

1. User Acceptance Tests

1.1 System State Diagram

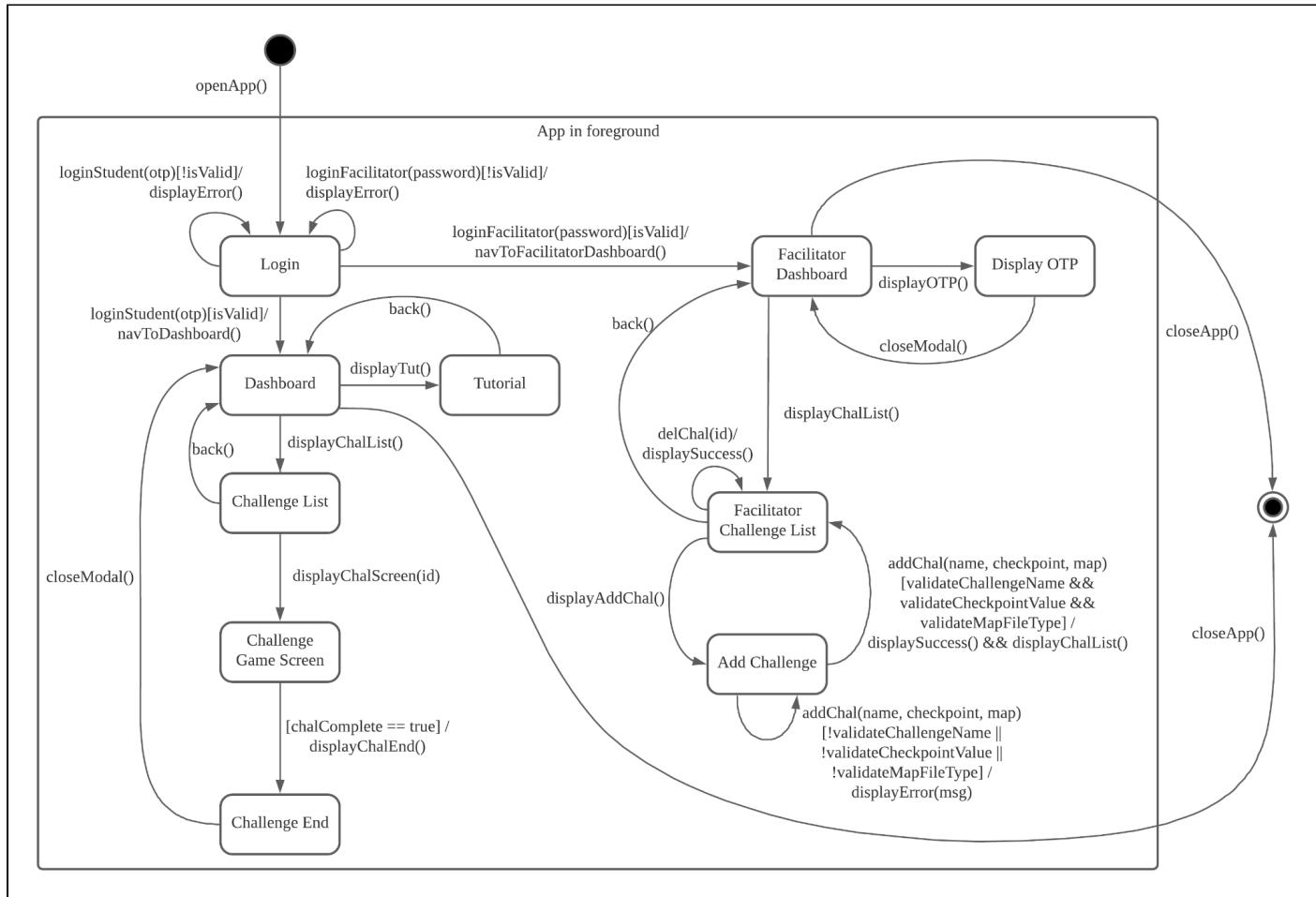


Figure 1: System State Diagram.

The System State Diagram has been updated due to changes made during software development in Milestone 3 (M3). Refer to *Section 1.2* of this document for the changes.

1.2 Changes to System state Diagram in Milestone 3

The System State Diagram has also been updated for M3 project deliverables.

1.2.1 Removal of *Car Connection Status* transition in *Challenge Game Screen* state

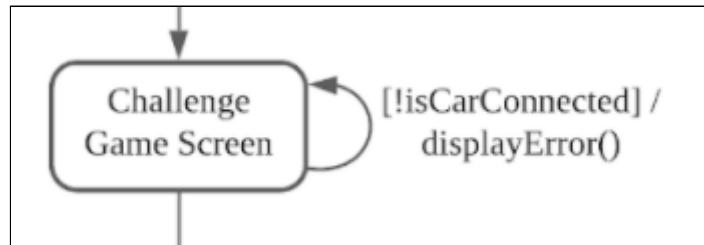


Figure 2: Removed transition (Image from Milestone 2 System State Diagram).

The transition and its relevant System Test (ST22) has been removed as it does not appear in Version 1.0.0 of the actual delivered product, which is the version the User Acceptance Test (UAT) was conducted on.

1.2.2 Changed *App Closure* transition to *Dashboard* state

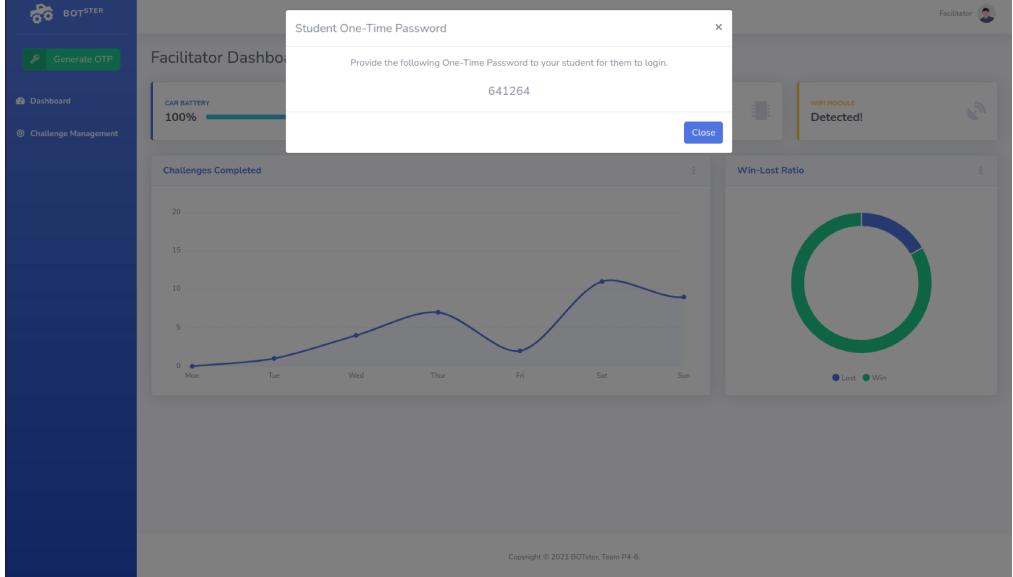
Instead of closing the BOTster web application from the *Challenge End* state from the Student actor's perspective, the transition now will begin from the *Dashboard* state.

1.2.3 Renamed *back* transition to *closeModal* transition for *Challenge End* state

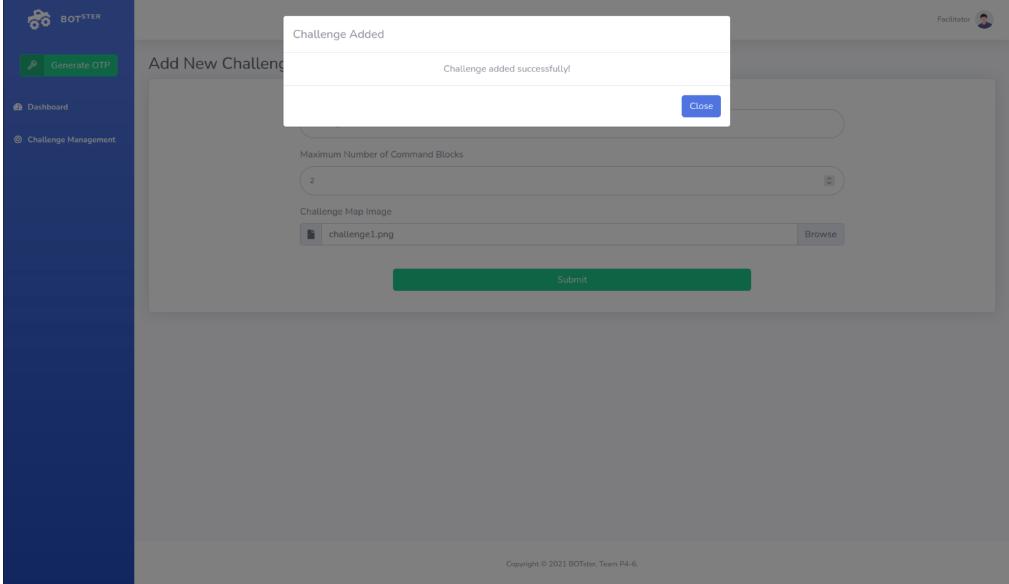
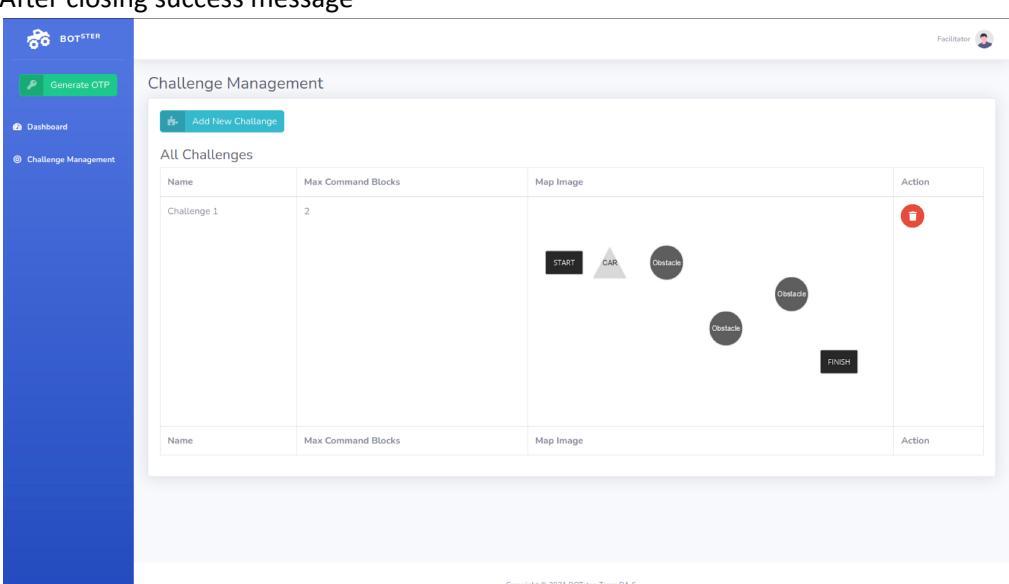
To more accurately reflect the actual state change in the product itself, the naming of the transition was modified since the state change to *Dashboard* state will occur only when a Modal is closed in the *Challenge End* state.

1.3 System Test Cases (User Acceptance Test)

1.3.1 Generate One-Time Password

System Test Identifier	ST1
Relevant Use Case ID	UC11
System Test Name	Generate One-Time Password
Preconditions	<ol style="list-style-type: none"> 1. Tester is signed in as Facilitator 2. Tester is on the Facilitator Dashboard page
Steps	<ol style="list-style-type: none"> 1. Click on "Generate OTP" button 2. Observe screen
Expected Result	 <p>The screenshot shows the Facilitator Dashboard interface. A modal window titled "Student One-Time Password" is open in the center. It contains the instruction "Provide the following One-Time Password to your student for them to login." and the password "641264". There is a "Close" button at the bottom right of the modal. In the background, there's a "Challenges Completed" chart showing a weekly trend from Monday to Sunday, and a "Win-Lost Ratio" donut chart.</p>
Actual Result	
Pass/Fail	

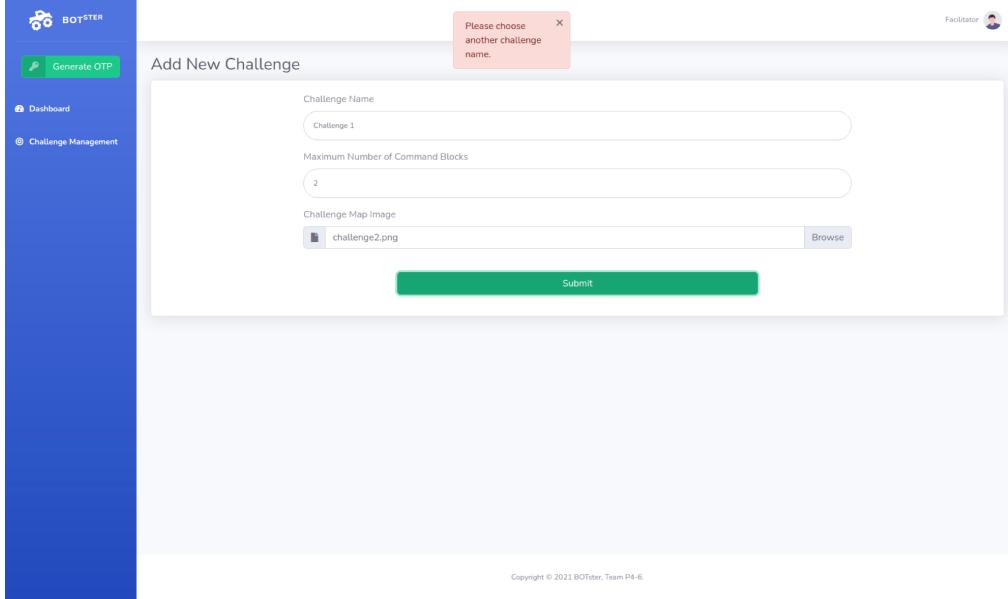
1.3.2 Add New Challenge

System Test Identifier	ST2
Relevant Use Case ID	UC13
System Test Name	Add New Challenge
Preconditions	<ol style="list-style-type: none"> 1. Tester is signed in as Facilitator 2. Tester is on the Facilitator Add Challenge page
Steps	<ol style="list-style-type: none"> 1. Input "Challenge 1" into the "Challenge Name" input box 2. Input "2" into the "Maximum Number of Command Blocks" input box 3. Click on "Upload Image" button 4. Select "challenge1.png" when prompted 5. Click on "Submit" button 6. Observe screen
Expected Result	 <p>After closing success message</p> 

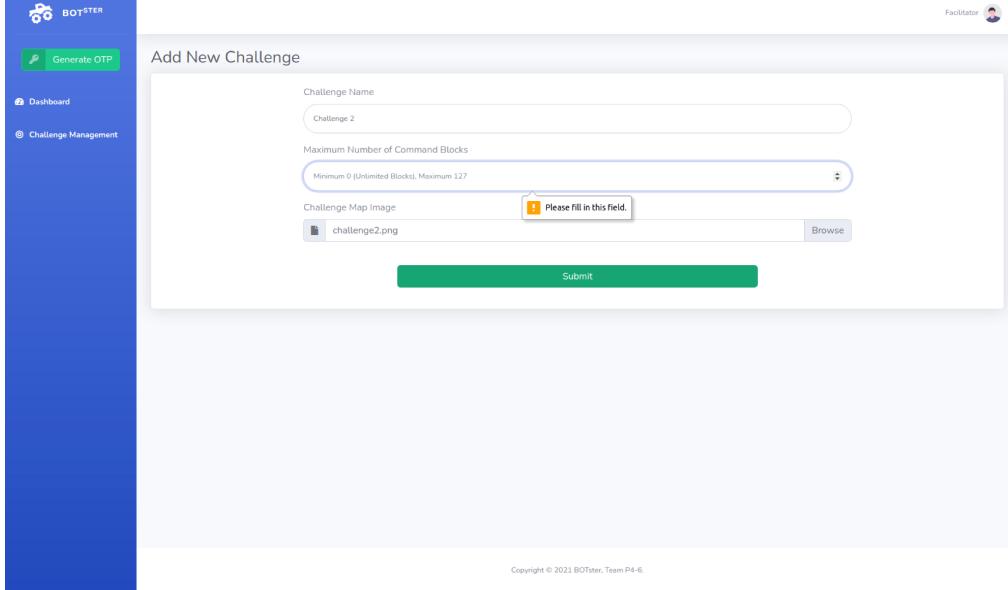
BOTster System Tests Documentation for User Acceptance Testing

Actual Result	
Pass/Fail	

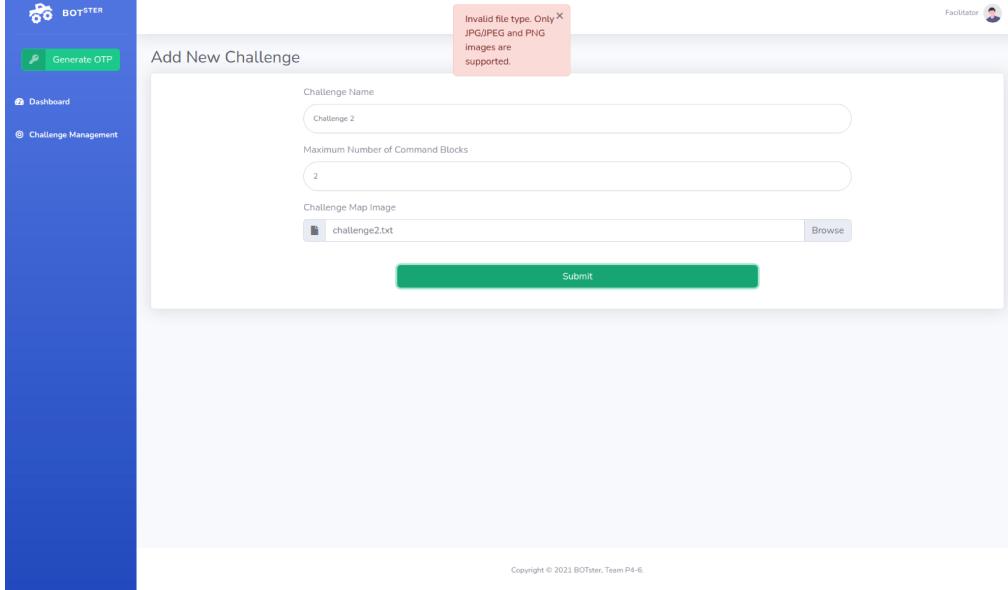
1.3.3 Duplicate Challenge Name When Adding Challenge

System Test Identifier	ST3
Relevant Use Case ID	UC13
System Test Name	Duplicate Challenge Name When Adding Challenge
Preconditions	<ol style="list-style-type: none"> 1. Tester is signed in as Facilitator 2. Tester is on the Facilitator Add Challenge page 3. Tester completed ST2 successfully
Steps	<ol style="list-style-type: none"> 1. Input "Challenge 1" into the "Challenge Name" input box 2. Input "2" into the "Maximum Number of Command Blocks" input box 3. Click on "Upload Image" button 4. Select "challenge2.png" when prompted 5. Click on "Submit" button 6. Observe screen
Expected Result	 <p>The screenshot shows the 'Add New Challenge' interface. On the left is a sidebar with 'Dashboard' and 'Challenge Management' options. The main area has fields for 'Challenge Name' (containing 'Challenge 1'), 'Maximum Number of Command Blocks' (containing '2'), and 'Challenge Map Image' (with a file named 'challenge2.png' selected). A red error message box at the top right displays the text 'Please choose another challenge name.' A green 'Submit' button is located at the bottom of the form.</p>
Actual Result	
Pass/Fail	

1.3.4 Invalid Max Command Block Value When Adding Challenge

System Test Identifier	ST4
Relevant Use Case ID	UC13
System Test Name	Invalid Checkpoint Value When Adding Challenge
Preconditions	<ul style="list-style-type: none"> 1. Tester is signed in as Facilitator 2. Tester is on the Facilitator Add Challenge page
Steps	<ol style="list-style-type: none"> 1. Input "Challenge 2" into the "Challenge Name" input box 2. Leave the "Maximum Number of Command Blocks" input box empty 3. Click on "Upload Image" button 4. Select "challenge2.png" when prompted 5. Click on "Submit" button 6. Observe screen
Expected Result	
Actual Result	
Pass/Fail	

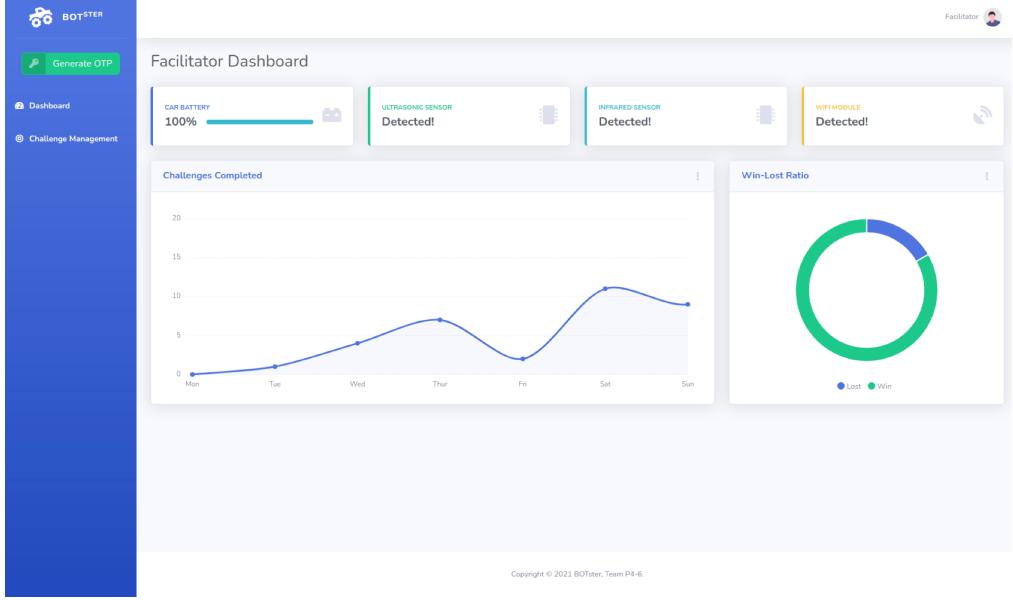
1.3.5 Invalid File Uploaded When Adding Challenge

System Test Identifier	ST5
Relevant Use Case ID	UC13
System Test Name	Invalid File Uploaded When Adding Challenge
Preconditions	<ul style="list-style-type: none"> 1. Tester is signed in as Facilitator 2. Tester is on the Facilitator Add Challenge page
Steps	<ul style="list-style-type: none"> 1. Input "Challenge 2" into the "Challenge Name" input box 2. Input "2" into the "Maximum Number of Command Blocks" input box 3. Click on "Upload Image" button 4. Select "challenge2.txt" when prompted 5. Click on "Submit" button 6. Observe screen
Expected Result	 <p>The screenshot shows the 'Add New Challenge' form. On the left is a sidebar with 'BOTSTER' logo, 'Generate OTP' button, 'Dashboard' link, and 'Challenge Management' link. The main area has a title 'Add New Challenge'. It contains fields for 'Challenge Name' (set to 'Challenge 2'), 'Maximum Number of Command Blocks' (set to '2'), and 'Challenge Map Image'. A file input field shows 'challenge2.txt' selected. A red error message box at the top right says: 'Invalid file type. Only JPEG/PNG images are supported.' A green 'Submit' button is at the bottom.</p>
Actual Result	
Pass/Fail	

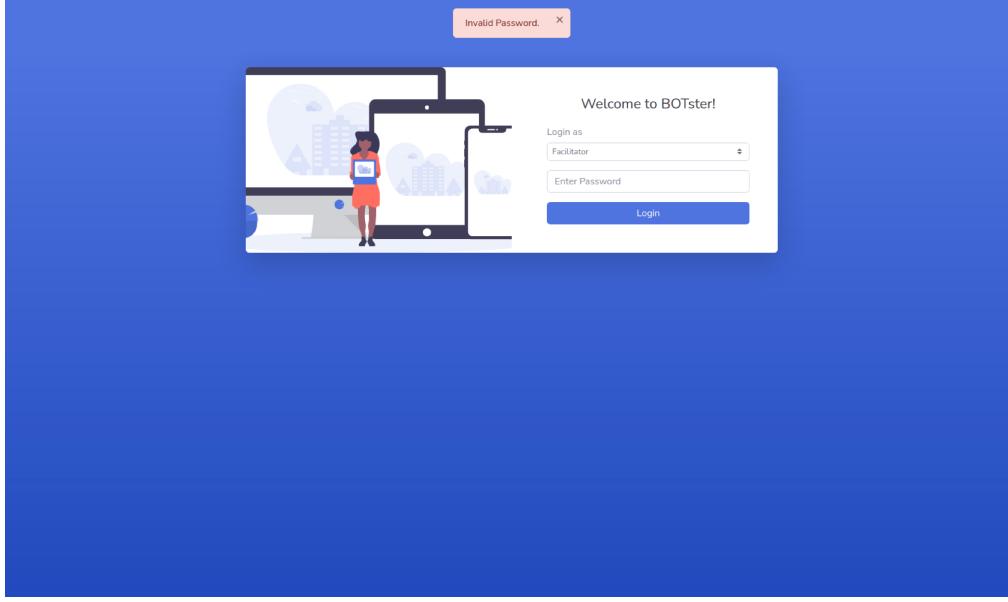
1.3.6 Open BOTster

System Test Identifier	ST6
Relevant Use Case ID	-
System Test Name	Open BOTster
Preconditions	<ol style="list-style-type: none"> 1. Web browser is running in foreground 2. BOTster web application is running 3. Tester's computer is connected to the same network as BOTster web application 4. Tester is not logged in
Steps	<ol style="list-style-type: none"> 1. Type "http://127.0.0.1:5000" into the web browser's URL bar 2. Press the enter key on the keyboard 3. Observe screen
Expected Result	
Actual Result	
Pass/Fail	

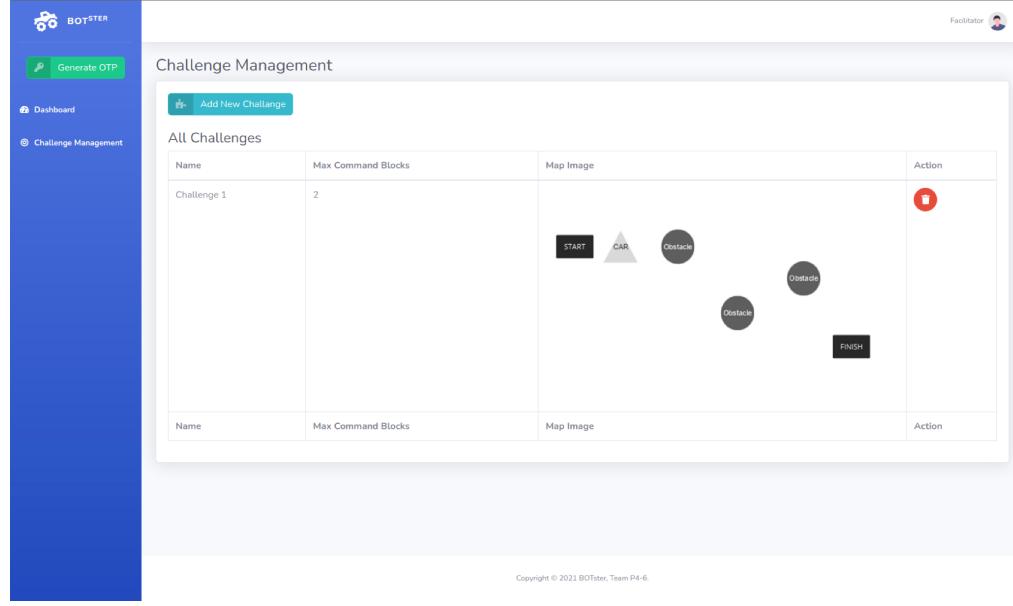
1.3.7 Login as Facilitator

System Test Identifier	ST7
Relevant Use Case ID	UC8
System Test Name	Login as Facilitator
Preconditions	<ol style="list-style-type: none"> 1. Web browser is open 2. Tester is not logged in 3. Tester is on BOTster Login page
Steps	<ol style="list-style-type: none"> 1. Select “Facilitator” for the “Login as” dropdown input 2. Enter “P@ssw0rd” into the “Password” input field 3. Press the “Login” button 4. Observe screen
Expected Result	 <p>The screenshot shows the Facilitator Dashboard interface. On the left, there's a sidebar with 'Generate OTP' and navigation links for 'Dashboard' and 'Challenge Management'. The main area has a header 'Facilitator Dashboard'. It features four status cards: 'CAR BATTERY 100%', 'ULTRASONIC SENSOR Detected!', 'INFRARED SENSOR Detected!', and 'WIFI MODULE Detected!'. Below these are two charts: 'Challenges Completed' (a line graph showing a weekly trend from Monday to Sunday) and 'Win-Lost Ratio' (a donut chart indicating the proportion of wins and losses). The bottom right corner of the dashboard displays the copyright notice 'Copyright © 2021 BOTster, Team P4-6.'</p>
Actual Result	
Pass/Fail	

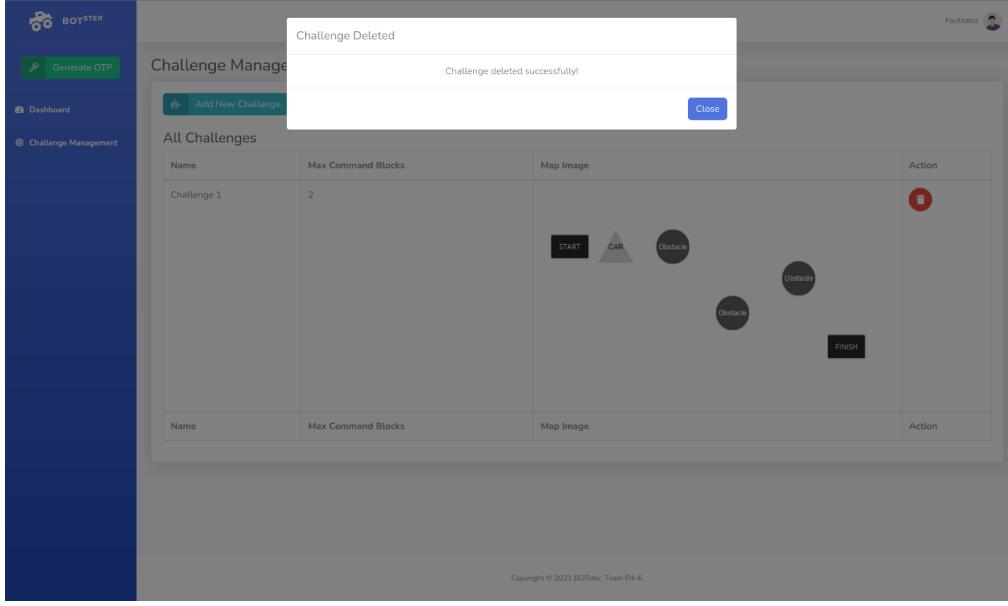
1.3.8 Facilitator Login using Invalid Password

System Test Identifier	ST8
Relevant Use Case ID	UC8
System Test Name	Facilitator Login using Invalid Password
Preconditions	<ol style="list-style-type: none"> 1. Web browser is open 2. Tester is not logged in 3. Tester is on BOTster Login page
Steps	<ol style="list-style-type: none"> 1. Select “Facilitator” for the “Login as” dropdown input 2. Enter “Password” into the “Password” input field 3. Press the “Login” button 4. Observe screen
Expected Result	 <p>The screenshot shows the BOTster login interface. At the top right, there is a red error message box with the text "Invalid Password." Below it, the login form is displayed. It has a placeholder "Welcome to BOTster!" above the fields. The "Login as" dropdown is set to "Facilitator". The "Enter Password" field is empty. A blue "Login" button is at the bottom right of the form.</p>
Actual Result	
Pass/Fail	

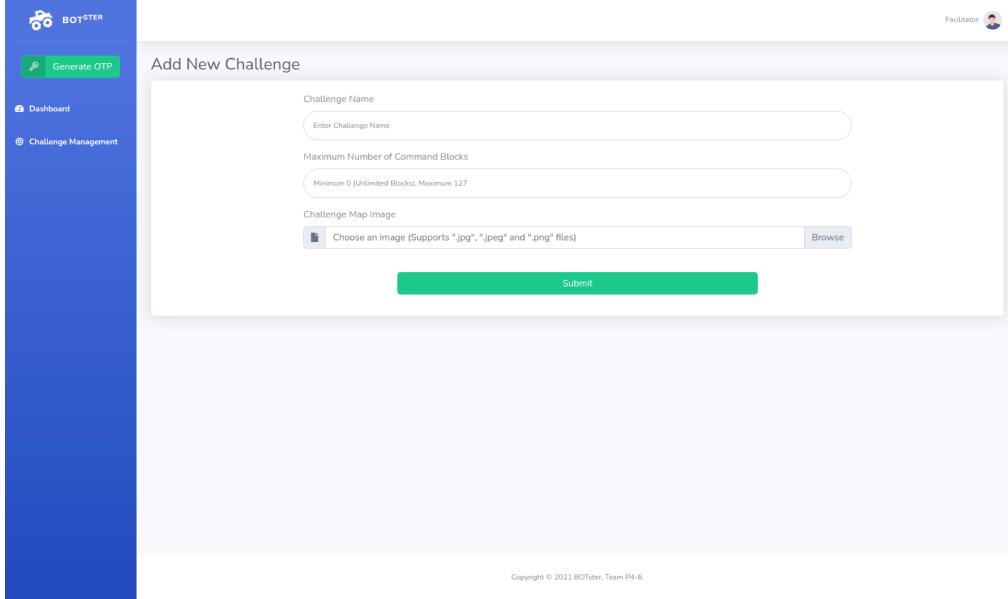
1.3.9 View Challenges List as Facilitator

System Test Identifier	ST9
Relevant Use Case ID	UC12
System Test Name	View Challenge List as Facilitator
Preconditions	<ol style="list-style-type: none"> 1. Tester is logged as Facilitator 2. Tester is on the Facilitator Dashboard page
Steps	<ol style="list-style-type: none"> 1. Click on “Challenge Management” in the left-side navigation bar 2. Observe screen
Expected Result	 <p>The screenshot shows the BOTster Challenge Management interface. On the left, there's a sidebar with 'Dashboard' and 'Challenge Management' options. The main area is titled 'Challenge Management' and contains a table with one row for 'Challenge 1'. The table columns are 'Name', 'Max Command Blocks', 'Map Image', and 'Action'. The 'Map Image' shows a path with markers for 'START', 'CAR', 'Obstacle', and 'FINISH'. There are also several 'Obstacle' markers on the path. A red circular icon with a minus sign is in the 'Action' column for the challenge entry.</p>
Actual Result	
Pass/Fail	

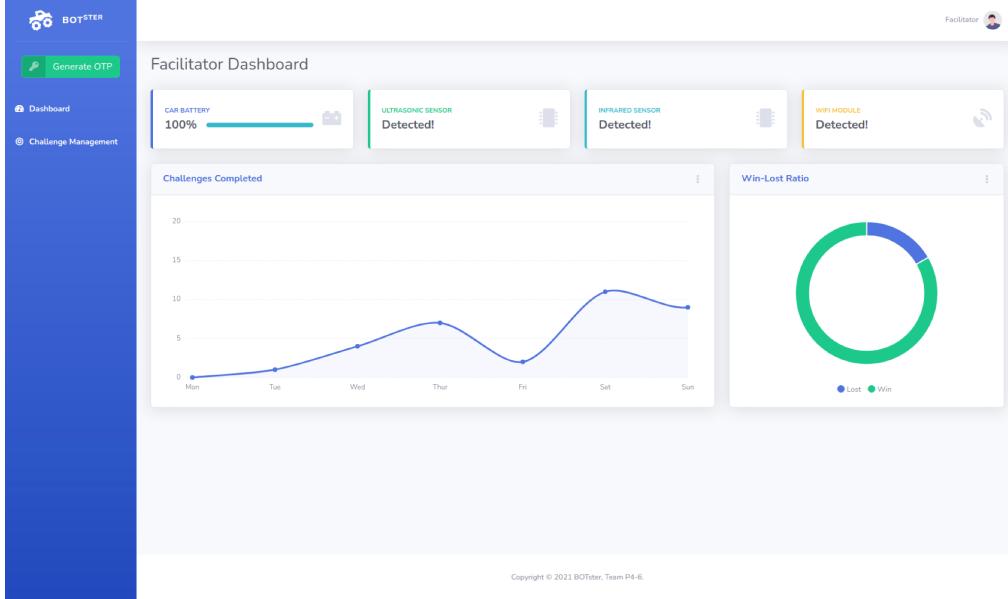
1.3.10 Delete Existing Challenge

System Test Identifier	ST10
Relevant Use Case ID	UC14
System Test Name	View Challenge List as Facilitator
Preconditions	<ul style="list-style-type: none"> 1. Tester is logged as Facilitator 2. Tester is on the Facilitator Challenge Management page
Steps	<ul style="list-style-type: none"> 1. Click on the red “Delete” button in the action column for “Challenge 1” 2. Observe screen
Expected Result	 <p>The screenshot shows the BOTster application's challenge management interface. A modal window titled "Challenge Deleted" is displayed, stating "Challenge deleted successfully!" with a "Close" button. Below the modal, the main "Challenge Management" table shows a single row for "Challenge 1". The table has columns for "Name", "Max Command Blocks", "Map Image", and "Action". The "Action" column contains a red "Delete" button. The "Map Image" column displays a navigation map with various icons: START, GAP, Obstacle, Obstacle, Obstacle, Obstacle, and FINISH.</p>
Actual Result	
Pass/Fail	

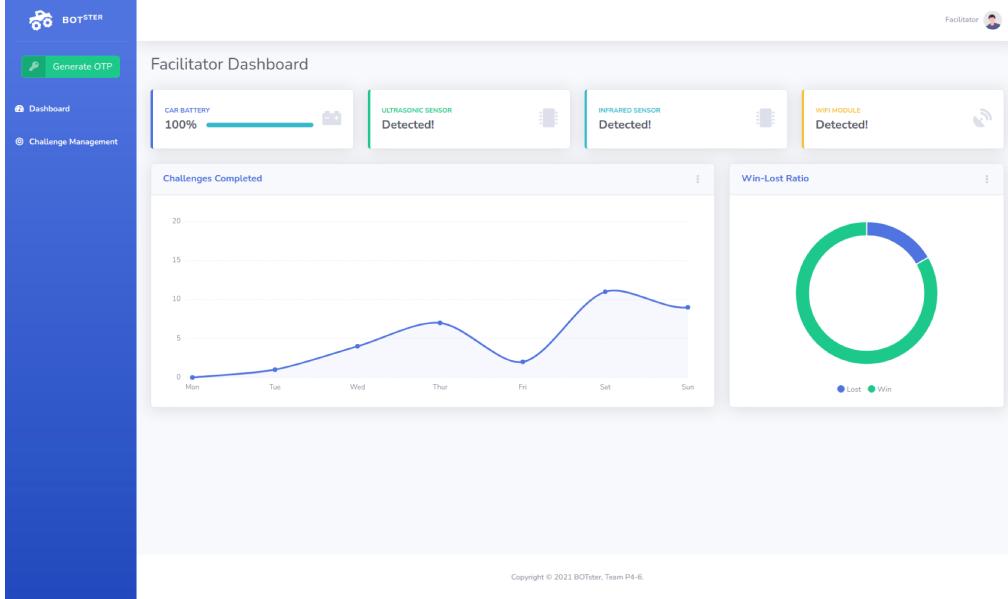
1.3.11 Display Add Challenge Page

System Test Identifier	ST11
Relevant Use Case ID	-
System Test Name	Display Add Challenge Page
Preconditions	<ol style="list-style-type: none"> 1. Tester is logged as Facilitator 2. Tester is on the Facilitator Challenge Management page
Steps	<ol style="list-style-type: none"> 1. Click on the “Add New Challenge” button 2. Observe screen
Expected Result	
Actual Result	
Pass/Fail	

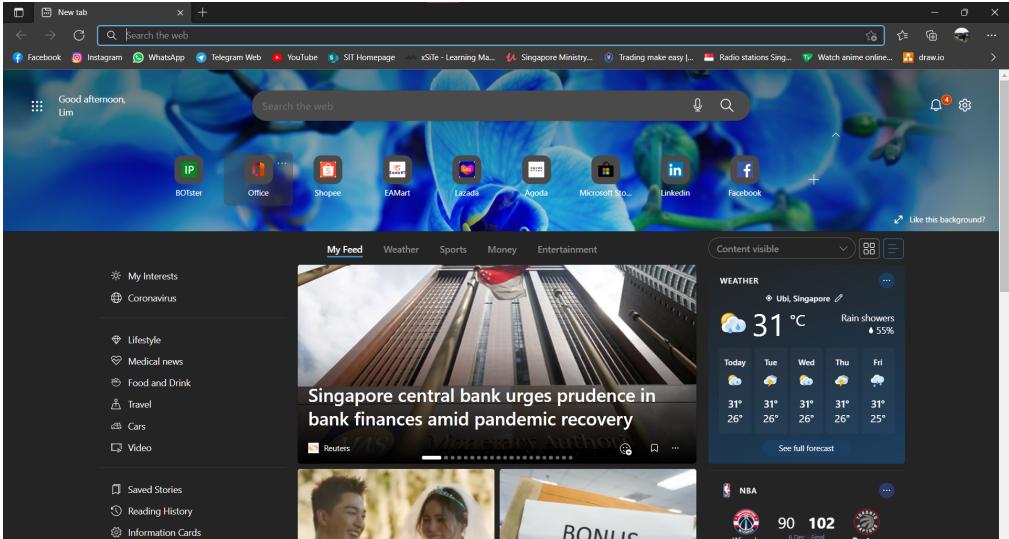
1.3.12 Back to Facilitator Dashboard from Facilitator Challenge Listing

System Test Identifier	ST12
Relevant Use Case ID	-
System Test Name	Back to Facilitator Dashboard from Facilitator Challenge Listing
Preconditions	<ol style="list-style-type: none"> 1. Tester is logged as Facilitator 2. Tester is on the Facilitator Challenge Management page
Steps	<ol style="list-style-type: none"> 1. Click on “Dashboard” in the left-side navigation bar 2. Observe screen
Expected Result	 <p>The screenshot shows the Facilitator Dashboard interface. On the left, there's a sidebar with a 'Generate OTP' button, 'Dashboard' (selected), and 'Challenge Management'. The main area has a title 'Facilitator Dashboard'. It features four status cards: 'CAR BATTERY' at 100%, 'ULTRASONIC SENSOR Detected!', 'INFRARED SENSOR Detected!', and 'WIFI MODULE Detected!'. Below these are two charts: 'Challenges Completed' (line graph) and 'Win-Lost Ratio' (donut chart). The 'Challenges Completed' graph shows a weekly trend starting at 0 on Monday, rising to about 7 by Wednesday, dipping to 2 on Friday, peaking at 12 on Saturday, and ending at 9 on Sunday. The 'Win-Lost Ratio' donut chart indicates a higher proportion of wins.</p>
Actual Result	
Pass/Fail	

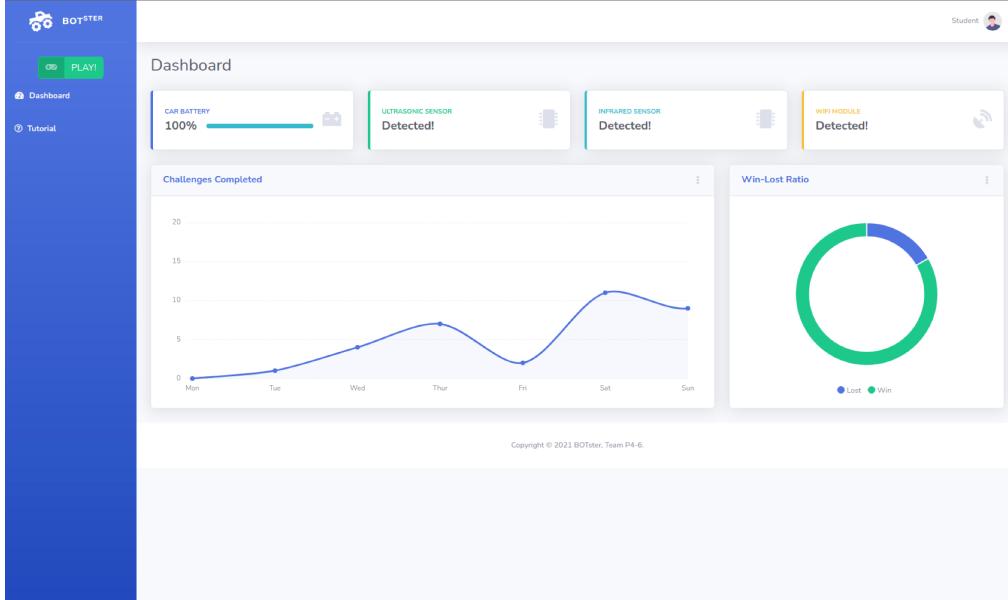
1.3.13 Closing Generated One-Time Password Modal

System Test Identifier	ST13
Relevant Use Case ID	-
System Test Name	Closing Generated One-Time Password Modal
Preconditions	<ol style="list-style-type: none"> 1. Tester is logged as Facilitator 2. Tester completed ST1 successfully
Steps	<ol style="list-style-type: none"> 3. Click on the “Close” button 4. Observe screen
Expected Result	 <p>The image shows the Facilitator Dashboard interface. On the left, there's a sidebar with a 'Generate OTP' button and links for 'Dashboard' and 'Challenge Management'. The main area is titled 'Facilitator Dashboard' and contains four cards: 'CAR BATTERY' at 100%, 'ULTRASONIC SENSOR Detected!', 'INFRARED SENSOR Detected!', and 'WIFI MODULE Detected!'. Below these is a chart titled 'Challenges Completed' showing a line graph from Monday to Sunday. The graph starts at 0 on Monday, rises to about 4 on Tuesday, dips to 2 on Wednesday, rises to a peak of about 7 on Thursday, dips again on Friday, rises sharply to about 12 on Saturday, and ends at about 9 on Sunday. To the right of the chart is a donut chart titled 'Win-Lost Ratio' with segments for 'Lost' (blue) and 'Win' (green).</p>
Actual Result	
Pass/Fail	

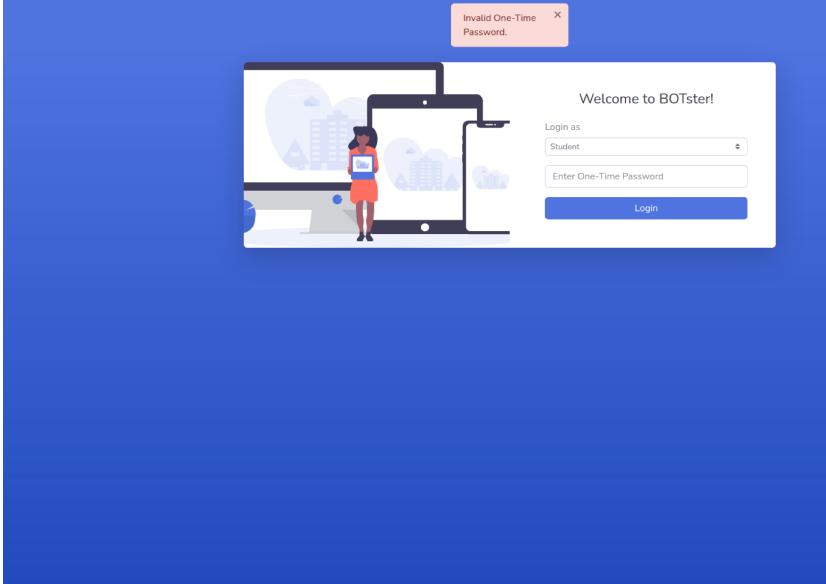
1.3.14 Closing BOTster from Facilitator Dashboard

System Test Identifier	ST14
Relevant Use Case ID	-
System Test Name	Closing BOTster from Facilitator Dashboard
Preconditions	3. Tester is logged as Facilitator 4. Tester is on the Facilitator Dashboard
Steps	5. Click on the “X” button on the tab that has BOTster web application opened 6. Observe screen
Expected Result	 <p>Note: Screen may vary depending on “New Tab Page” design or web browser used.</p>
Actual Result	
Pass/Fail	

1.3.15 Login as Student

System Test Identifier	ST15
Relevant Use Case ID	UC1
System Test Name	Login as Student
Preconditions	<ol style="list-style-type: none"> 1. Web browser is open 2. Tester is not logged in 3. Tester is on BOTster Login page 4. Generated One-Time Password (OTP) from ST1 is 123456 (Actual value depends on actual OTP generated via ST1 during UAT)
Steps	<ol style="list-style-type: none"> 1. Select “Student” for the “Login as” dropdown input 2. Enter “123456” into the “One-Time Password” input field 3. Press the “Login” button 4. Observe screen
Expected Result	 <p>The screenshot shows the BOTster Dashboard after a student has logged in. The left sidebar has 'PLAY!' and 'Tutorial' buttons. The main area has four status cards: 'CAR BATTERY' at 100%, 'ULTRASONIC SENSOR' detected, 'INFRARED SENSOR' detected, and 'WIFI MODULE' detected. Below these are two charts: a line graph titled 'Challenges Completed' showing activity from Monday to Sunday, and a donut chart titled 'Win-Lost Ratio' with a legend for 'Lost' (blue) and 'Win' (green).</p>
Actual Result	
Pass/Fail	

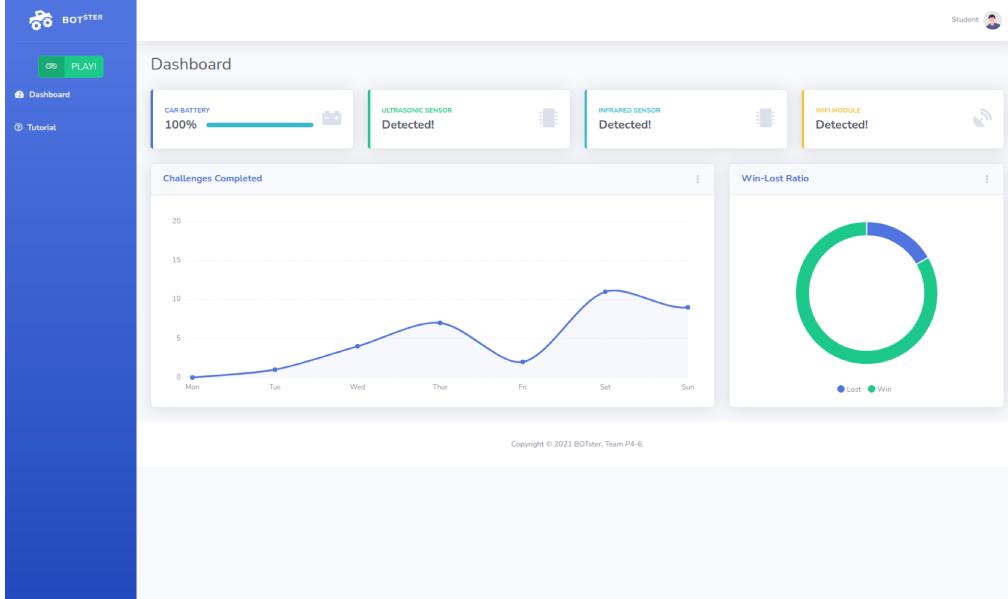
1.3.16 Login using Invalid One-Time Password

System Test Identifier	ST16
Relevant Use Case ID	UC1
System Test Name	Login using Invalid One-Time Password
Preconditions	<ol style="list-style-type: none"> 1. Web browser is open 2. Tester is not logged in 3. Tester is on BOTster Login page 4. Generated One-Time Password (OTP) from ST1 is 123456 (Actual value depends on actual OTP generated via ST1 during UAT)
Steps	<ol style="list-style-type: none"> 1. Select “Student” for the “Login as” dropdown input 2. Enter “000000” into the “One-Time Password” input field 3. Press the “Login” button 4. Observe screen
Expected Result	 <p>The screenshot shows the BOTster login interface. At the top, there is a red error message box with the text "Invalid One-Time Password." Below the message, the login form is visible. It has a "Welcome to BOTster!" header, a "Login as" dropdown set to "Student", an "Enter One-Time Password" input field containing "000000", and a blue "Login" button.</p>
Actual Result	
Pass/Fail	

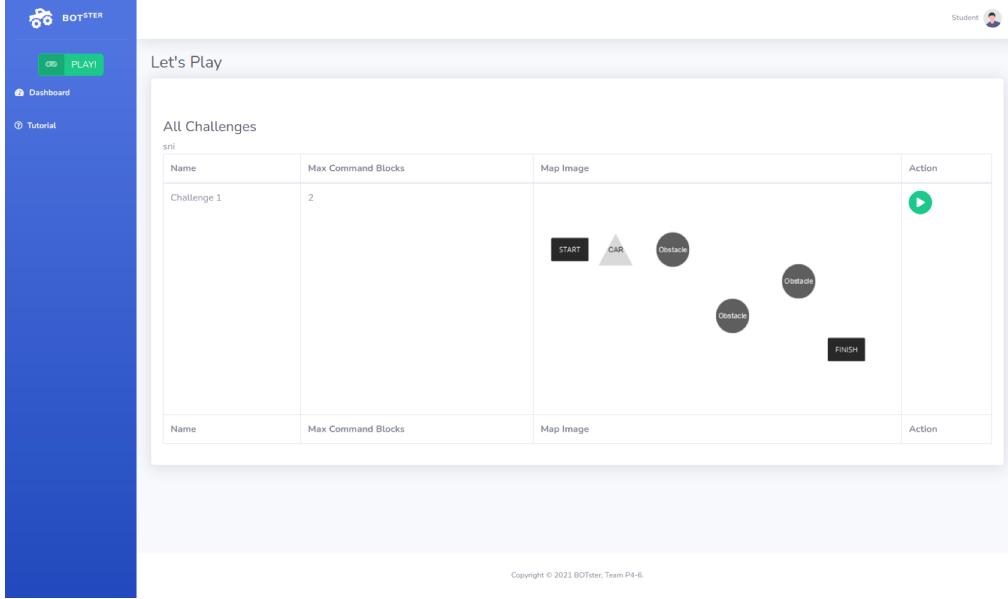
1.3.17 Access Tutorial

System Test Identifier	ST17
Relevant Use Case ID	UC3
System Test Name	Access Tutorial
Preconditions	<ol style="list-style-type: none"> 1. Tester is logged as Student 2. Tester is on the Student Dashboard page
Steps	<ol style="list-style-type: none"> 1. Click on “Tutorial” in the left-side navigation bar 2. Observe screen
Expected Result	 <p>The screenshot shows the BOTster Student Dashboard. On the left, there is a vertical navigation bar with options: PLAY!, Dashboard, and Tutorial. The 'Tutorial' option is currently selected, indicated by a blue background. The main content area is titled 'Tutorial'. Below the title, there is a section titled 'To Take Note Before Playing!' containing three bullet points: 1. Ensure that the game is played under supervision of an adult, 2. Ensure that you stand outside the playing area, and 3. Avoid using the laptop too far from the playing area to have good connection. There is also a section titled 'How to start?' with four steps: 1. Click on the play button, 2. A list of challenges will be displayed, 3. Select a challenge to play, and 4. Enjoy the game! At the bottom of the page, there is a note: 'There is a box on the right side of the challenge page to drag and drop commands, the goal of the game will be to make use of the drag and drop to maneuver the vehicle to the finish line while avoiding the obstacles set in the given map. The available drag and drop commands are move forward, turn left, turn right, if condition and loop. You will need to plan your steps ahead well to complete the challenge with minimum number of steps.' The copyright notice 'Copyright © 2021 BOTster, Team P4-6.' is at the very bottom.</p>
Actual Result	
Pass/Fail	

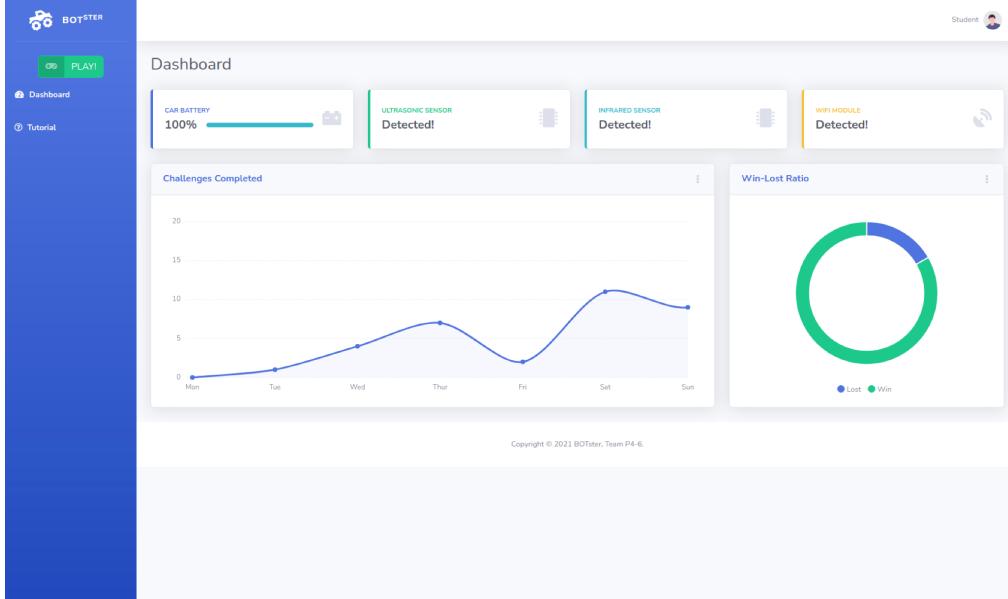
1.3.18 Back to Dashboard from Tutorial

System Test Identifier	ST18
Relevant Use Case ID	UC3
System Test Name	Back to Dashboard from Tutorial
Preconditions	<ol style="list-style-type: none"> 1. Tester is logged as Student 2. Tester is on the Tutorial page
Steps	<ol style="list-style-type: none"> 1. Click on “Dashboard” in the left-side navigation bar 2. Observe screen
Expected Result	 <p>The screenshot shows the BOTster dashboard interface. On the left, there's a sidebar with 'PLAY!' and 'Tutorial' buttons. The main area has a 'Dashboard' title. It features four status cards: 'CAR BATTERY' at 100%, 'ULTRASONIC SENSOR Detected!', 'INFRARED SENSOR Detected!', and 'WIFI MODULE Detected!'. Below these are two charts: 'Challenges Completed' (a line graph showing progress from Monday to Sunday) and 'Win-Lost Ratio' (a donut chart showing the ratio of wins to losses).</p>
Actual Result	
Pass/Fail	

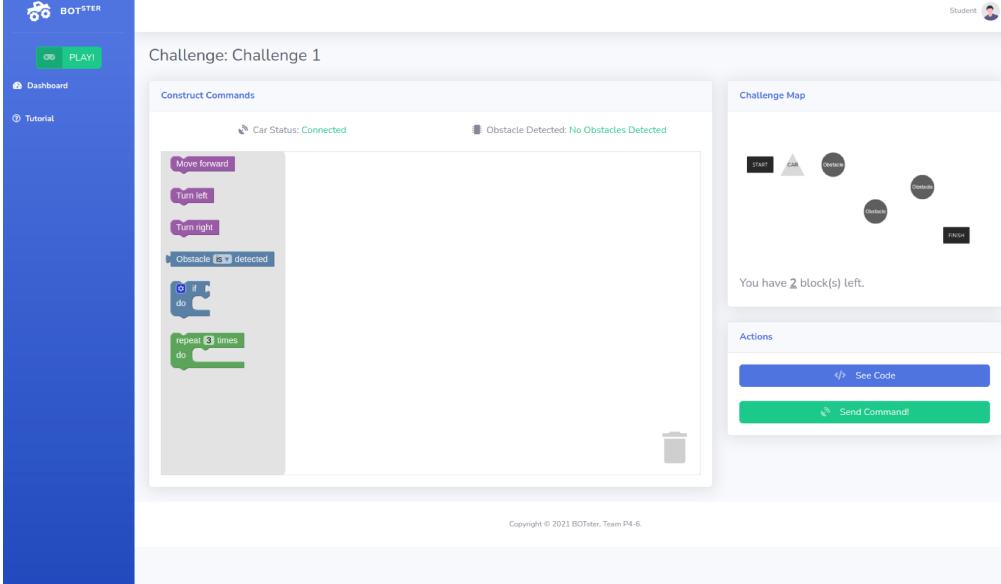
1.3.19 View Challenges List as Student

System Test Identifier	ST19
Relevant Use Case ID	-
System Test Name	View Challenge List as Student
Preconditions	<ol style="list-style-type: none"> 1. Tester is logged as Student 2. Tester is on the Student Dashboard page 3. "Challenge 1" successfully created in ST2 and still exist in system
Steps	<ol style="list-style-type: none"> 1. Click on the "PLAY!" button in the left-side navigation bar 2. Observe screen
Expected Result	 <p>The screenshot shows the BOTster Student Dashboard. On the left, there's a vertical navigation bar with 'Dashboard' and 'Tutorial' options. A green 'PLAY!' button is at the top. The main area is titled 'Let's Play' and contains a table titled 'All Challenges'. The table has one row for 'Challenge 1', showing 'Name' and 'Max Command Blocks' (both empty). To the right of the table is a map with a 'START' point, several 'Obstacle' points, and a 'FINISH' point. A green play button icon is located to the right of the map.</p>
Actual Result	
Pass/Fail	

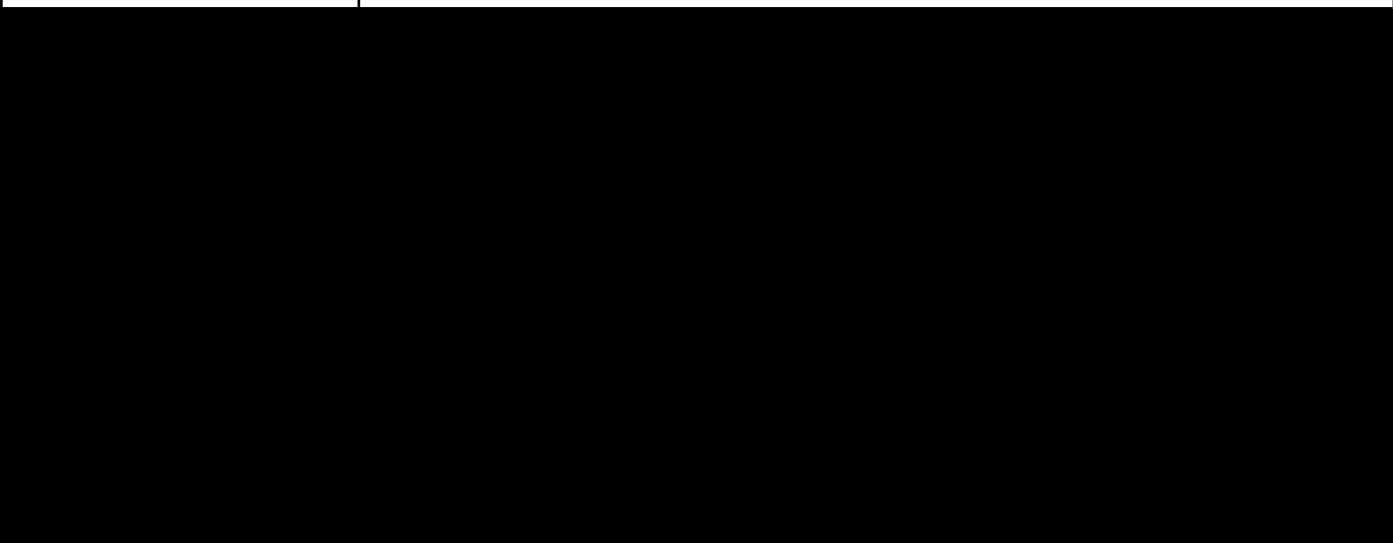
1.3.20 Back to Dashboard from Student Challenges List

System Test Identifier	ST20
Relevant Use Case ID	-
System Test Name	Back to Dashboard from Student Challenges List
Preconditions	<ol style="list-style-type: none"> 1. Tester is logged as Student 2. Tester is on the Student Challenge List page
Steps	<ol style="list-style-type: none"> 1. Click on “Dashboard” in the left-side navigation bar 2. Observe screen
Expected Result	 <p>The screenshot shows the BOTster dashboard interface. On the left, there's a sidebar with 'PLAY!' and 'Tutorial' buttons. The main area has a 'Dashboard' title. It features four status boxes: 'CAR BATTERY' at 100%, 'ULTRASONIC SENSOR Detected!', 'INFRARED SENSOR Detected!', and 'WIFI MODULE Detected!'. Below these are two charts: 'Challenges Completed' (line graph) and 'Win-Lost Ratio' (donut chart). The 'Challenges Completed' graph shows a weekly trend starting at 0 on Monday, rising to about 5 by Wednesday, peaking at 7 on Thursday, dipping to 2 on Friday, rising to 11 on Saturday, and ending at 9 on Sunday. The 'Win-Lost Ratio' donut chart is mostly green ('Win') with a small blue ('Lost') segment.</p>
Actual Result	
Pass/Fail	

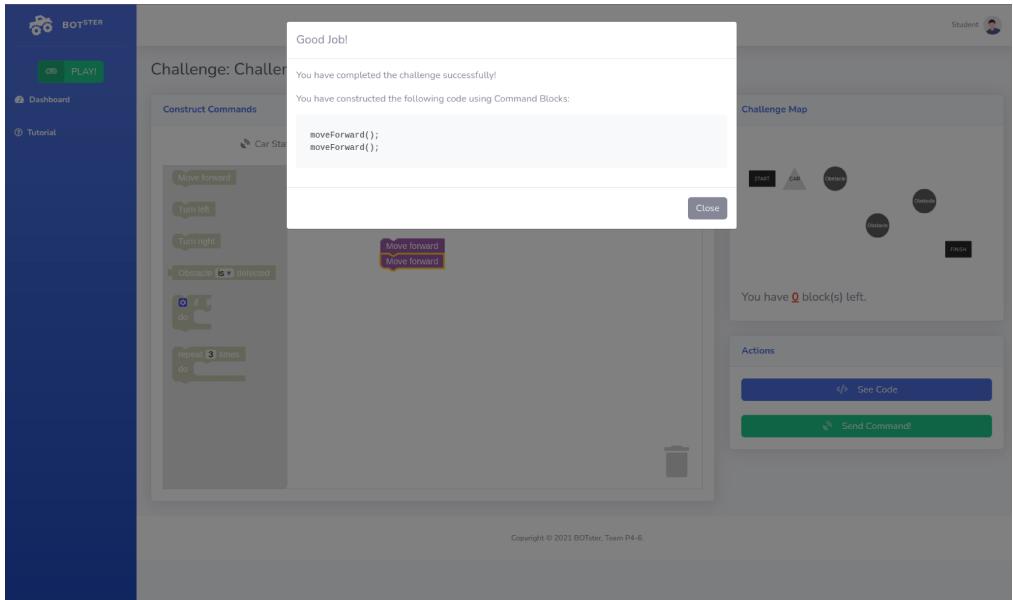
1.3.21 Start Challenge

System Test Identifier	ST21
Relevant Use Case ID	UC4
System Test Name	Start Challenge
Preconditions	<ol style="list-style-type: none"> 1. Tester is logged as Student 2. Tester is on the Student Challenge List page
Steps	<ol style="list-style-type: none"> 1. Click on the green “Play” button in the action column of “Challenge 1” 2. Observe screen
Expected Result	
Actual Result	
Pass/Fail	

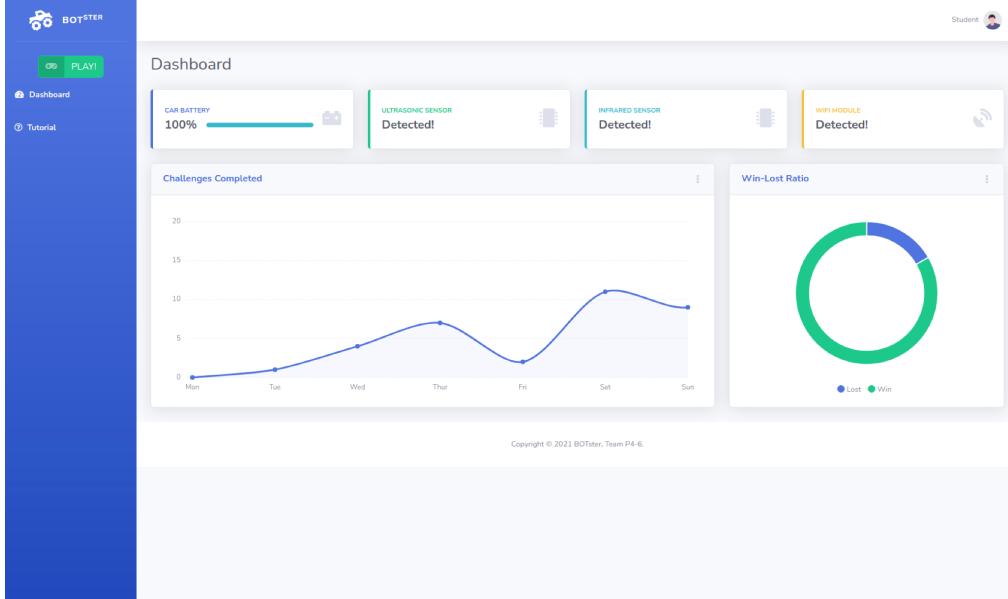
1.3.22 (REMOVED) ~~Lost Connection to Robotic Car on Challenge Game Screen~~

System Test Identifier	ST22
	 A large black rectangular redaction box covers the majority of the page below the test identifier.

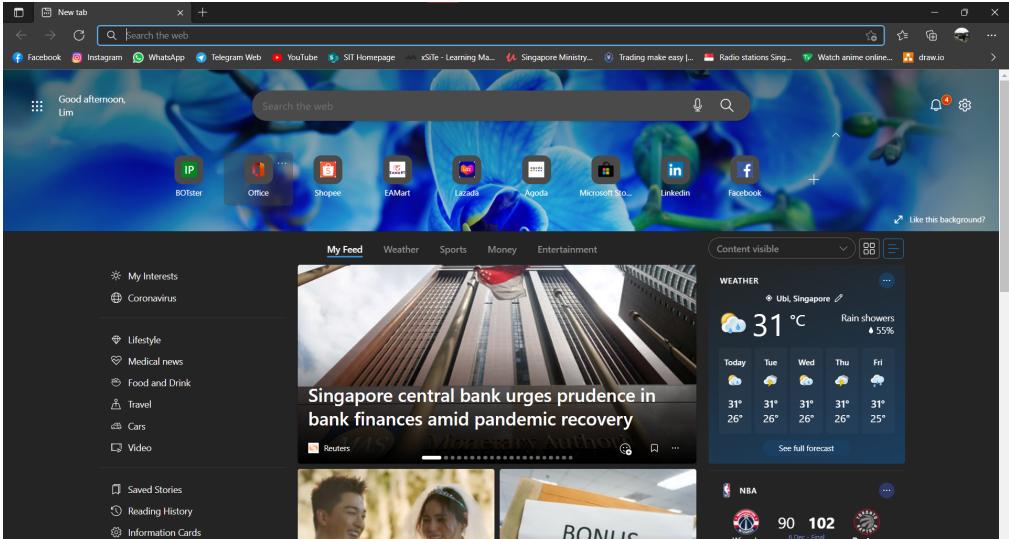
1.3.23 Complete Challenge

System Test Identifier	ST23
Relevant Use Case ID	-
System Test Name	Complete Challenge
Preconditions	<ol style="list-style-type: none"> 1. Tester is logged as Student 2. Tester completed ST21 successfully
Steps	<ol style="list-style-type: none"> 1. Drag and drop the “Move forward” command block onto the Command panel 2 times 2. Press the green “Send Command!” button 3. Observe screen
Expected Result	
Actual Result	
Pass/Fail	

1.3.24 Back to Dashboard after Challenge Completion

System Test Identifier	ST24
Relevant Use Case ID	-
System Test Name	Back to Dashboard after Challenge Completion
Preconditions	<ol style="list-style-type: none"> 1. Tester is logged as Student 2. Tester completed ST23 successfully
Steps	<ol style="list-style-type: none"> 1. Press the “Close” button in the “Good Job!” Modal 2. Observe screen
Expected Result	 <p>The screenshot shows the BOTster dashboard interface. At the top, there are four status indicators: CAR BATTERY at 100%, ULTRASONIC SENSOR Detected!, INFRARED SENSOR Detected!, and WIFI MODULE Detected!. Below these are two main sections: 'Challenges Completed' and 'Win-Lost Ratio'. The 'Challenges Completed' section contains a line graph showing the number of challenges completed per day from Monday to Sunday. The 'Win-Lost Ratio' section contains a donut chart indicating the proportion of wins and losses.</p>
Actual Result	
Pass/Fail	

1.3.25 Closing BOTster after Student Challenge Completion

System Test Identifier	ST25
Relevant Use Case ID	-
System Test Name	Closing BOTster after Student Challenge Completion
Preconditions	<ol style="list-style-type: none"> 1. Tester is logged as Facilitator 2. Tester completed ST23 successfully
Steps	<ol style="list-style-type: none"> 1. Click on the “X” button on the tab that has BOTster web application opened 2. Observe screen
Expected Result	 <p>Note: Screen may vary depending on “New Tab Page” design or web browser used.</p>
Actual Result	
Pass/Fail	

— End of Document —