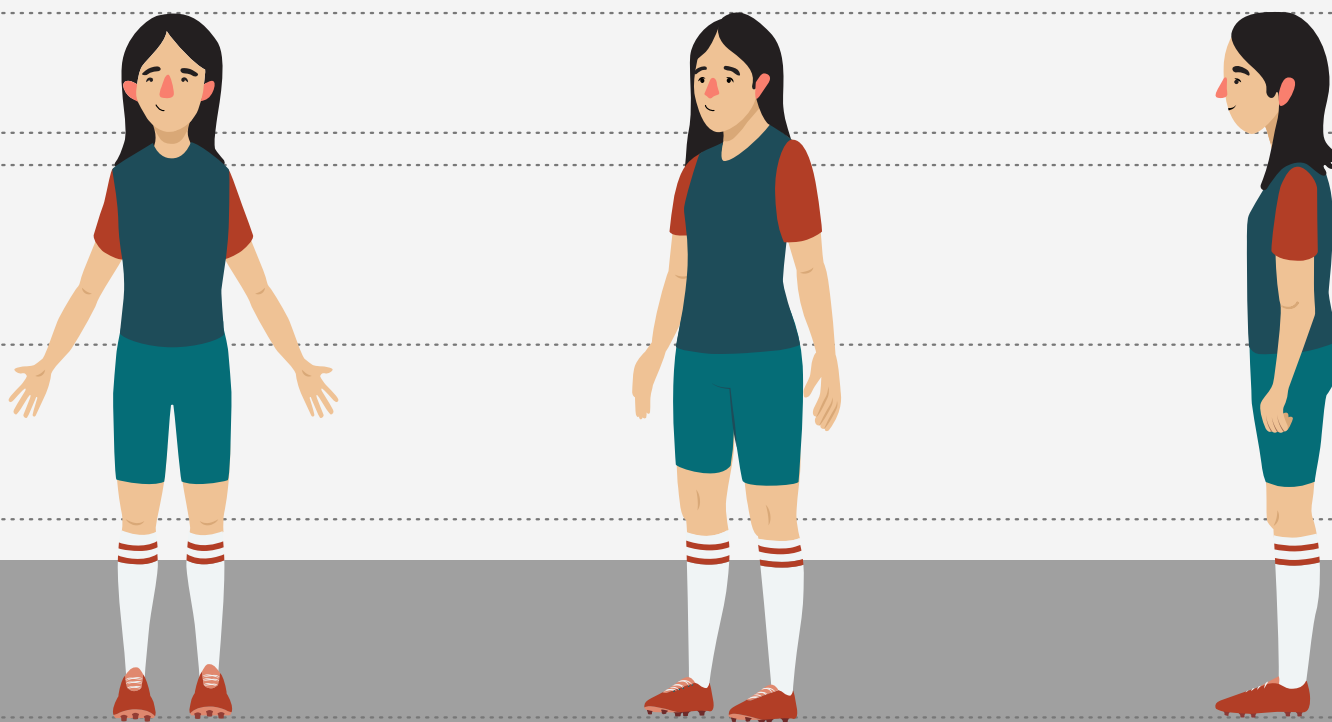


Secondary



A Character Design

Meet Character D.



Primary

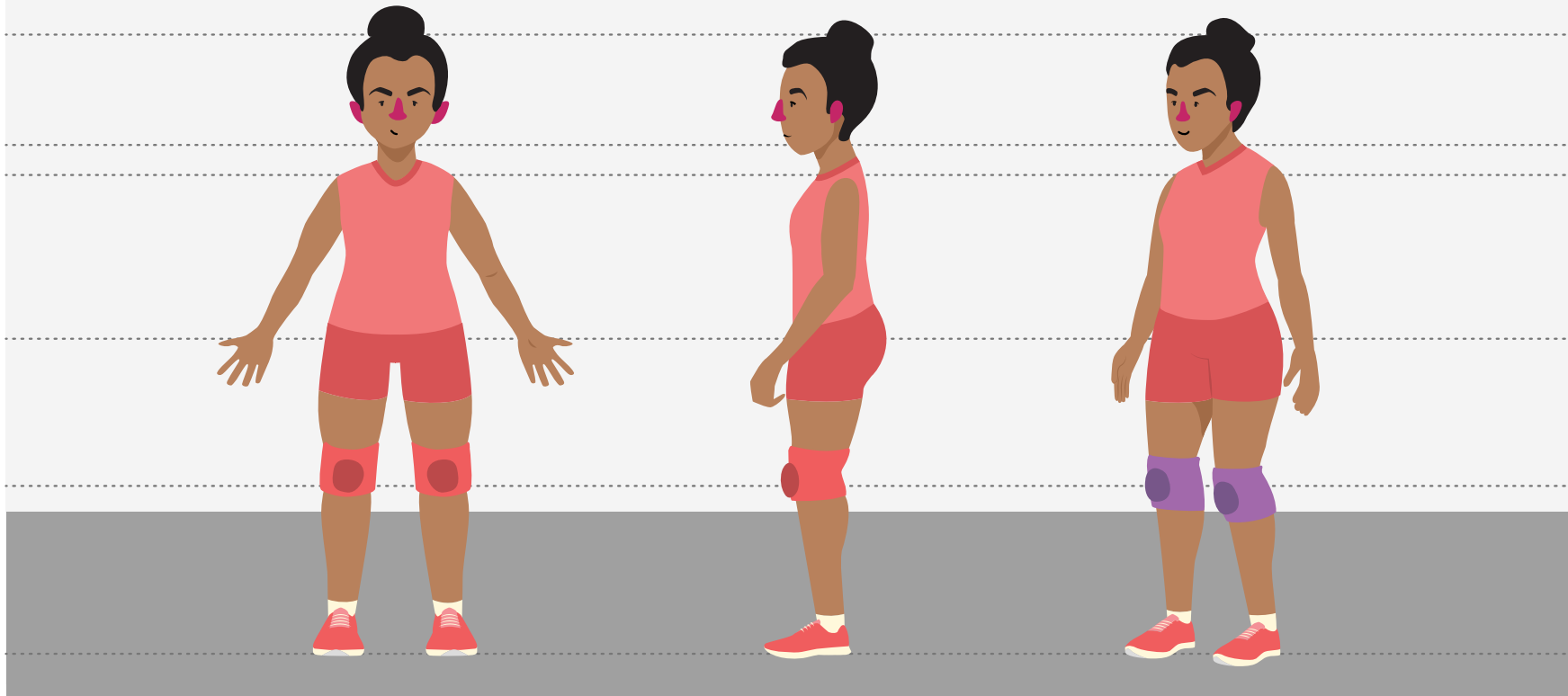


Secondary



A Character Design

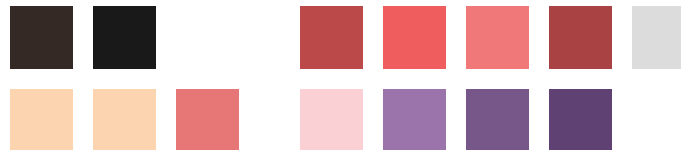
Meet Character E.



Primary

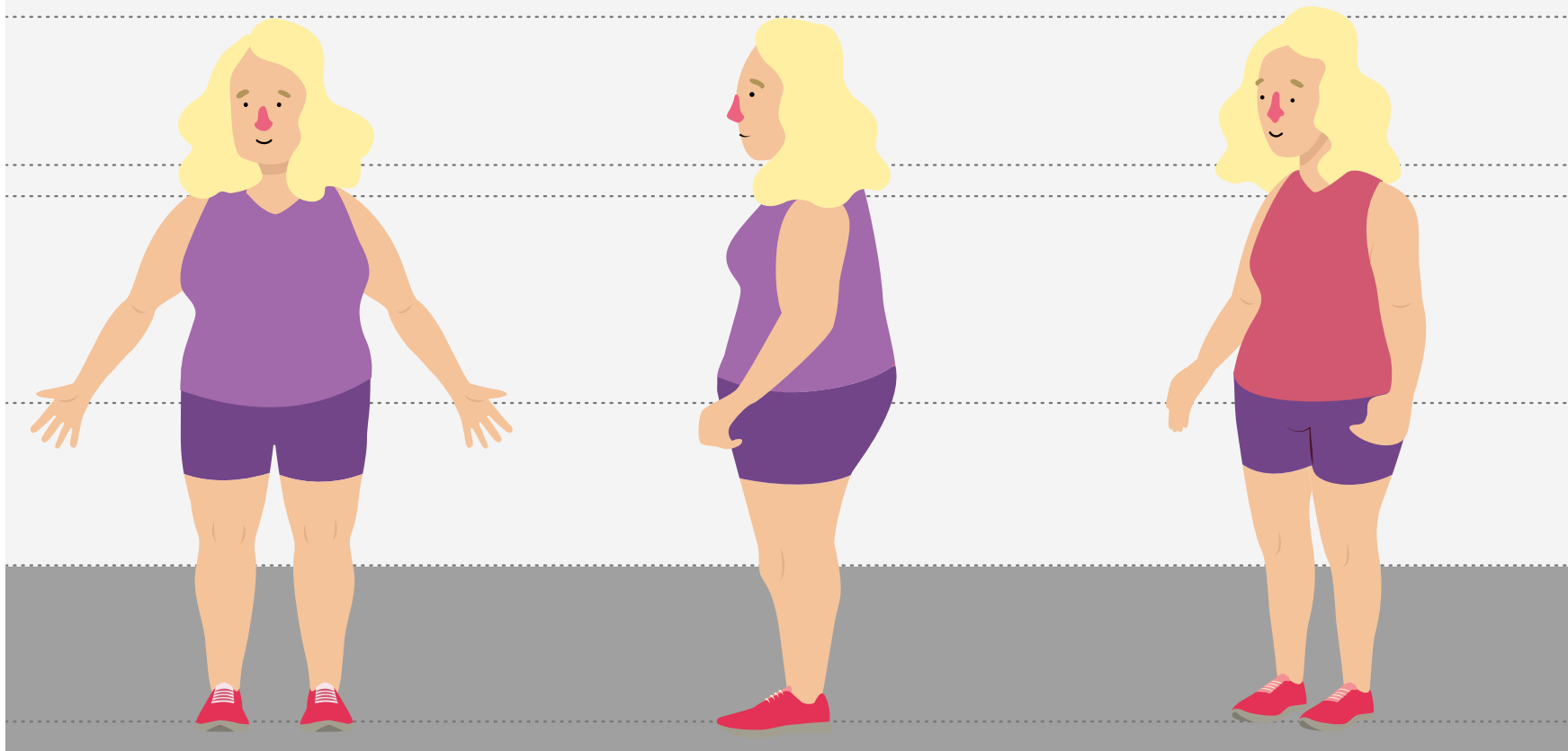


Secondary



A Character Design

Meet Character F.



Primary



Secondary

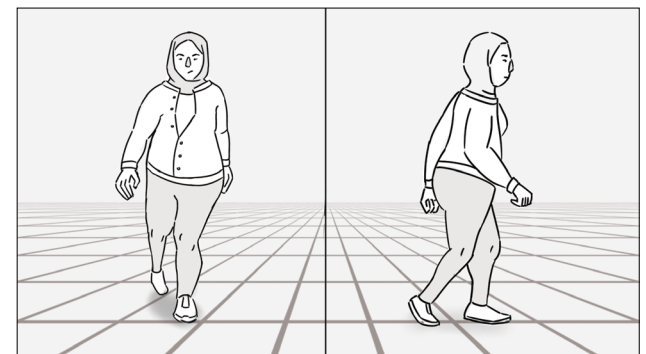
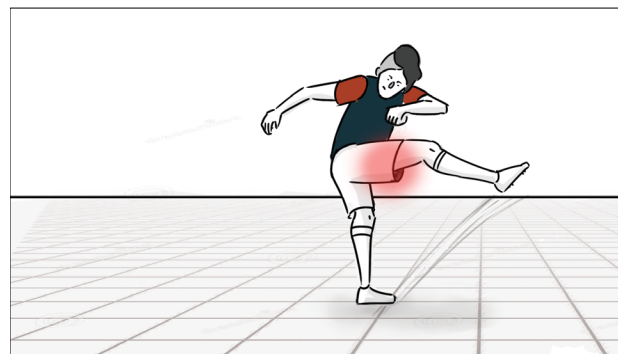
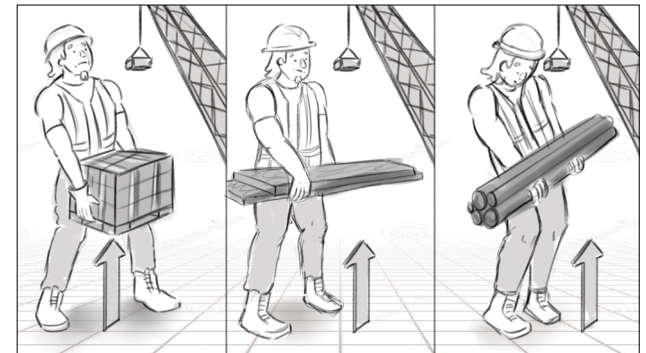
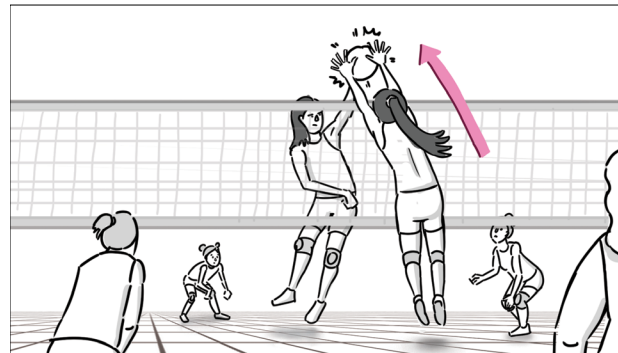
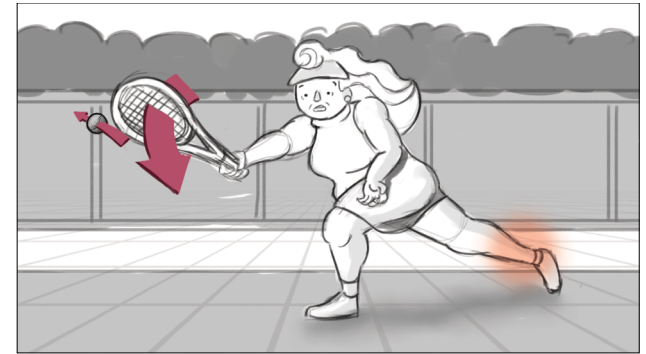


B Animation

At the beginning of each case study, users watch a short 2D animation depicting the injury scenario. In alignment with our overarching objectives, these animations are created to not only clearly illustrate the context and mechanism of injury, but also to be fun and engaging.

Each animation follows a consistent format. The same narrator introduces the character and present each Kinundrum. The mechanism of injury is shown in slow motion to emphasize the affected anatomy, and the injured area of the body is highlighted.

Stills from Case Study animatics:



B Animation

Before the case injury scenarios are animated, we created multiple iterations of pre-production assets. These include several drafts of scripts, storyboards and animatics. Even though the visual style of Kinundrum characters, props and layouts is graphic and 'cartoony', the animation itself is closely based on live action reference. To be used effectively as an anatomy learning resource, it is especially important that the motion of the characters are realistic representations.

Links to each animatic are listed below:

The Case of the Rebel Driver

The Case of the Tennis Mom

The Case of the Volleyball Player

The Case of the Soccer Player

The Case of the Weightlifter

The Case of the Alpine Skier

Storyboard for the Case of the Rebel Driver:

