

Learn how to drive in Nova Scotia

(Nova Driving)



Usability Study Design

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Study design goals and objectives

Nova Driving's core goal is to provide users with a platform that enhances the learning process of obtaining a driver's license in Nova Scotia. Building on the momentum gained through the multiple iterations of requirement gathering and refinement in addition to heuristic evaluation; the results were used to enhance and streamline the platform's design and flow in preparation for prototyping.

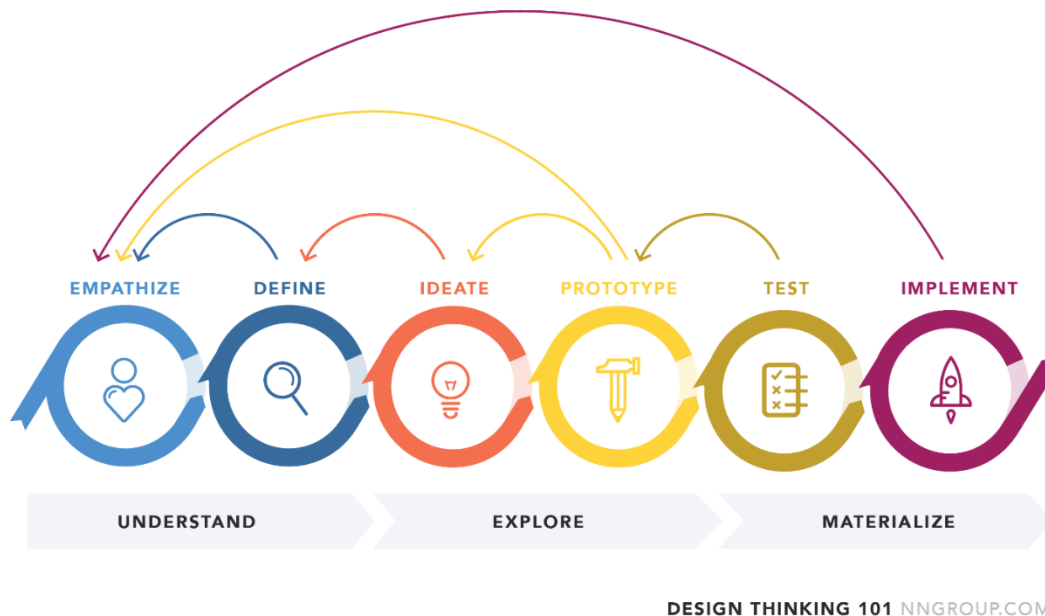


Figure 1: Design Thinking Process

A rapid horizontal prototype was developed based on the refined functional, data and usability requirements and recommendations from the heuristics evaluation. The next phase of the design thinking process, as illustrated in Figure 1 (above) by Gibbons from the NN Group (2016), is to test the prototype - starting with usability testing.

The overarching purpose of usability testing is to identify and further explore all user responses and experiences with the platform's usability specifically the main functionality groups:

1. General system functionality: navigation, login/sign-up, search, etc.
2. Core features: lessons, tests and resources

Following the definition of 'usability' from Rubin and Chisnell (2008):

"The user can do what he or she wants to do the way he or she expects to be able to do it, without hindrance, hesitation, or questions."

A multi-pronged and user-centric approach was applied to test the platform and address the following objectives:

1. Identify bugs and issues with functionality and usability
2. Assess the platform's accessibility specifically the platform's navigation, logical flow, structure, layout and overall design
3. Identify instances of confusing experiences and evaluate the platform's ease of use and user-friendliness

Methodology

Rooted in informing the design of the final product and helping identify and eliminate user frustration, the usability testing phase will focus on conducting the appropriate tests and gathering the associated data to identify and then rectify usability deficiencies in our existing design and prototype. Using a hypothesis-based approach, the following four components underpin the design methodology and are discussed in detail in the following section:

- Test participant selection
- Test plan
- Test cases
- Data analysis plan

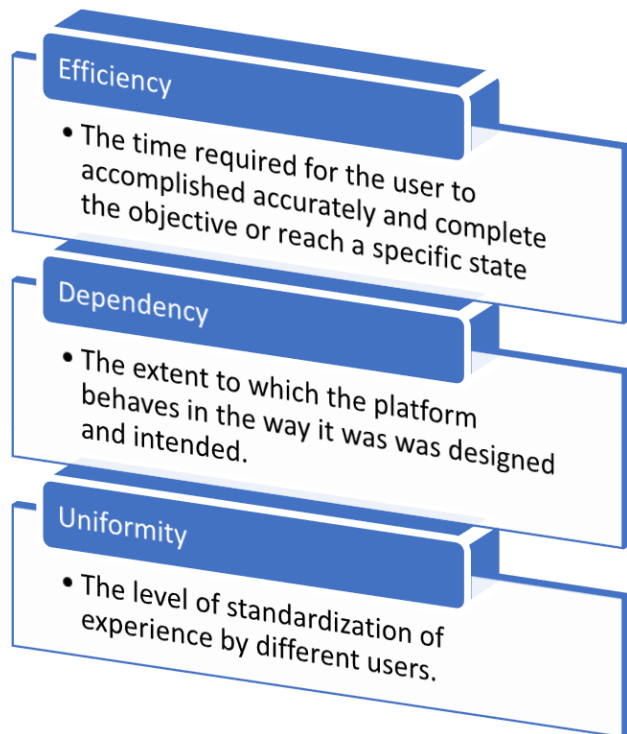
Study design hypotheses:

Three main hypothesis categories were developed and integrated into our study design to test the usability of the platform as portrayed in Figure 2.

Hypothesis testing will be applied based on the details in Table 1 for each hypothesis category and follow the following steps:

1. Specify the null and alternative hypothesis
2. Set significance levels
3. Calculate the test statistics and corresponding p-value

Figure 2: Study Hypothesis Categories



Category	Efficiency
Claim	Does user become efficient in using the app as he/she spends more time using the app?
Null hypothesis (H₀)	Mean time taken by user in Home Screen >= Mean time taken by user in Login Screen
Alternative hypothesis (H₁)	Mean time taken by user in Home Screen < Mean time taken by user in Login Screen
Required Metrics	
<ul style="list-style-type: none"> Efficiency will be measured by the time consumed by the user to complete testing for a screen. Average of total time taken by multiple users will be considered for each screen. 	

Category	Dependency
Claim	Is there any relationship between user experience and the screens of the app?
Null hypothesis (H₀)	There is no relationship between user experience and screens.
Alternative hypothesis (H₁)	There is a relationship between user experience and screens.
Required Metrics	
<ul style="list-style-type: none"> User experience will be measured by a uniform weighted average of the time consumed by the user and count of clicks performed by the user to complete testing for a screen. Multiple users must be considered. 	

Category	Uniformity
Claim	Is the degree of user interaction uniform across the app?
Null hypothesis (H₀)	There is no relationship between the degree of user interaction and design of screens.
Alternative hypothesis (H₁)	There is a relationship between the degree of user interaction and design of screens.
Required Metrics	
<ul style="list-style-type: none"> Degree of user interaction will be measured by a uniform weighted average of the count of clicks performed by the user to complete testing for a screen and no. of interactive elements part of design of the screen. Multiple users must be considered. 	

Table 1: Hypothesis Testing Details

Test participant selection

A total of 5 testing participants will be selected to conduct the usability study. Finding the right participants for the test is a critical component, the selection criteria should ensure testers are selected and are representatives of the platform's target audience and match the persona defined in the Ideation Workshop. Therefore, a screening protocol will be applied to ensure participants are aligned with our testing plan and methodology. Based on this, the testing participants should have the following characteristics:

- International students or new comers to Canada and/ or Nova Scotia
- Does not have a Nova Scotia Driver License but intends to attain it

Recognizing the iterative nature of the testing phase in addition to the resource, time and other costs associated with testing, a representative sample size of 5 testers will be used to conduct the usability testing study.

Test plan

The testing study plan sets out the components and protocols required for conducting the usability study as outlined in the table below:

Test Plan Component	Description and purpose
Type of test	Between-subjects study design will be applied where all 5 testing participants will test a single and consistent user interface using an identical test plan and testing method. The remaining components and protocols help ensure the required experimental controls are in place to create identical testing conditions for each participant and usability test session.
Test settings and conditions	Testers will be observed in a controlled setting as they perform a series of tasks defined by a standardized set of test cases. Figure 2: test step (below) depicts the test settings where the testers will be provided with an interactive prototype on one laptop and the test details on a second laptop that will be supervised by the moderator.
Test method and logistics	A three-phase approach is used to conduct the test study which consists of: <ol style="list-style-type: none"> 1. Test participant screening 2. Initial introduction and brief synopsis 3. Usability testing session
Data collection and evaluation measures	<ul style="list-style-type: none"> • Number of clicks • Time taken to complete tasks and each test scenario • Error rates (pass/ fail)
Testing moderator and observer roles and responsibilities	Multiple members of the design and development team will be present during the tests and fulfill the following roles and responsibilities: <ol style="list-style-type: none"> 1. Main test moderator 2. Product and technical expert (lead prototype designer) 3. Note taker #1: number of clicks 4. Note taker #2: error rates and user sentiment 5. Time keeper
Test script (opening remarks and instructions)	Testing session orientation and onboarding to provide the tester with the appropriate context, test session instructions and information about the platform, its purpose and the study design.

Table 2: Test Plan Components

Test script

[Introductions to the testing team]

[Brief intro about the platform]

Thank you for taking the time to participate in this study. Before we begin, let us walk you through why we are here today. Our team is designing a platform to help international student and new comers to Nova Scotia learn how to drive in the Province by providing the necessary learning requirements with adjustable language preferences and through a visual and interactive manner.

[Go over the consent form details]

[Study screening questions]

To participate in the study, we will ask you three short screening questions to make sure you fit the study design criteria.

Question 1: Are you an international student?

Question 2: Do you have a Nova Scotia driver's license?

Question 3: Do you intend on getting a licence to drive in Nova Scotia?

[Brief intro on the test purpose and setup]

We will give you a brief overview of the test and how it will work. Here we will give you a broader task to complete and then will ask questions as we go along.

Before we proceed towards the task, we would like to give you a little bit overview of the context behind it, such as why you might be doing it and what you will achieve from it. We are only testing the website and not you, so feel free to respond while performing the test. Please feel free to let us know if you like or dislike something, or if you are confused while performing test.

Please feel free to let us know if you are not feeling comfortable to perform test and you can stop at any particular time of the test. Also, we would like you to "think aloud" as much as possible, so that we can note down your point of view.

[Go over data collection protocols]

My team members will be collecting data in few different forms:

1. Timing to complete each task
2. Number of clicks
3. Noting down your overall experience as you go through
4. Note down a pass or fail of the test based on how the prototype functioned in the test

All data collected will be used in aggregate form only. Your name is only required on the consent form, other than that no personal or identifiable information will be collected or stored. If at any point you have questions, please don't hesitate to ask. Do you have any questions so far?

Test method specifics

- **Test participant screening**

To ensure the test participant satisfies the participant selection criteria as detailed in the previous section, the participant will be asked the following brief questions prior to starting the next phase of the test method:

Question 1: Are you an international student?

Question 2: Do you have a Nova Scotia driver's license?

Question 3: Do you intend on getting a licence to drive in Nova Scotia?

- **Initial introduction and brief synopsis**

Prior to starting the usability testing session, the test moderator will start with a brief introduction on the test protocols, the prototype, the expected results of test and the type of data being collected by the testing team.

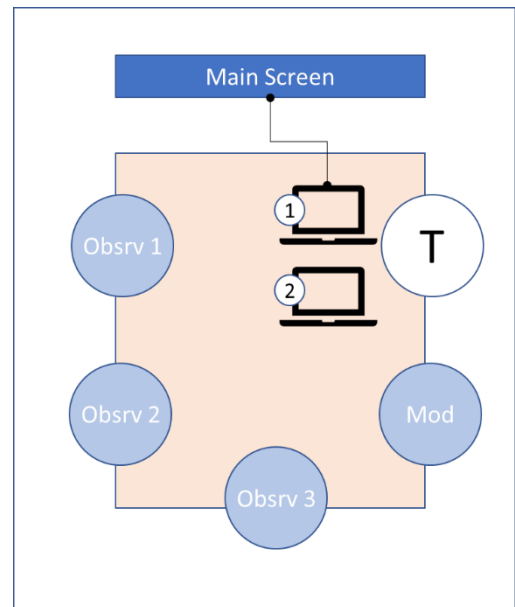
The participant will be asked to think and read out loud to enable the members of the testing team to record and track results and progress during the test session.

- **Subsequent usability testing session**

The testing session will include the following steps:

- Provide user with the prototype with the relevant preconditions for each test case
- Provide user with additional screen for steps and instructions
- Collection of qualitative and quantitative results and measurements

Figure 3: Testing setup



Test scenarios and cases

Testing scenarios have been built around the 5 main components of the platform:

1. Login and sign-up functionality
2. Access and navigation to and across the platform's components from the home page
3. Access and navigation to and within the lessons components
4. Access and navigation to and within the test component and the various modes within
5. Access and navigation to the resources and the associated content within

Each platform testing component listed above include one or more testing scenarios that are broken down further into logical test cases with associated steps and expected results/ success criteria as outlined in Figure 4 the test template and Table 3.

Table 3: Test Template Elements

Test template elements	Description and purpose
Test scenario breakdown and details	
Test Scenario	Describe the platform component being tested.
Test Case	Describe the component being tested.
Precondition(s)	Describe the conditions that must be observed before testing.
Steps	Describe the specific steps of an ideal test.
Expected Results/ Success Criteria	Describe the test results expected when the user completes the test. It will serve as an important basis for comparison with the actual results and determine whether the test results are successful or not.
Results and collected data points (collected for each test session)	
Status	Describe whether the test case's result matches the expected result. If they match, the status displays "Pass", otherwise it displays "Fail"
Actual Results/ Comments	Describe the actual results of the test case when the tester tests the test case, and the tester's comments on the result.
Number of clicks	Describe the number of clicks the tester needs to complete the test case
Time taken	Describe the length of time the tester takes to complete the test case

S.No.	Test Scenario	Test Case	Precondition(s)	Steps	Expected Result	Tester Number			
						Status	Actual Result / Comments	Number of Clicks	Time taken
1	Scenario 1	Test case 1					
		Test case 2							
		Test case 3							
		Test case 4							

Figure 4: Test Template

([Link to full version](#))

Data analysis plan

Methodology of proof

- Each hypothesis will have a well-crafted list of assumptions which will be tested statistically.
- The appropriate test model (comparing means) will be used to infer the results for the platform and state the reason behind the selection
- The default level of significance will be 0.05 (i.e. confidence coefficient will be 95%)

Expected Results

- Rejection/acceptance of the hypotheses
- An upper triangular efficiency matrix for the logical flow of user experience from one screen to another. For this, we will conduct the efficiency test for each pair of screens.

Metrics to be used as input for testing

- Time taken by testers to complete the usability testing cases
- Click count performed by testers to complete the usability testing cases
- Percentage of pass/ fail for each usability testing case
- Qualitative measures will be used based on the captured tester sentiments about the user experience

Results of testing conducted on peers

The test plan was conducted on two peer testers using the same protocols, testing templates and data collection procedures to gathering an initial set of test results.

The testing template also handles the data capture, consolidation and high-level analysis of the results as shown in Figure 5.

The data analysis plan outlined in the previous section will be conducted on the full usability testing study with the appropriate sample size.

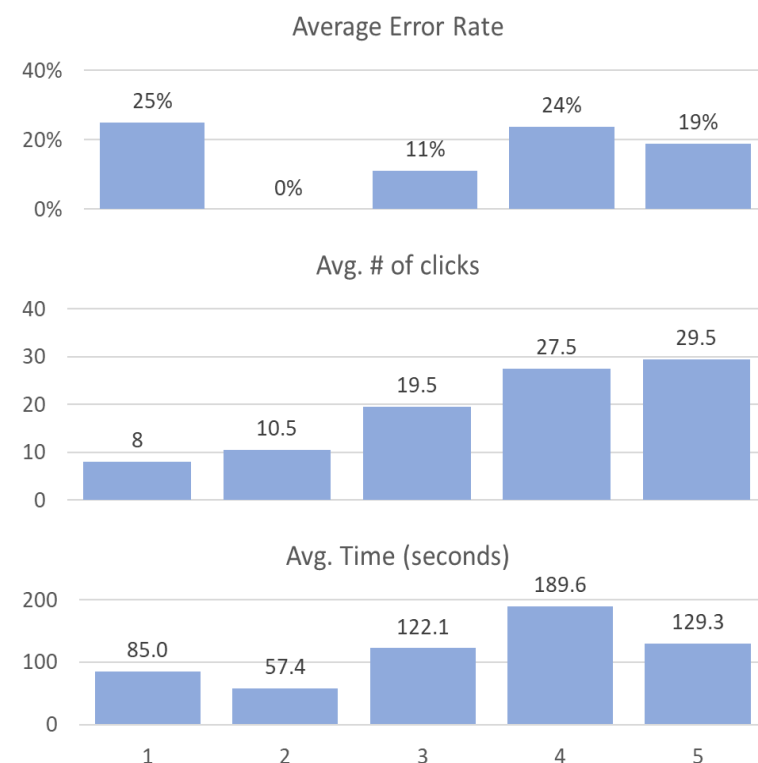


Figure 5: Preliminary (Peer) Test Results

Appendix

Prototype screenshots

1. Login

LOGO

Login

Username/E-mail: Input your username or E-ma...

Please input your username


Password: Input your password


Please input your password

☐ Remember the password

SIGN-IN

Forget your password?

 SIGN-IN with Google

 SIGN-IN with Facebook

English | Français

Version: 0.0.0.0.0

Figure 6-1: Log in without entering a username and password



Figure 6-2: Switch the language preference

2. Home

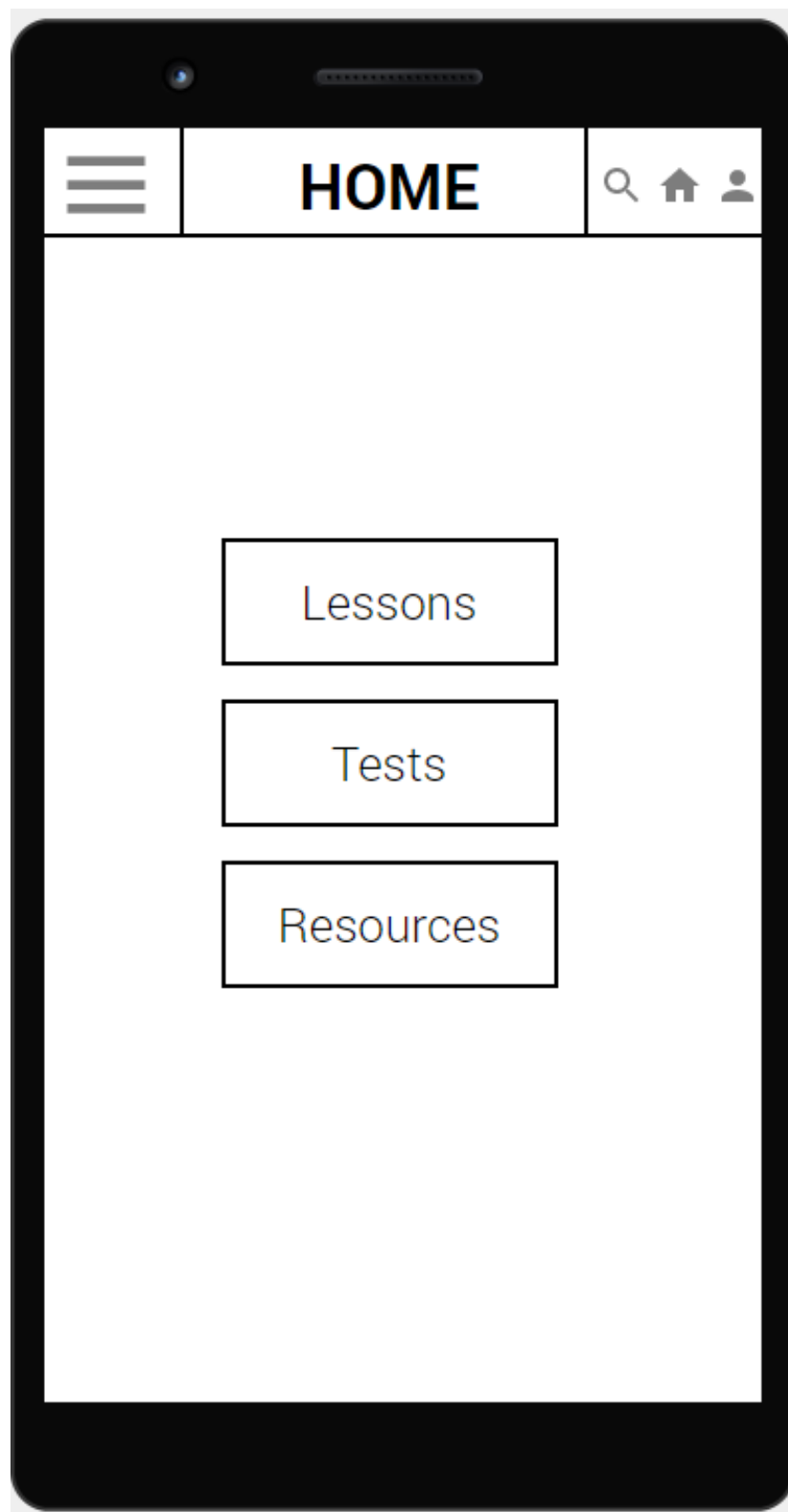


Figure 6-3: Home page

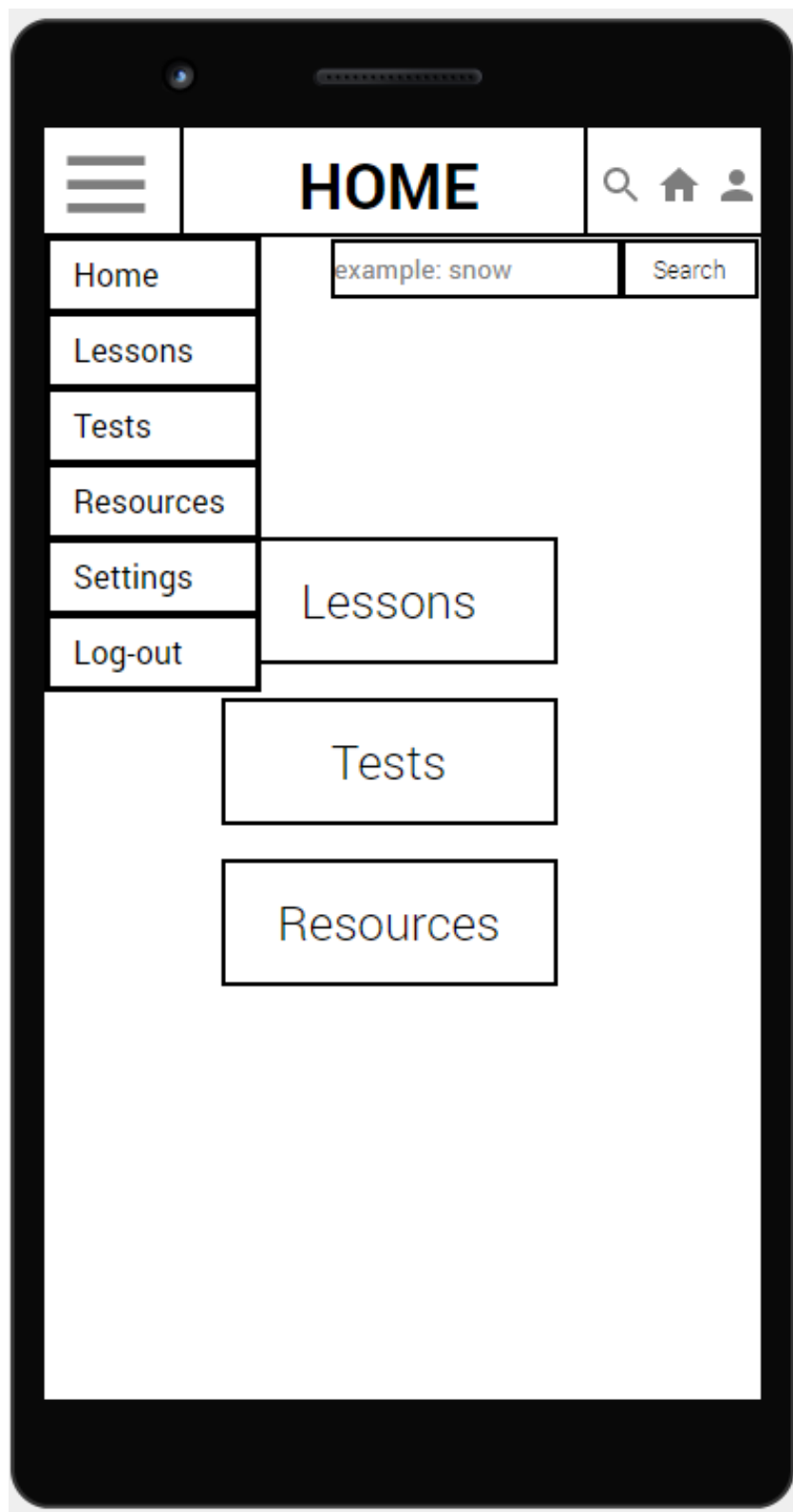


Figure 6-4: Test side-menu and search button in home page

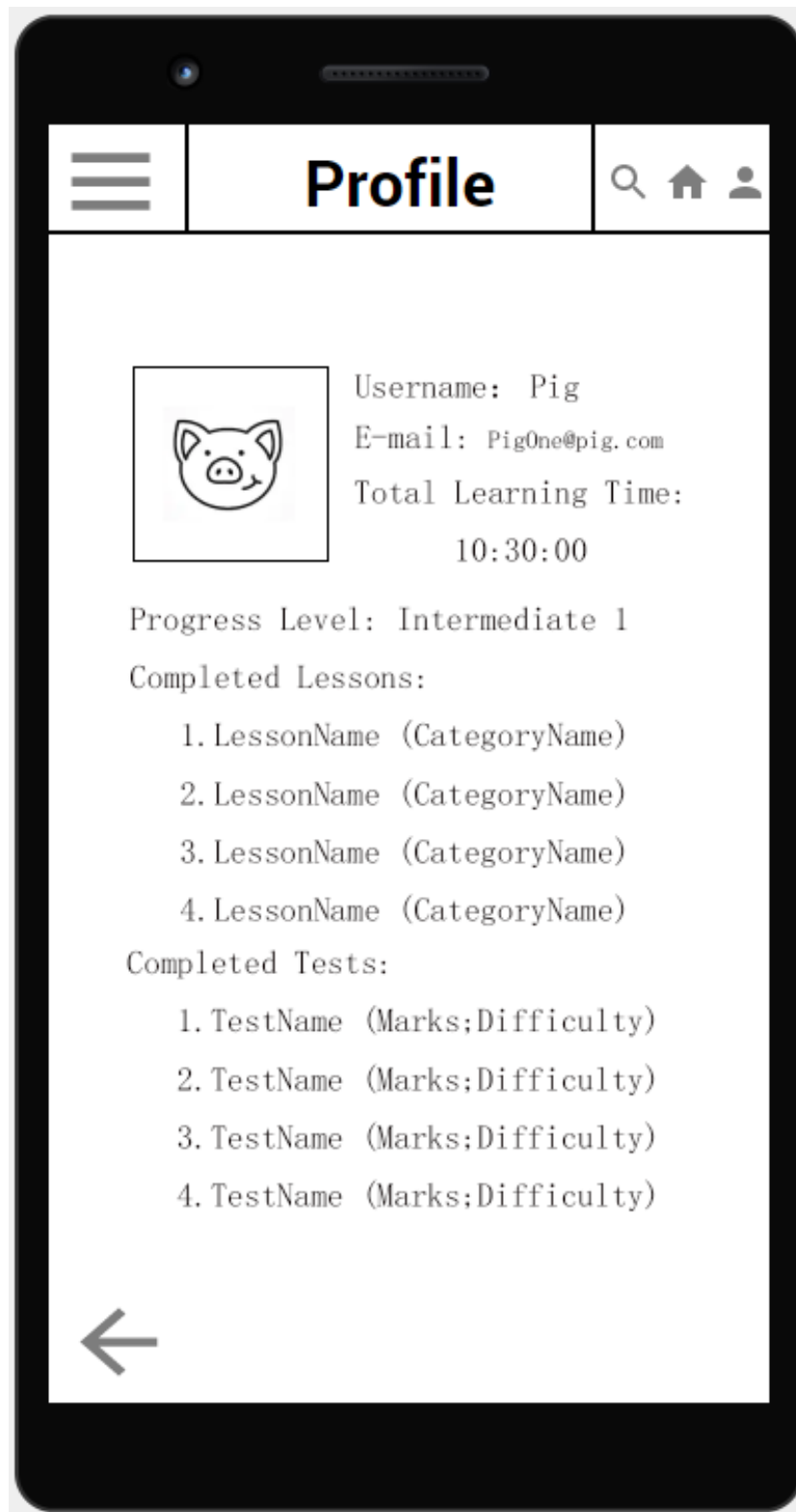


Figure 6-5: Navigate from home page to profile page by user button

3. Lessons

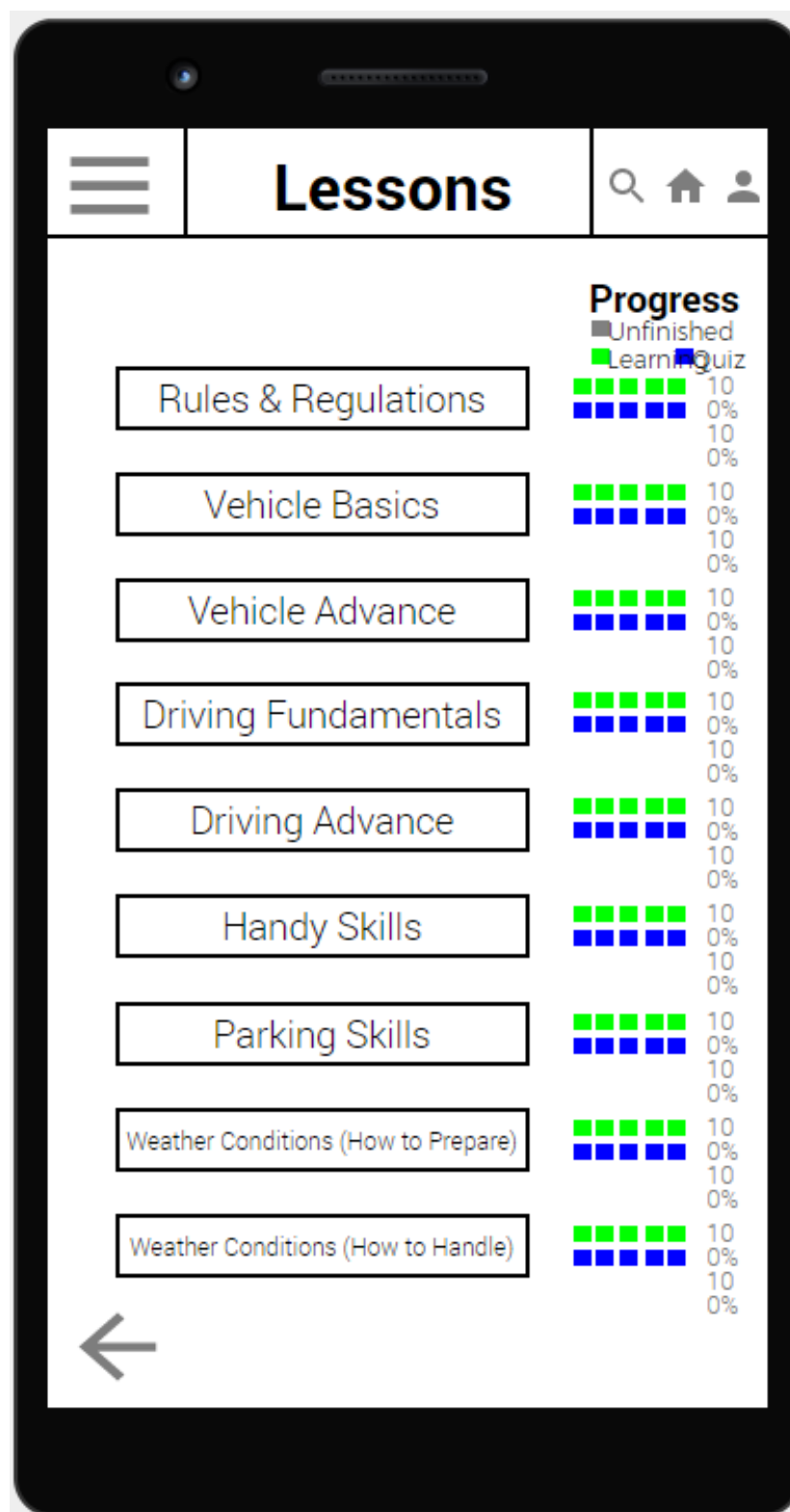


Figure 6-6: Lessons page

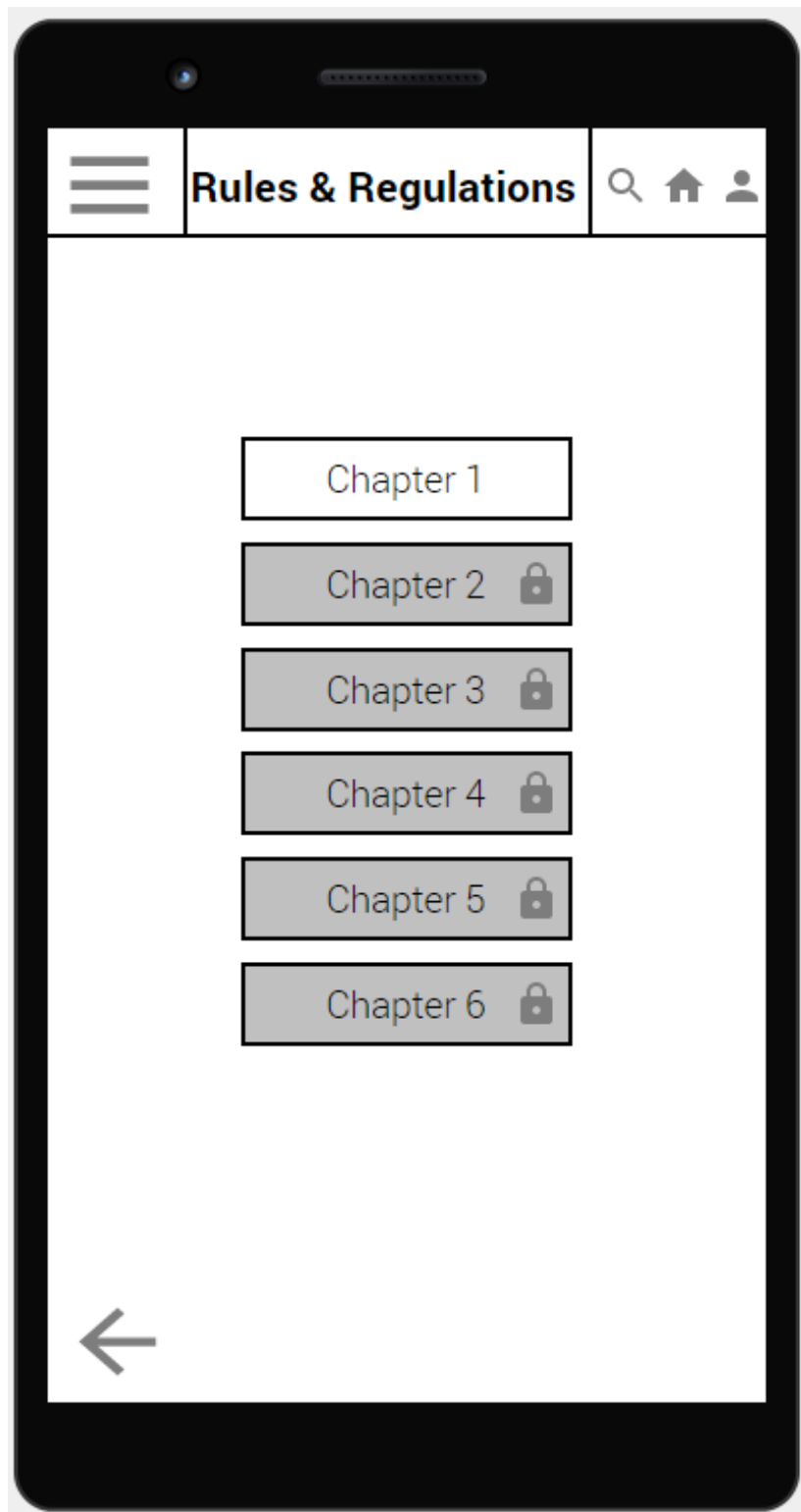


Figure 6-7: Chapter option page

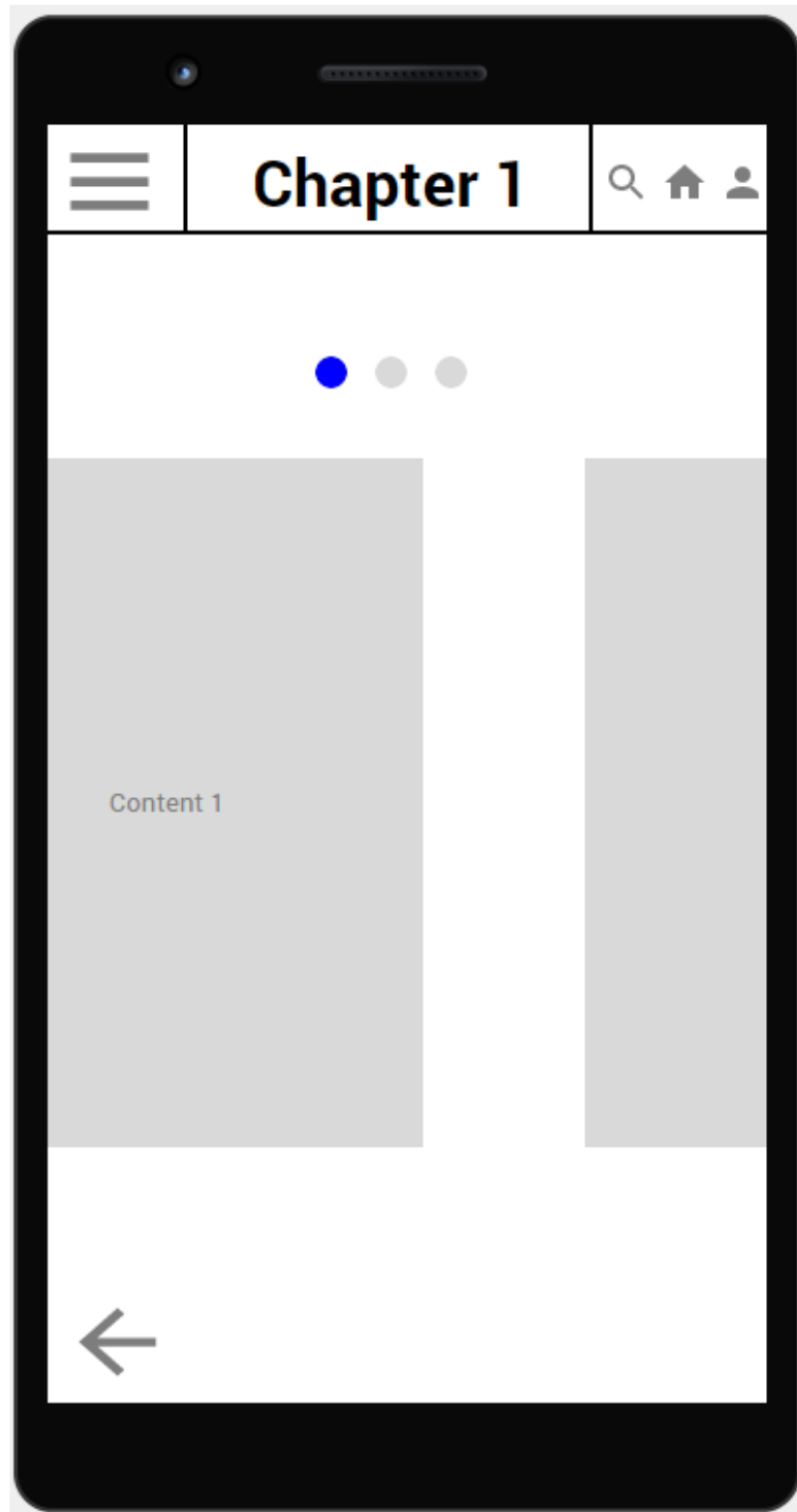


Figure 6-8: Lesson content page (while page switch checking)

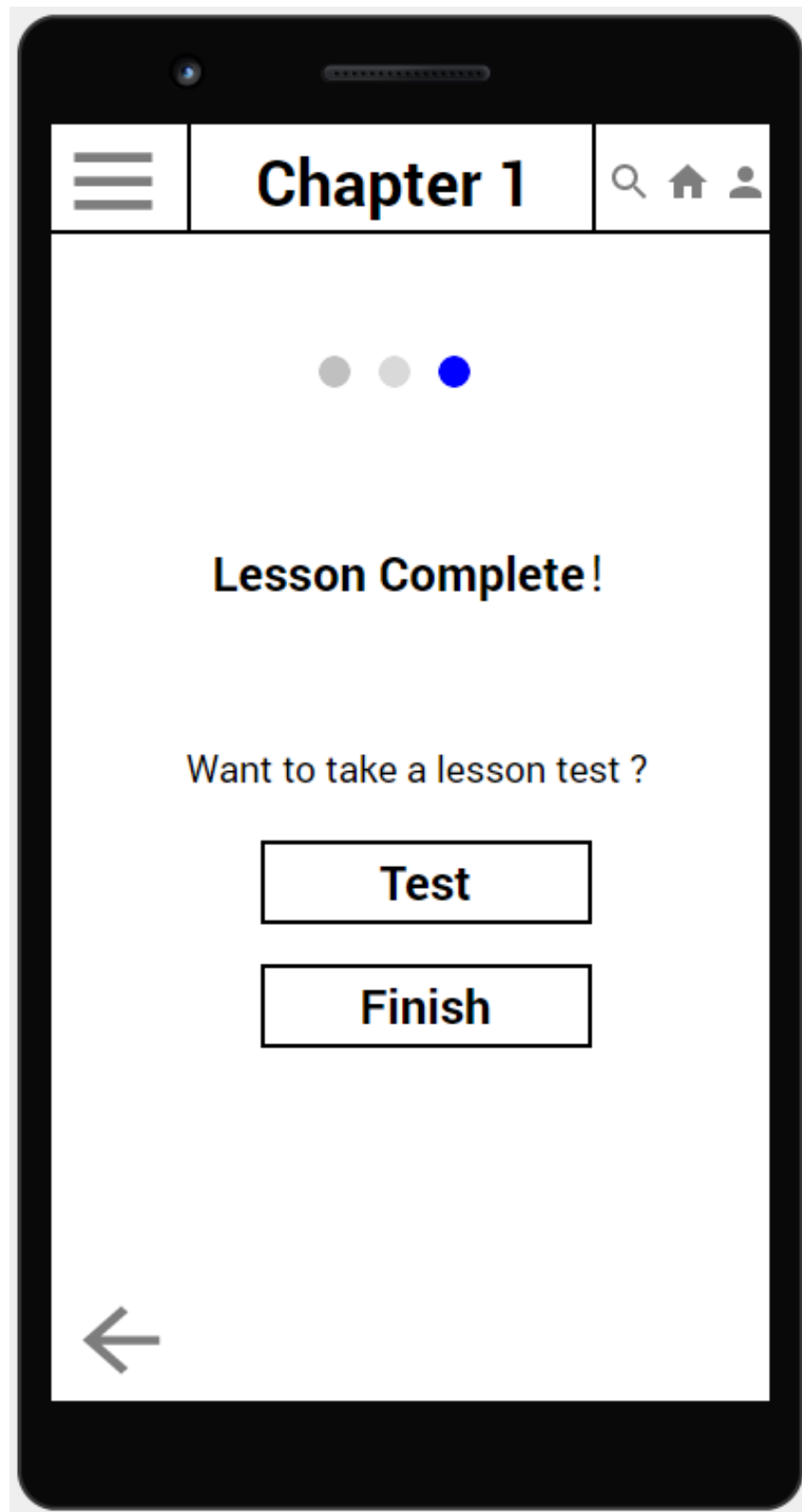


Figure 6-9: Lesson complete page

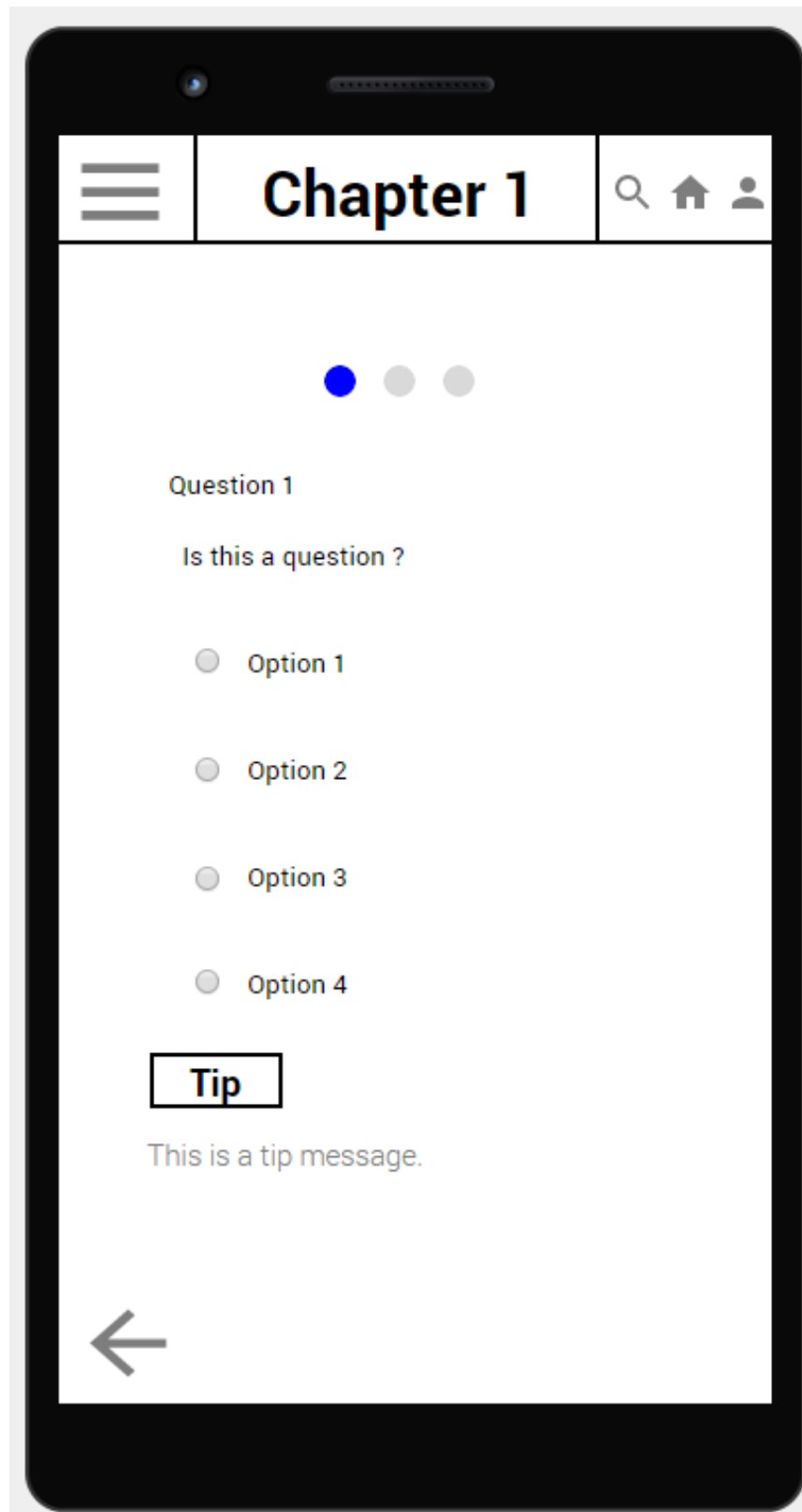


Figure 6-10: Lesson's instant test page

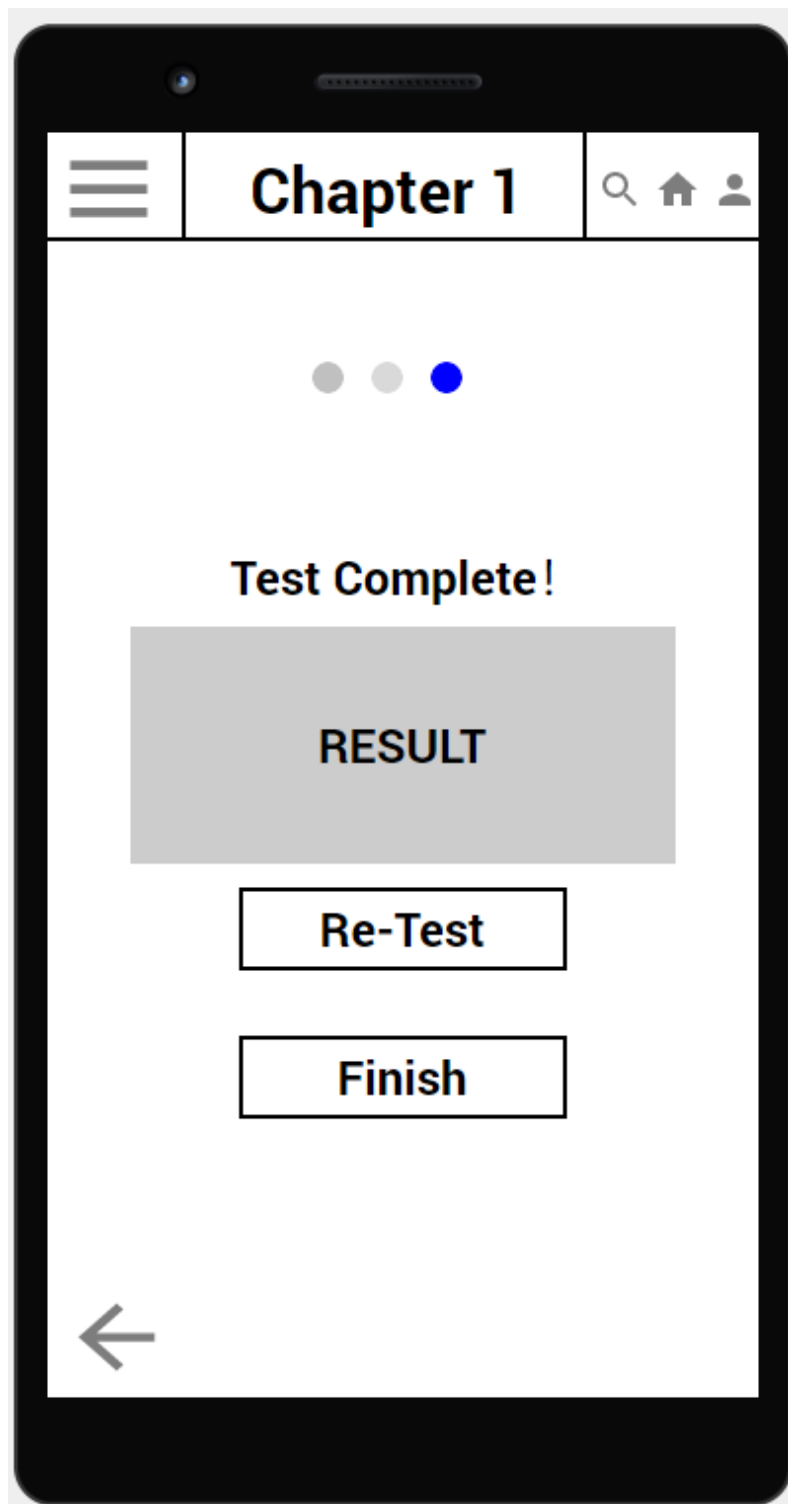


Figure 6-11: Test complete page

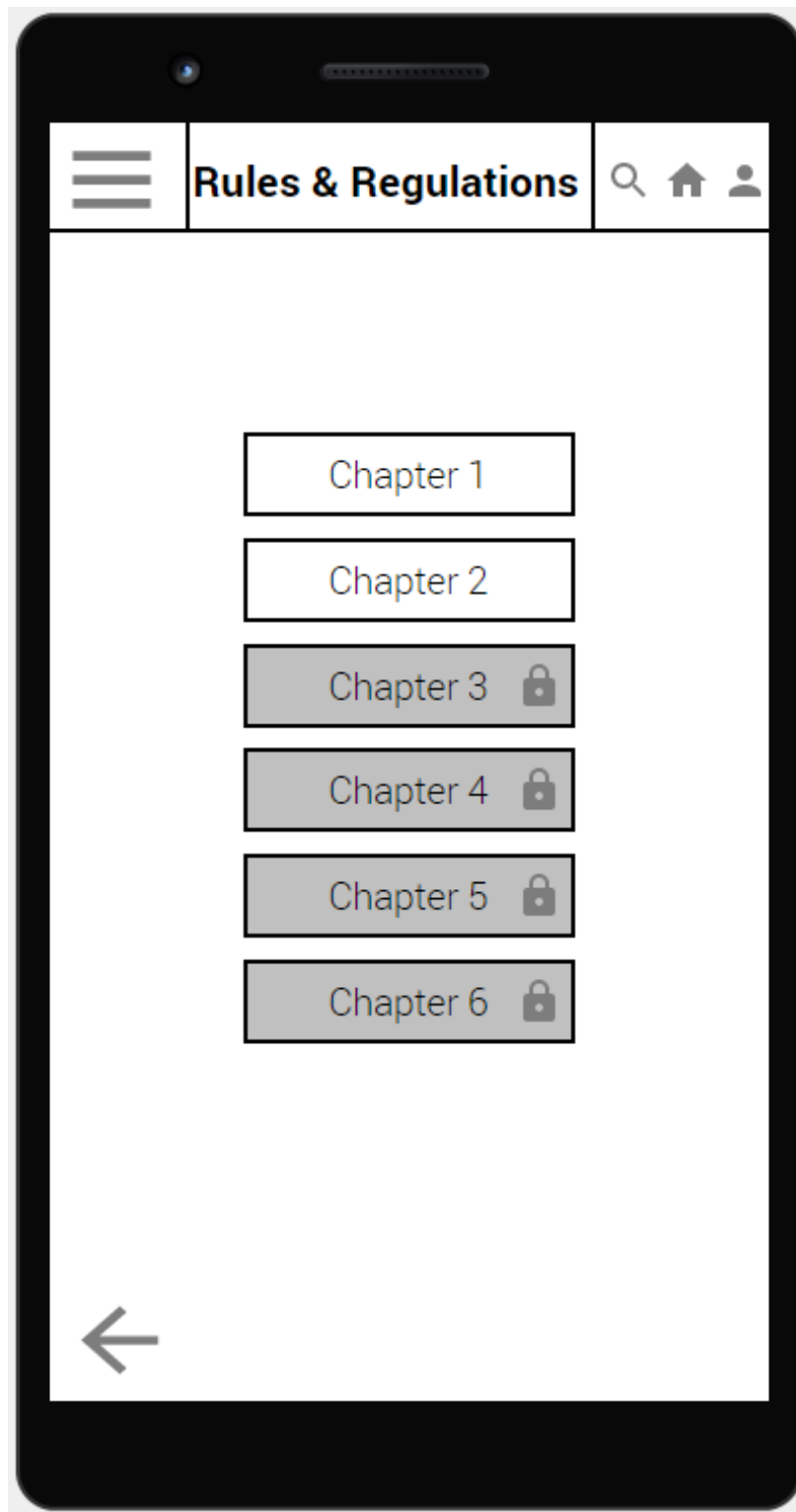


Figure 6-12: Chapter option page (Chapter 2 is unlocked)

4. Tests

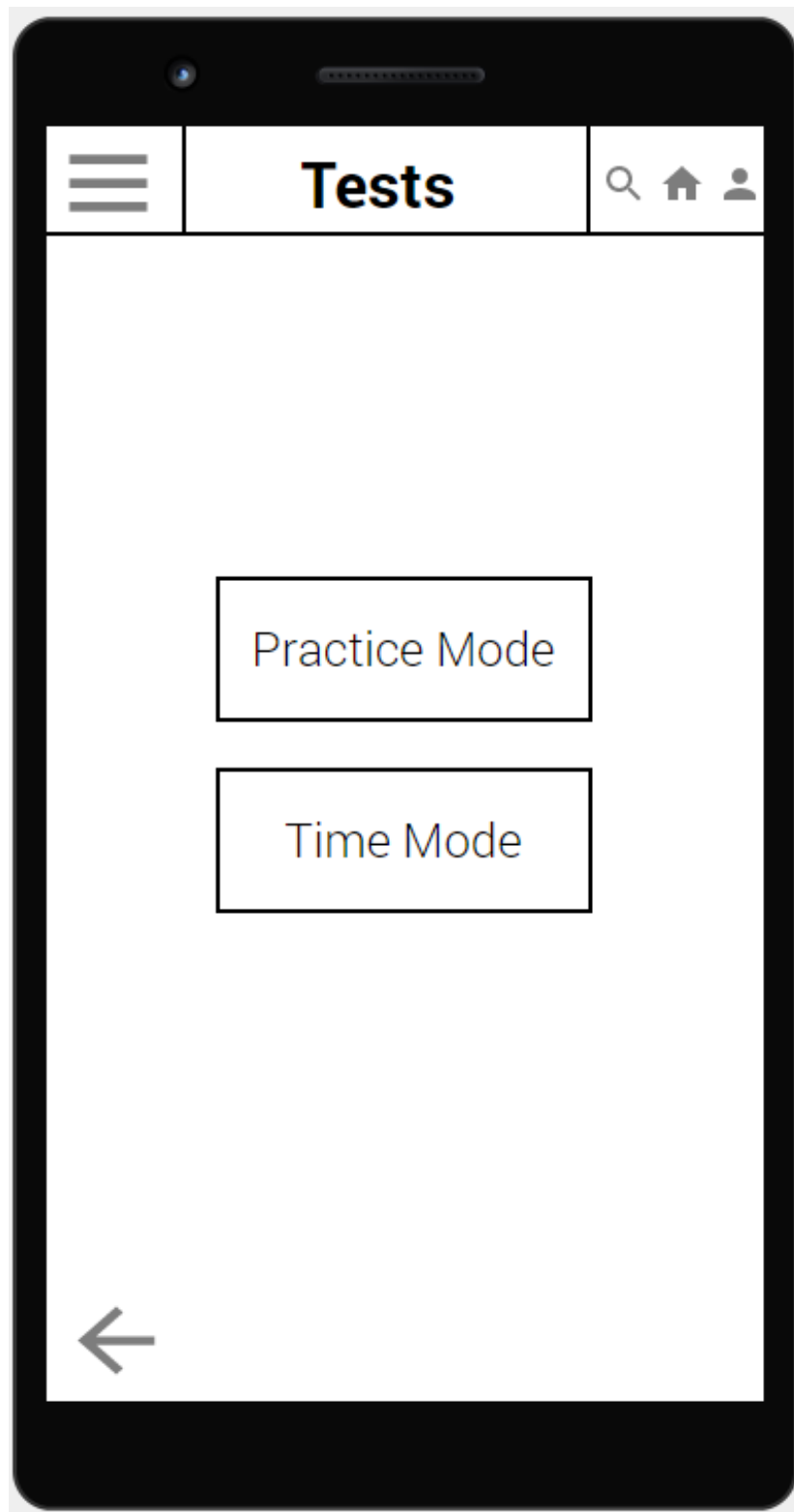


Figure 6-13: Tests page (Mode option)

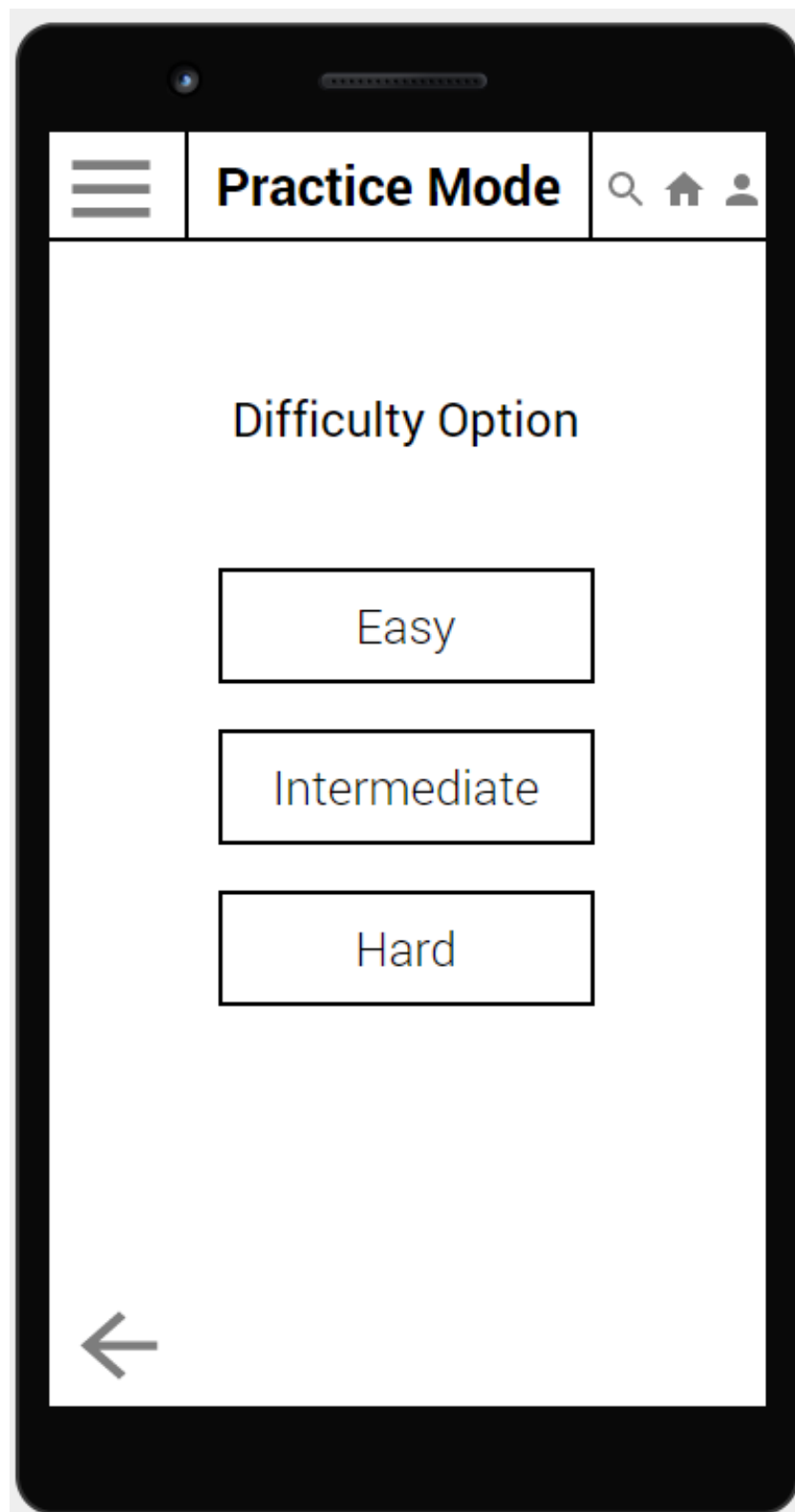


Figure 6-14: Difficulty option page

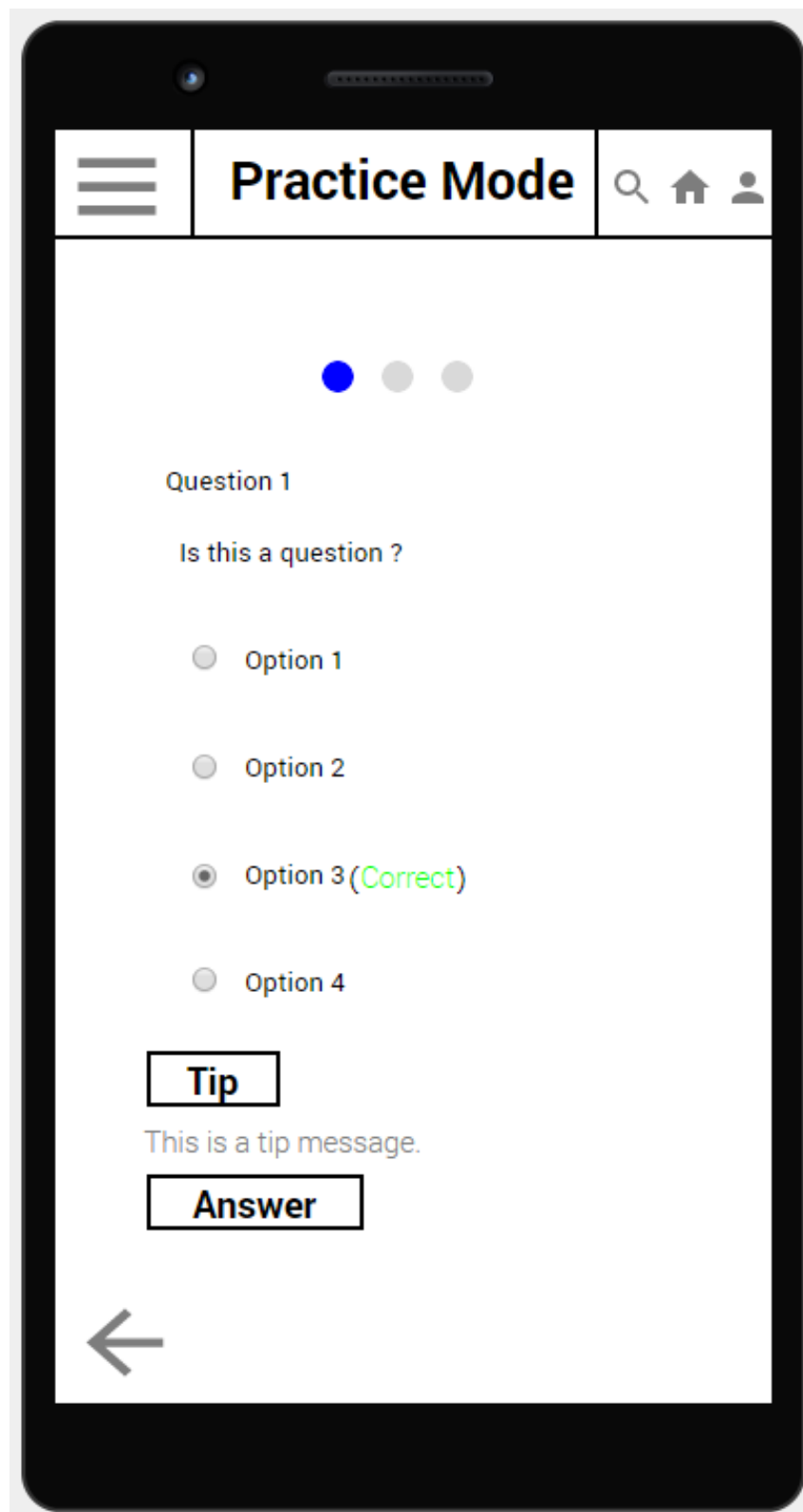


Figure 6-15: Practice mode test page

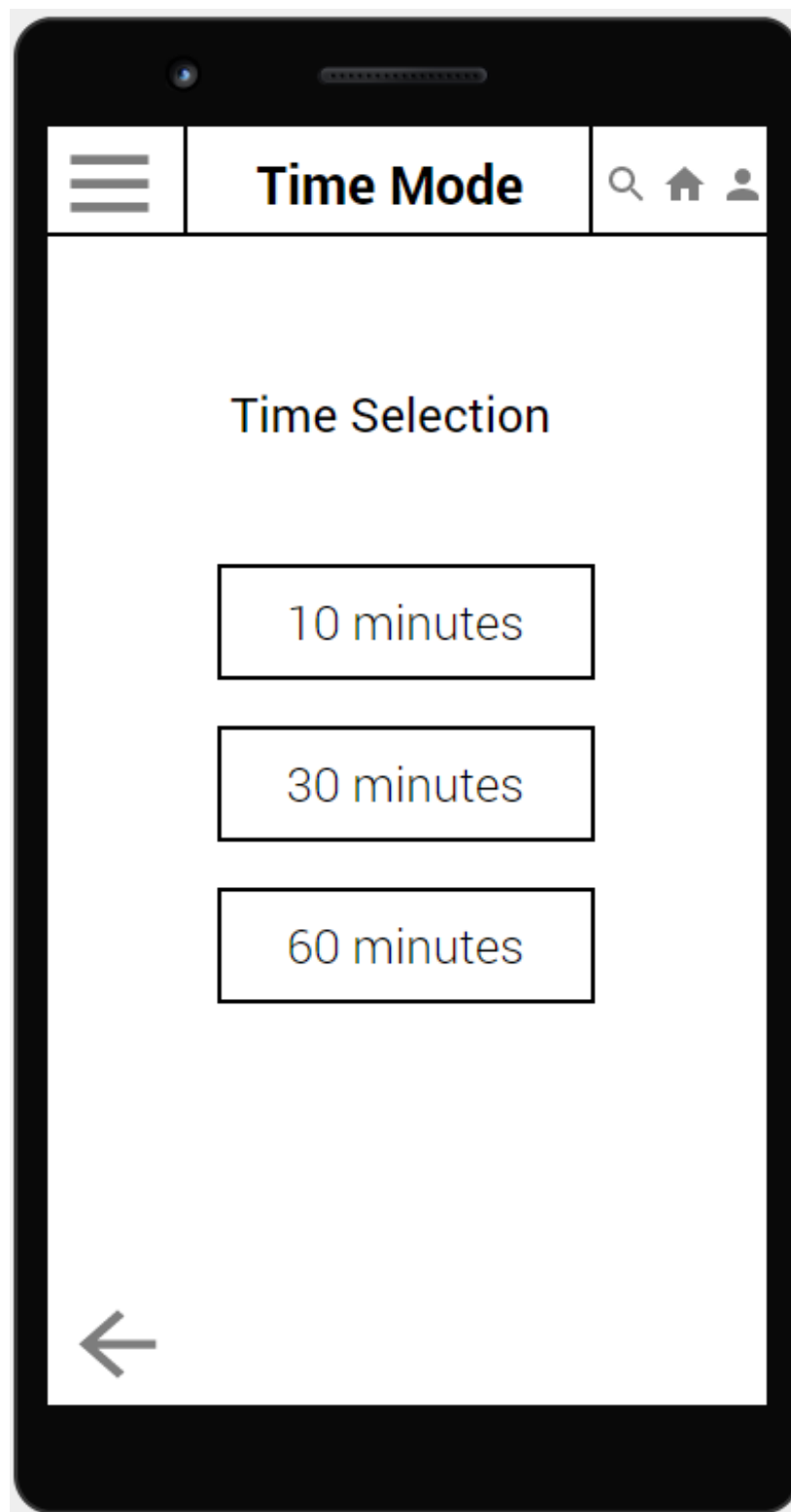


Figure 6-16: Time selection page

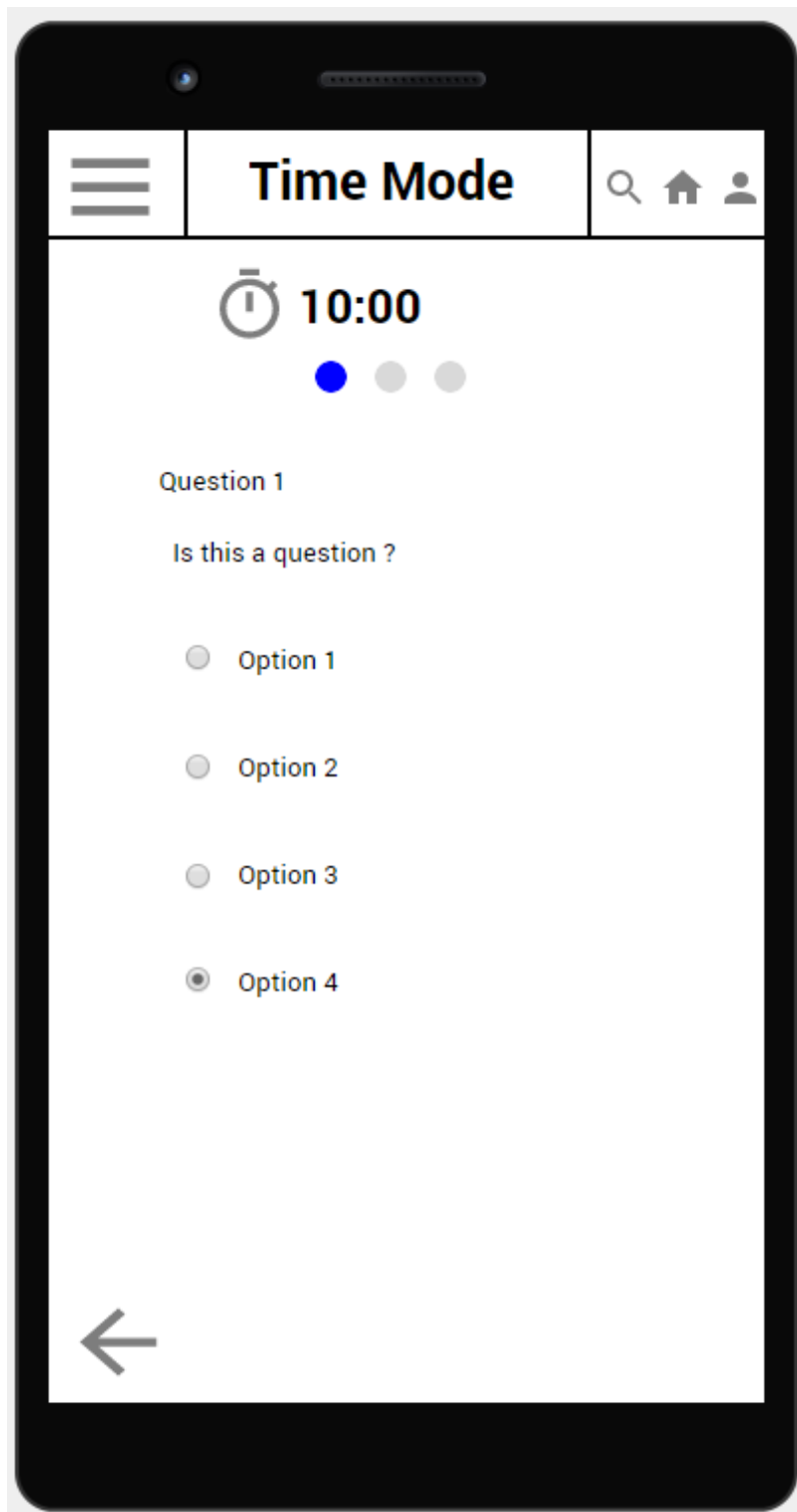


Figure 6-17: Time mode test page (without tips and answers)

5.Resources

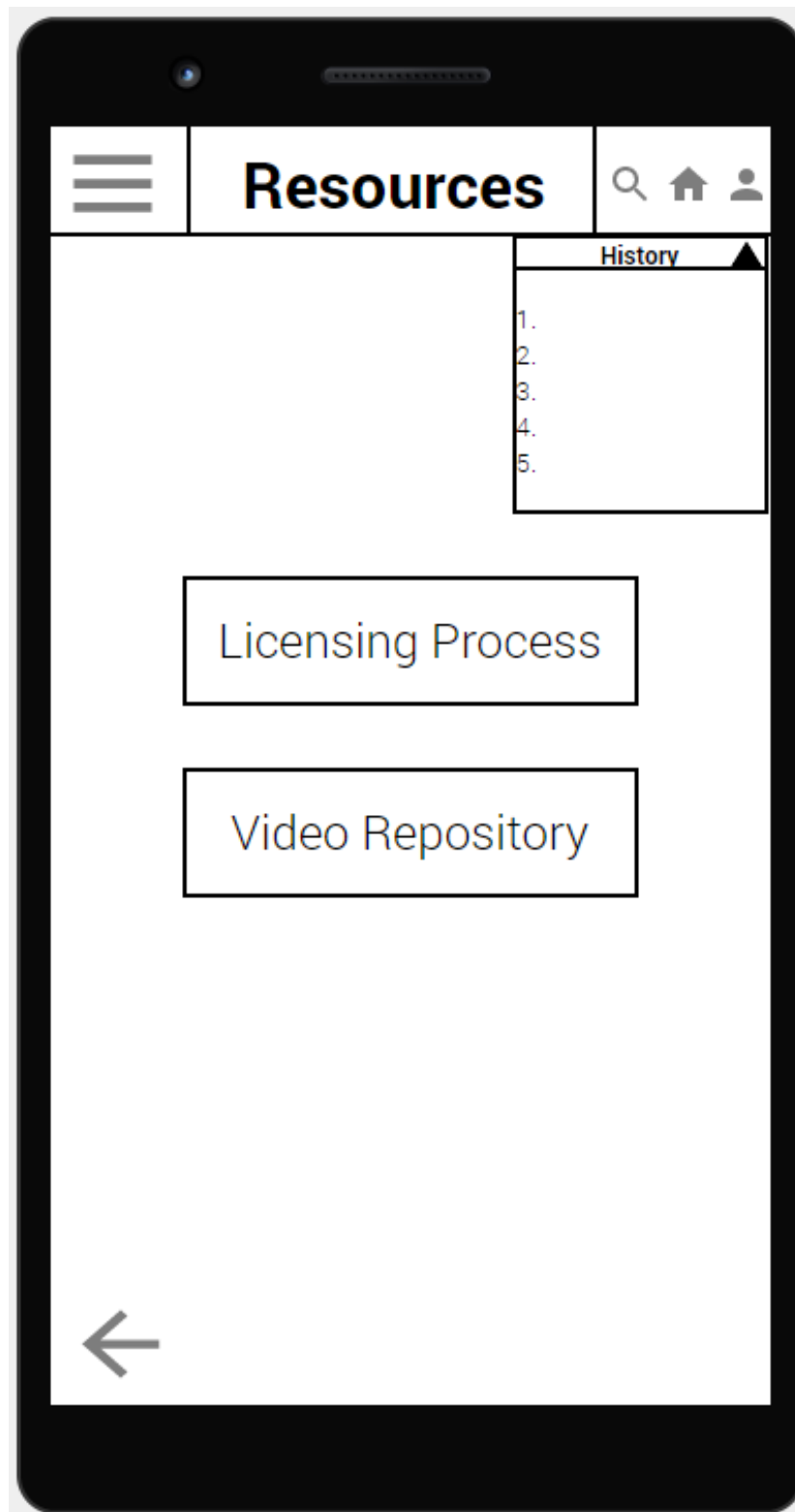


Figure 6-18: Resources page (unfold history window)

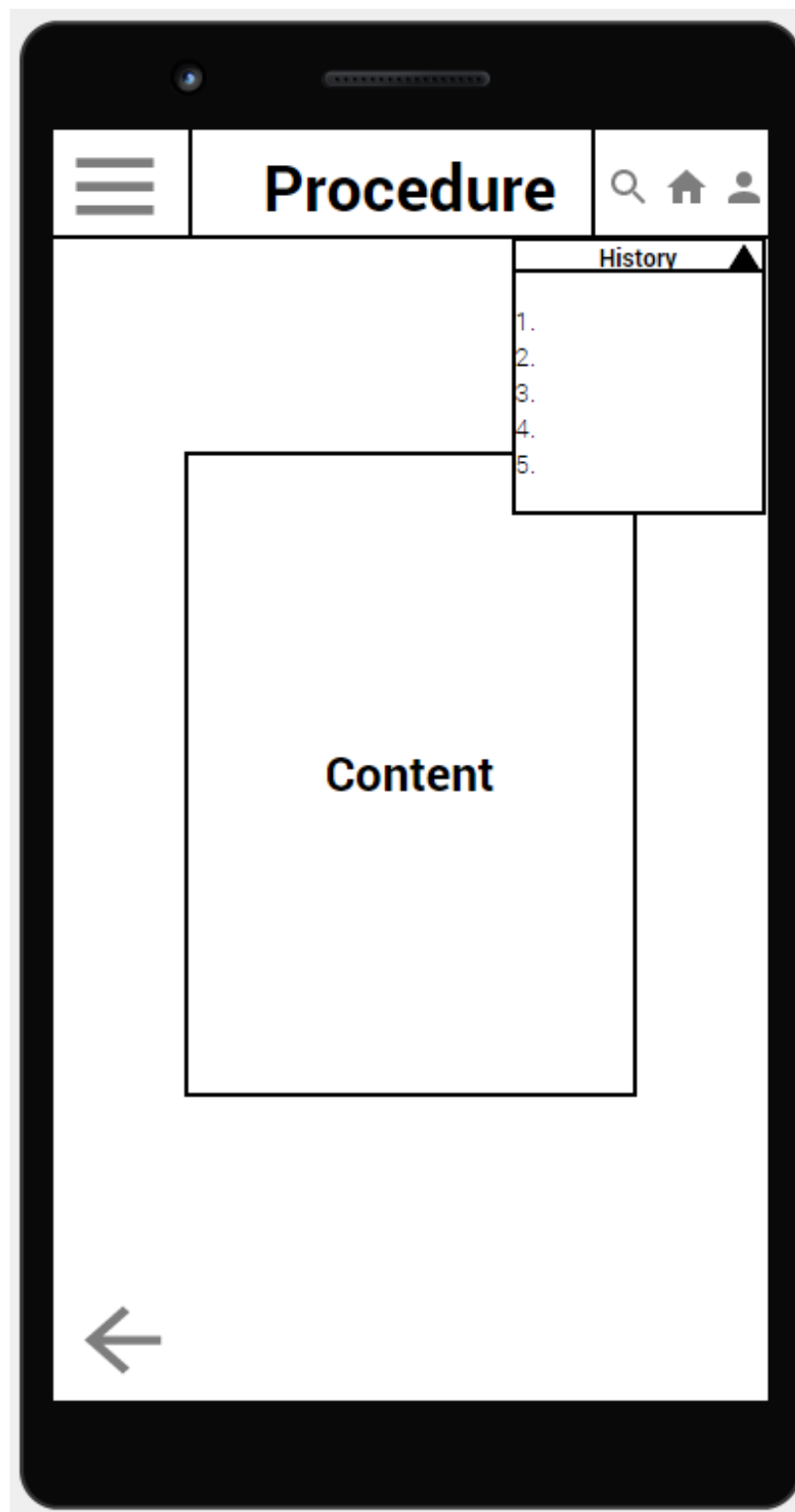


Figure 6-19: Procedure page

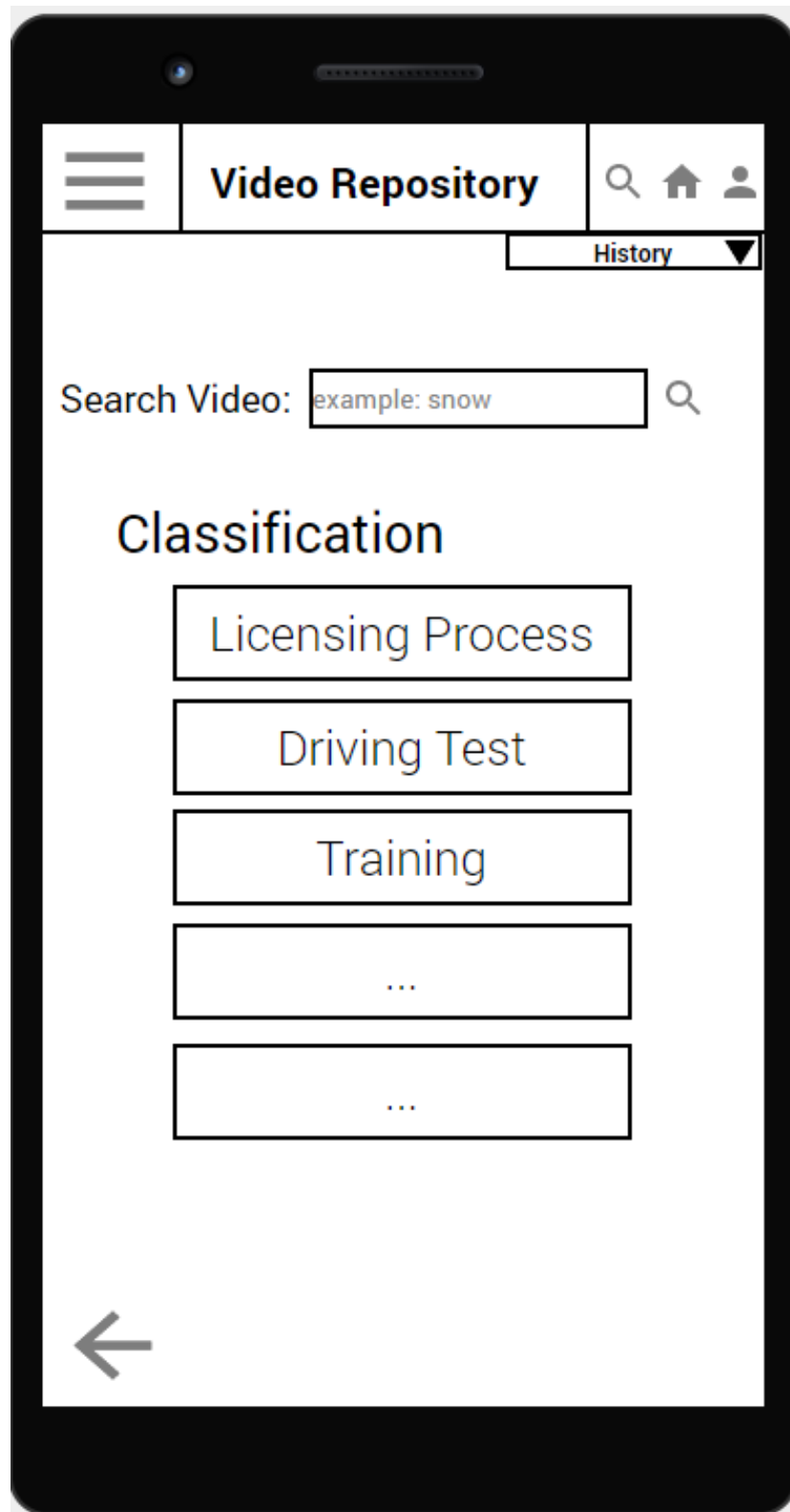


Figure 6-20: Video repository page

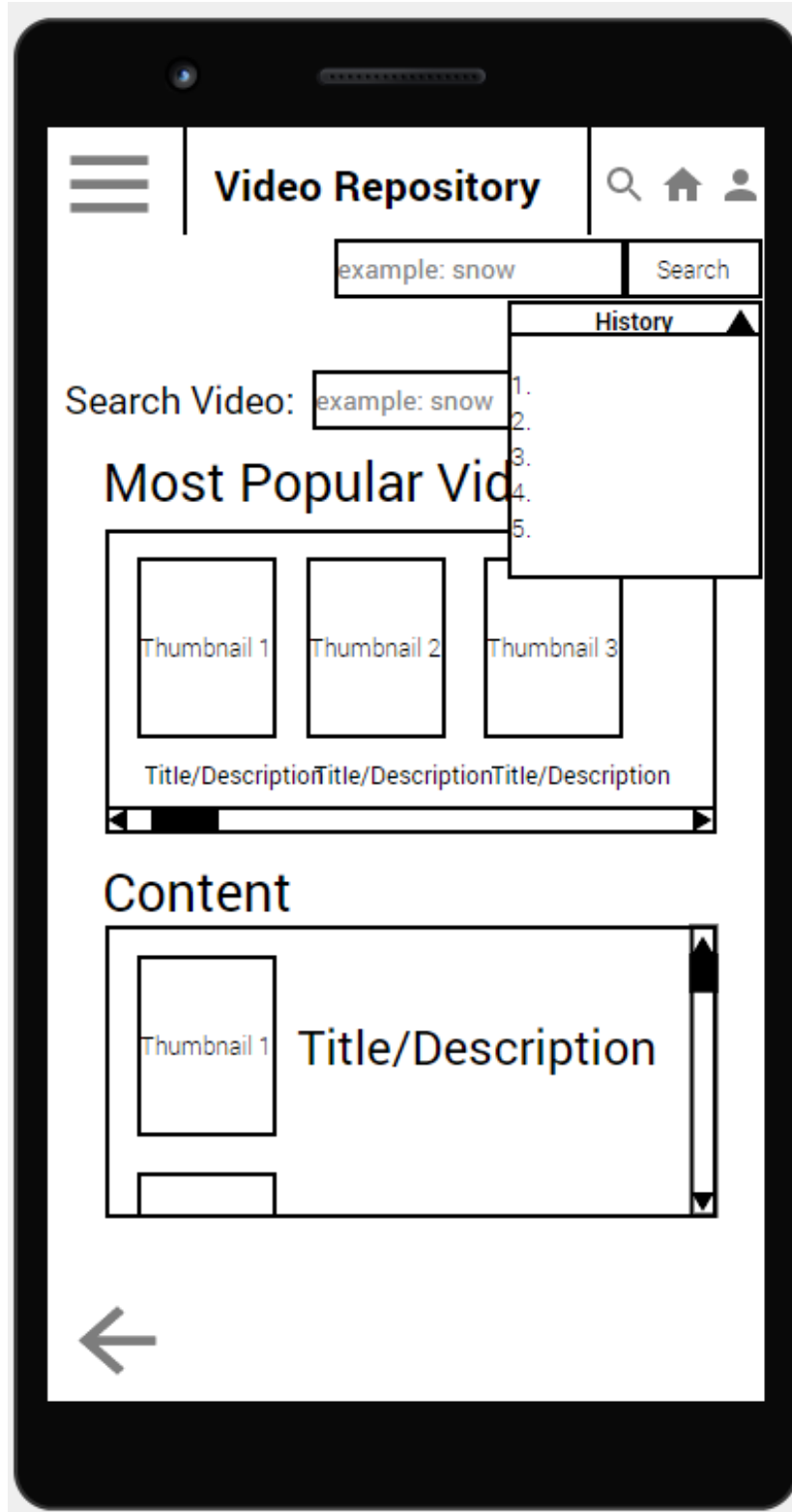


Figure 6-21: Video repository page 2

Test scenario and case tables

Login					
S.No.	Test Scenario	Test Case	Precondition(s)	Steps	Expected Result
1	Login	User can login	Login Screen with default language (English)	Give username and password and then click on sign-in button	User should be able to log-in and access home page
		Set preferred language and then user logs in	Login Screen with default language (English)	Observe contents in English, give username and password and then click on sign-in button	User should see the contents in English and able to log-in and access home page
			Login Screen with default language (French/ Francais)	Observe contents in French, give username and password and then click on sign-in button	User should see the contents in French and able to log-in and access home page
		User can sign up	Login Screen with default language (English)	Click on sign up page	User can access sign up page

Home					
1	Home	All services are listed	Home Page	Observe contents	User should see the services - Lessons, Tests and Resources
		Accessibility to drop down menu	Home Page	Click on the triple horizontal bars on the left of the top of the screen	User should access the drop down menu containing shortcuts to subcomponents of the system and logout options
		Access to search function	Home Page	Click on search icon on the right of the top of screen	A text box should be popped out just below the search icon where user may input a text. There should be a search button near the textfield.
		Access to profile details	Home Page	Click on the person icon on the right of the top of screen	User should see his/her profile details
		Navigation facility	Home Page	Click on the lessons button and then click on the ← at the bottom of the page	User should come back to the Home Page
		Access to Home Page	Home Page	Click on the lessons button and then the Home icon (next to it)	User should come back to the Home Page from the profile details page

Group 6 – Usability Study Design

Lessons					
1	Lessons from Home Page	Level of Progress for lesson reading	Home Page	Click on lessons and then Observe Contents	User can see the learning progress for every lessons
		Level of Progress for lesson quiz	Home Page	Click on lessons and Observe Contents	User can see the quiz progress for every lessons
		Accessibility to Rules and Regulations	Lessons Page	Click on Rules and Regulations	User should see list of chapters
		Accessibility to Chapters	Lessons Page	Click on Rules and Regulations and then Chapter 1	User should access the lesson content
		Completion of chapter	Lessons Page	Click on Rules and Regulations and then Chapter 1 and drag contents from right to left till the end	User can access the content and complete the chapter. User gets meaningful message after the chapter is completed.
			Lessons Page	Click on Rules and Regulations and then Chapter 1 and drag contents from right to left till the end and the click on finish button	Once finish button is clicked, user should access Rules and Regulations Page with Chapter 2 is unlocked
		Access Lesson quiz	Lessons Page	Click on Rules and Regulations and then Chapter 1 and drag contents from right to left till the end and the click on test button	Once test button is clicked, user should access lesson quiz page with options to quizzes and tips for the question
			Lessons Page	Click on Rules and Regulations and then Chapter 1 and drag contents from right to left till the end and the click on test button and drag questions from right to left	Once the quiz is over, user should access lesson quiz page with options to quizzes and tips for the question confirmed with test completion feedback/result

Group 6 – Usability Study Design

Test					
1	Test Page	Navigate to Test from Home Page	Click on Tests Button from home page	User should be in Home Page	Test Page should be displayed
2	Practice Mode	User should be able to access Practice mode from Test Page	Click on Practice Mode from Test Page	User should be in Test Page	Practice Mode page should be displayed
		selection of difficulty option from Practice Mode Page	Click on Easy/Intermediate/Hard option from Practice Mode page	User should be in Practice Mode	User should be able to select easy/intermediate/Hard one at a time
		User should be able to give test	On click of Easy/Intermediate/Hard level from Practice Mode for respective level	User should be in Practice Mode	Test should start
		Tips should be displayed	On clicking Tips button, tip should be displayed	User should be in Practice Mode	Tips should be displayed
		Answer should be displayed	On clicking Answer button, solution should be displayed.	User should be in Practice Mode	Answer should be displayed
		Navigation to different questions from practice Mode Page	On clicking ←, user navigates to previous question	User should be in Practice Mode	User should navigate back to previous question
			On clicking →, user can navigate to next question	User should be in Practice Mode	User should navigate to next question
		Complete Test	Re-test allows user to restart the test	User should be in Practice Mode	Test should start again
			Finish redirects user to Practice Mode	User should be in Practice Mode	User should be redirected practice mode page
		User should be able to go back from Practice Mode to Test page	On clicking ←, user navigates from Practice Mode Page to Test page.	User should be in Practice Mode	User should navigate back to Test page
3	Time Mode	User should be able to access Time mode from Test Page	Click on Time Mode from Test page	User should be in Test Page	Time Mode Page should be displayed
		Selection of Time duration for test from Time Mode page	Click on 10mins/ 30mins/ 60mins from Time Mode page	User should be in Time Mode	User should be able to select 10mins/ 30mins/ 60mins test one at a time
		User should be able to give test	On click of 10mins/ 30mins/ 60mins from Time Mode page should start the test	User should be in Time Mode	Test should start
		Navigation to different questions from Time Mode page	On clicking ←, user navigates to previous question	User should be in Time Mode	User should navigate back to previous question
			On clicking →, user can navigate to next question	User should be in Time Mode	User should navigate to next question
		Complete Test	Re-test allows user to restart the test	User should be in Time Mode	Test should start again
			Finish redirects user to Time Mode	User should be in Time Mode	User should ne redirected to Time Mode page

Group 6 – Usability Study Design

Resources					
1	Resources Page	Navigate to Resources Page from Home Page	Click on Resources Button from home page	User should be in Home Page	Resources Page should be displayed
2	Home Page	Navigate to Home Page from Resources Page	Click on home icon button	User should be in Resources Page	Home Page should be displayed
		Navigate to Home Page from Resources Page	Click on ← from resources page	User should be in Resources Page	Home Page should be displayed
3	Resources/Licensing Process	Navigate to Licensing Process	Click on Licensing Process button from Resources Page	User should be in Resources Page	Licensing Process Page should be displayed
4	Procedure Page	Navigate to Procedure Page from Licensing Process	Click on Procedure button from Licensing Page	User should be in Licensing Process	Procedure Page should be displayed
	Alert message pop up		On clicking the link from Procedure Page alert pop's out	User should be in Procedure Page	Alert Messgae Pop Up should be displayed
			On clicking Ok on Alert Pop Up, user navigates to the selected link	User should be in Procedure Page	Selected link page will be displayed
			On clicking Cancel, user remains in the Procedure Page	User should be in Procedure Page	User remains In the same page
		Navigate to Licensing Process Page from Procedure Page	Click on ← from Procedure page	User should be in Procedure Page	Licensing Process Page should be displayed
5	Video Repository	Navigate to Video Repository Page from Resources Page	Click on Video Repository button from Resources page	User should be in Resources Page	Video Repository Page should be displayed
		Search video from the video repository page	click on search button from video repository.	User should be in video repository page	Seach result should be displayed
		Navigate to Licensing Process	Click on Licensing process button from Video Repository Page	User should be in video repository page	Licensing Process Page should be displayed
	Alert message pop up		On clicking Video link from the video repository Page, alert message pop's out.	User should be in video repository page	Alert Messgae Pop Up should be displayed
			On clicking Ok on Alert Pop Up, user navigates to the selected link	User should be in video repository page	Selected link page will be displayed
			On clicking Cancel, user remains in the Video Repository Page	User should be in video repository page	User remains In the same page

Test data collection and analysis template



LessonNHomeNLog
in Test Cases v11.xls:

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