



JavaScript with D3.js

Data Boot Camp
Lesson 14.3



Class Objectives

By the end of today's class you will be able to:



Use D3 for basic DOM manipulation.



Populate a table using static data structure.



Understand events.



Use `this` to reference elements.



Use D3 to attach events to DOM elements.



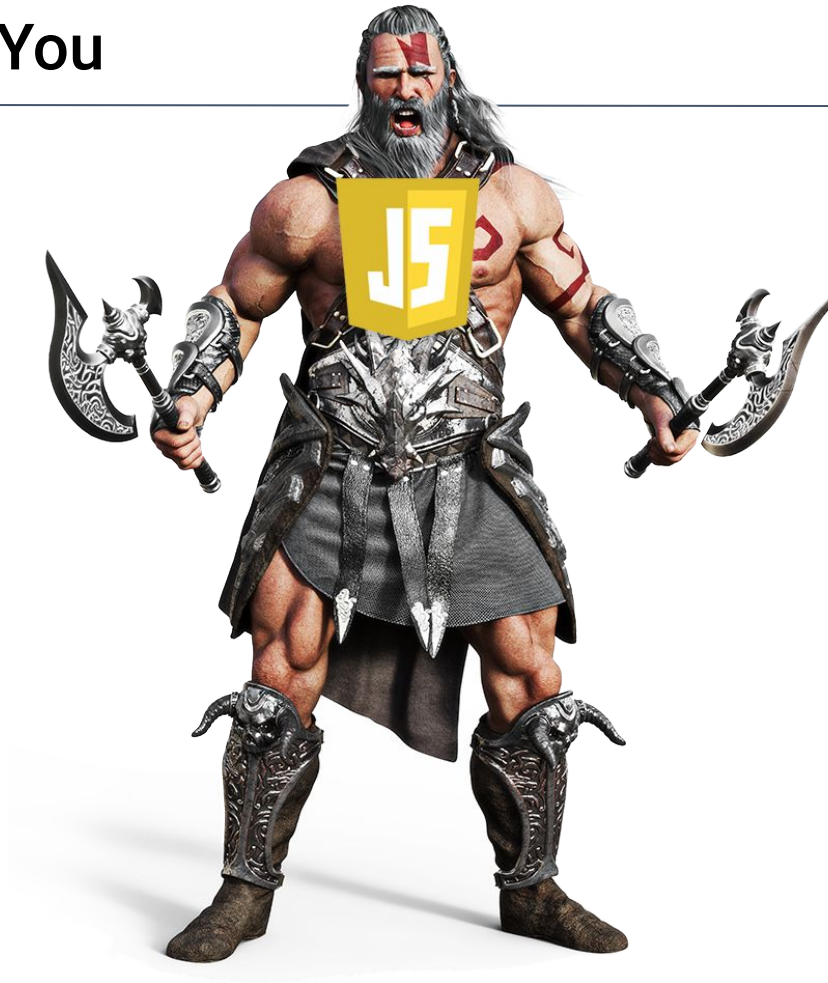
Dynamically manipulate the DOM through events.



Dynamically filter tables.

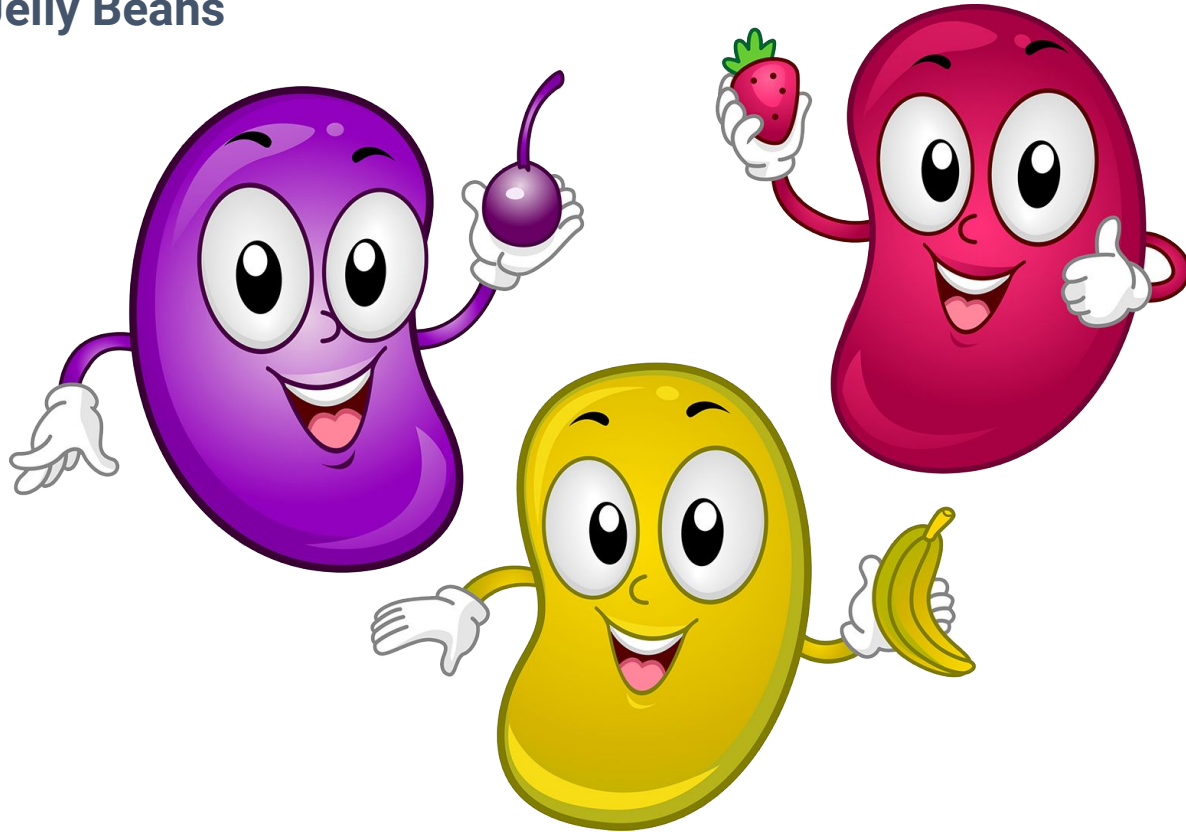
This Will Soon Be You

JavaScript Juggernauts



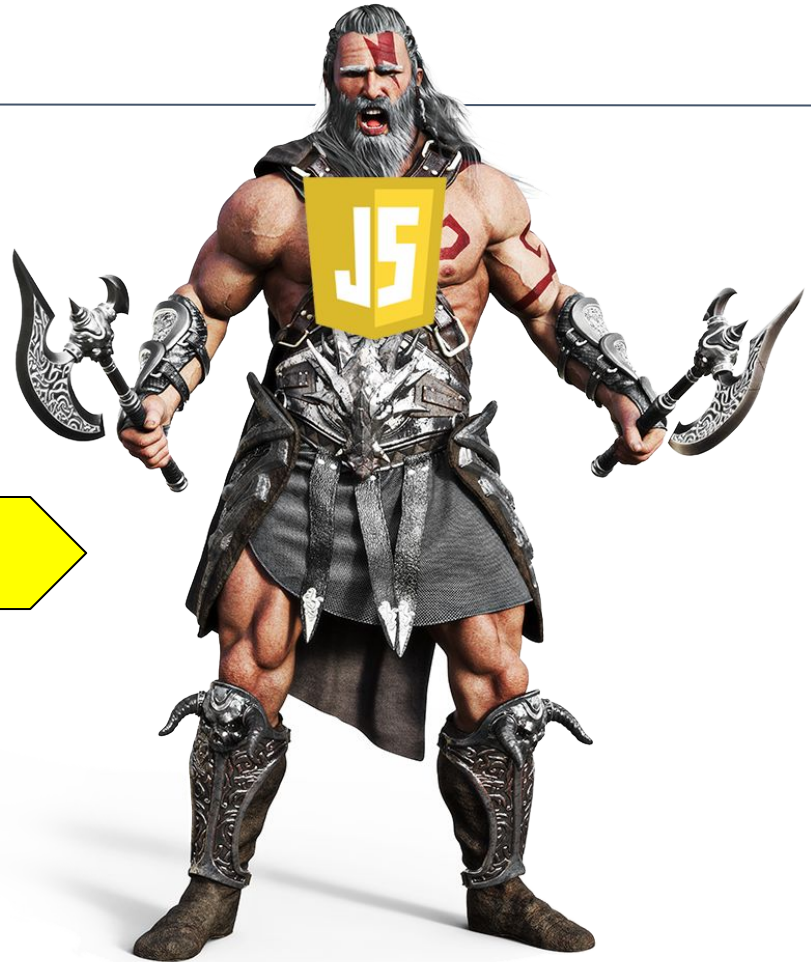
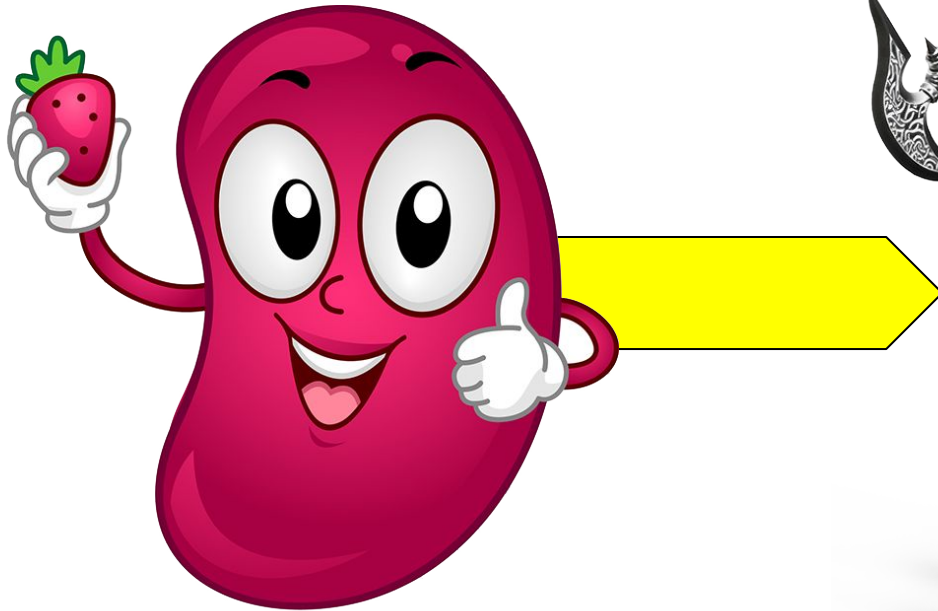
But Right Now You Feel Like:

JavaScript Jelly Beans



Transformation to Come!

Hang in there!





Everyone Do: Intro to D3 and Select

In this activity, everyone will be introduced and kick off with **D3** basics.

Suggested Time:
25 Minutes



Everyone Do: Intro to D3 and Select

The image shows a code editor with two files: `index.js` and `index.html`. The `index.html` file contains HTML code with several annotations. The `index.js` file contains JavaScript code with annotations explaining D3.js functions. A browser console is also visible, showing the output of the JavaScript code.

index.html

```
1 <!DOCTYPE html>
2 <html lang="en">
3
4 <head>
5   <meta charset="UTF-8">
6   <meta name="viewport" content="width=device-width, initial-scale=1.0">
7   <meta http-equiv="X-UA-Compatible" content="ie=edge">
8   <title>D3 Select</title>
9   <script src="https://d3js.org/d3.v5.min.js"></script>
10 </head>
11
12 <body>
13   <h1>This is an H1</h1>
14   <div class="text1">This div has a class</div>
15   <div id="text2">This div has an id</div>
16   <div class="my-link">
17     <a href="https://github.com/d3/d3-selection">D3 Home</a>
18   </div>
19
20   <div class="deeplink">
21     <div class="outer">
22       <div class="inner">
23         <a href="https://github.com/d3/d3-selection">D3 Select</a>
24       </div>
25     </div>
26   </div>
27
28   <ul>
29     <li>Item 1</li>
30     <li>Item 2</li>
31     <li>Item 3</li>
32   </ul>
33 </body>
34 <script src="static/js/index.js"></script>
35
36 </html>
37
38
```

index.js

```
1 // Select the text of an HTML element
2 var text1 = d3.select(".text1").text();
3 console.log("text1 says: ", text1);
4
5 var text2 = d3.select("#text2").text();
6 console.log("text2 says: ", text2);
7
8 // Modify the text of an HTML element
9 d3.select(".text1").text("Hey, I changed this!");
10
11 // Capture the HTML of a selection
12 var myLink = d3.select(".my-link").html();
13 console.log("my-link: ", myLink);
14
15 // Select an element's child element
16 // An object is returned
17 var myLinkAnchor = d3.select(".my-link>a");
18 console.log(myLinkAnchor);
19
20 // Capture the child element's href attribute
21 var myLinkAnchorAttribute = myLinkAnchor.attr("href");
22 console.log("myLinkAnchorAttribute: " + myLinkAnchorAttribute);
23
24 // Change an element's attribute
25 myLinkAnchor.attr("href", "https://python.org");
26
27 // Use chaining to join methods
28 d3.select(".my-link>a").attr("href", "https://nytimes.org").text("Now this is a link to the NYT!!");
29
30 // Select all list items, then change their font color
31 d3.selectAll("li").style("color", "blue");
32
33 // Create a new element
34 var li1 = d3.select("ul").append("li");
35 li1.text("A new item has been added!");
36
37 // Use chaining to create a new element and set its text
38 var li2 = d3.select("ul").append("li").text("Another new item!");
39
40
41
42
```


Browser Console

```
text1 says: This div has a class
text2 says: This div has an id
my-link:
  <a href="https://github.com/d3/d3-selection">D3 Home</a>
```

Annotations:

- `<script src="https://d3js.org/d3.v5.min.js"></script>` → D3 link
- `d3.select(".text1").text();` → Captures the text of that element
- `d3.select("#text2").text();` → Captures the text of that element
- `d3.select(".text1").text("Hey, I changed this!");` → Creates a reference to DOM element with the class text1

Everyone Do: Intro to D3 and Select



```
index.js index.html x
1 <!DOCTYPE html>
2 <html lang="en">
3
4 <head>
5   <meta charset="UTF-8">
6   <meta name="viewport" content="width=device-width, initial-scale=1.0">
7   <meta http-equiv="X-UA-Compatible" content="ie=edge">
8   <title>D3 Select</title>
9   <script src="https://d3js.org/d3.v5.min.js"></script>
10
11 </head>
12
13 <body>
14   <h1>This is an H1</h1>
15   <div class="text1">This div has a class</div>
16   <div id="text2">This div has an id</div>
17   <div class="my-link">
18     <a href="https://github.com/d3/d3-selection">D3 Home</a>
19   </div>
20
21   <div class="deeplink">
22     <div class="outer">
23       <div class="inner">
24         <a href="https://github.com/d3/d3-selection">D3 Select</a>
25       </div>
26     </div>
27   </div>
28
29   <ul>
30     <li>Item 1</li>
31     <li>Item 2</li>
32     <li>Item 3</li>
33   </ul>
34 </body>
35 <script src="static/js/index.js"></script>
36
37 </html>
38

index.js* x
1 // Select the text of an HTML element
2
3 var text1 = d3.select(".text1").text();
4
5 console.log("text1 says: ", text1);
6
7 var text2 = d3.select("#text2").text();
8
9 console.log("text2 says: ", text2);
10
11 // Modify the text of an HTML element
12 d3.select(".text1").text("Hey, I changed this!");
13
14 // Capture the HTML of a selection
15 var myLink = d3.select(".my-link").html();
16 console.log("my-link: ", myLink);
17
18 // Select an element's child element
19 // An object is returned
20 var myLinkAnchor = d3.select(".my-link>a");
21 console.log(myLinkAnchor);
22
23 // // Capture the child element's href attribute
24 var myLinkAnchorAttribute = myLinkAnchor.attr("href");
25 console.log("myLinkAnchorAttribute: " + myLinkAnchorAttribute);
26
27 // Change an element's attribute
28 myLinkAnchor.attr("href", "https://python.org");
29
30 // Use chaining to join methods
31 d3.select(".my-link>a").attr("href", "https://nytimes.org").text("Now this is a link to the NYT!!");
32
33 // Select all list items, then change their font color
34 d3.selectAll("li").style("color", "blue");
35
36 // Create a new element
37 var li1 = d3.select("ul").append("li");
38 li1.text("A new item has been added!");
39
40 // Use chaining to create a new element and set its text
41 var li2 = d3.select("ul").append("li").text("Another new item!");
42
```


Everyone Do: Intro to D3 and Select

```
index.js index.html
1 <!DOCTYPE html>
2 <html lang="en">
3
4 <head>
5 <meta charset="UTF-8">
6 <meta name="viewport" content="width=device-width, initial-scale=1.0">
7 <meta http-equiv="X-UA-Compatible" content="ie=edge">
8 <title>D3 Select</title>
9 <script src="https://d3js.org/d3.v5.min.js"></script>
10
11 </head>
12
13 <body>
14 <h1>This is an H1</h1>
15 <div class="text1">This div has a class</div>
16 <div id="text2">This div has an id</div>
17 <div class="my-link">
18 <a href="https://github.com/d3/d3-selection">D3 Home</a>
19 </div>
20
21 <div class="deepLink">
22 <div class="outer">
23 <div class="inner">
24 <a href="https://github.com/d3/d3-selection">D3 Select</a>
25 </div>
26 </div>
27 </div>
28
29 <ul>
30 <li>Item 1</li>
31 <li>Item 2</li>
32 <li>Item 3</li>
33 </ul>
34 </body>
35 <script src="static/js/index.js"></script>
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37 </html>
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```

index.js

```
1 // select the text of an HTML element
2
3 var text1 = d3.select(".text1").text();
4
5 console.log("text1 says: ", text1);
6
7 var text2 = d3.select("#text2").text();
8
9 console.log("text2 says: ", text2);
10
11 // Modify the text of an HTML element
12 d3.select(".text1").text("Hey, I changed this!");
13
14 // Capture the HTML of a selection
15 var myLink = d3.select(".my-link").html();
16 console.log("my-link: ", myLink);
17
18 // Select an element's child element
19 // An object is returned
20 var myLinkAnchor = d3.select(".my-link a");
21 console.log(myLinkAnchor);
22
23 // Capture the child element's href attribute
24 var myLinkAnchorAttribute = myLinkAnchor.attr("href");
25 console.log("myLinkAnchorAttribute: " + myLinkAnchorAttribute);
26
27 // Change an element's attribute
28 myLinkAnchor.attr("href", "https://python.org");
29
30 // Use chaining to join methods
31 d3.select(".my-link a").attr("href", "https://nytimes.org").text("Now this is a link to the NYT!");
32
33 // Select all list items, then change their font color
34 d3.selectAll("li").style("color", "blue");
35
36 // Create a new element
37 var li1 = d3.select("ul").append("li");
38 li1.text("A new item has been added!");
39
40 // Use chaining to create a new element and set its text
41 var li2 = d3.select("ul").append("li").text("Another new item!");
42
```

Objected
Returned



console

```
Array(1)
Array(1)
Object
  __proto__: Array(1)
  accessKeys: ""
  ariaAtomic: null
  ariaAutoComplete: null
  ariaBusy: null
  ariaChecked: null
  ariaColCount: null
  ariaColIndex: null
  ariaColSpan: null
  ariaCurrent: null
  ariaDescription: null
  ariaDisabled: null
  ariaExpanded: null
  ariaHasPopup: null
  ariaHidden: null
  ariaKeyShortcuts: null
  ariaLabel: null
  ariaLevel: null
  ariaLive: null
  ariaModal: null
  ariaMultiline: null
  ariaMultiSelectable: null
  ariaOrientation: null
  ariaPlaceholder: null
  ariaPosInSet: null
  ariaPressed: null
  ariaReadOnly: null
  ariaRelevant: null
  ariaRequired: null
  ariaRoleDescription: null
  ariaRowCount: null
  ariaRowIndex: null
  ariaRowSpan: null
  ariaSelected: null
  ariaSetSize: null
  ariaSort: null
  ariaValueMax: null
  ariaValueMin: null
  ariaValueNow: null
  ariaValueText: null
  assignedSlot: null
  __proto__: Object
```

Attributes of
the Element

```
attributes: NamedNodeMap
href: href
  __proto__: NamedNodeMap
  childNodes: NodeList(1)
  firstChild: null
  isConnected: false
  lastChild: null
  localName: "href"
  namespaceURI: null
  namespacePrefix: null
  namespaceSuffix: null
  nodeName: "href"
  nodeType: 2
  nodeValue: "https://nytimes.org"
  ownerDocument: document
  ownerElement: a
  parentElement: null
  parentNode: null
  prefix: null
  previousSibling: null
  __proto__: NamedNodeMap
```

href attribute

href attribute value



```
content: "https://nytimes.org"
value: "https://nytimes.org"
```

Everyone Do: Intro to D3 and Select

index.js ×

```
1 // Select the text of an HTML element
2
3 var text1 = d3.select("#text1").text();
4
5 console.log("text1 says: ", text1);
6
7 var text2 = d3.select("#text2").text();
8
9 console.log("text2 says: ", text2);
10
11 // Modify the text of an HTML element
12 d3.select("#text1").text("Hey, I changed this!");
13
14 // Capture the HTML of a selection
15 var myLink = d3.select("#my-link").html();
16 console.log("my-link: ", myLink);
17
18 // Select an element's child element
19 // An object is returned
20 var myLinkAnchor = d3.select("#my-link").select("a");
21 console.log(myLinkAnchor);
22
23 // Capture the child element's attribute
24 var myLinkAnchorAttribute = myLinkAnchor.attr("href");
25 console.log("myLinkAnchorAttribute: ", myLinkAnchorAttribute);
26
27 // Change an element's attribute
28 myLinkAnchor.attr("href", "https://pythontesting.net");
29
30 // Use chaining to join methods
31 d3.select("#my-link>a").attr("href", "https://nytimes.org").text("Now this is a link to the NYT!!");
32
33 // Select all list items, then change their font color
34 d3.selectAll("li").style("color", "blue");
35
36 // Create a new element
37 var li1 = d3.select("ul").append("li");
38 li1.text("A new item has been added!");
39
40 // Use chaining to create a new element and set its text
41 var li2 = d3.select("ul").append("li").text("Another new item!");
42
```

The href attribute of the object

Elements Console Sources Network Performance Memory Application Security Lighthouse

top Filter Default levels

text1 says: This div has a class [index.js:3](#)

text2 says: This div has an id [index.js:6](#)

my-link: [D3 Home](https://github.com/d3/d3-selection) [index.js:13](#)

▼ Pt { groups: Array(1), _parents: Array(1) } [index.js:18](#)

- ▶ _groups: [Array(1)]
- ▶ _parents: [html]
- ▶ proto: Object

myLinkAnchorAttribute: <https://github.com/d3/d3-selection> [index.js:22](#)



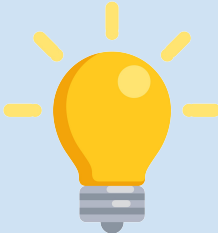
Activity: D3 Select

In this activity, you will use **D3** to add a new row of data to a table.

Suggested Time:
20 Minutes



Activity: D3 Select

| Instructions | Hints |
|--|--|
| Use D3 to convert the Bootstrap table into a striped table. | <div data-bbox="1421 350 1669 386"><code>.table-striped</code></div> <div data-bbox="1421 418 1545 454"><code><tbody></code></div>  |
| Use D3 to select the table body and append a new row and cells for the new student name and grade. | |



Time's Up! Let's Review.



Everyone Do: D3 Table

In this activity, everyone will use D3 to select data and build a raw table.

Suggested Time:
20 Minutes



<Time to Code>





Instructor Demonstration

D3 Event Listeners



What is an Event?

- An action triggered by the user or the browser, detected by JavaScript (listen) to execute the code (interact HTML).
- There are several event types that are supported by the browser, including:
 - `click`
 - `change`
 - `Keydown`
 - `scroll`
 - `pointenter`
 - `pointerleave`

D3 Event Listeners

→ Events have two main components:

```
function handleClick() {  
  console.log("A button was clicked!");  
  console.log(d3.event.target);  
}
```

- A target: a reference to the object that dispatched the event.
- A handler: a function that executes in response to the event occurring.

D3 Event Listeners

- In D3, Events are attached using the `.on()` function.

```
button.on("click", handleClick);
```

- Alternatively, the click handler can be defined inline.

```
button.on("click", function() {  
  console.log("Hi, a button was clicked!");  
  console.log(d3.event.target);  
});
```

D3 Event Listeners

- They are just like functions that can execute code or call other functions.

```
button.on("click", function() {  
  d3.select(".giphy-me").html("<img src='https://gph.to/2Krfn0w' alt='giphy'>");  
});
```

- Events can be triggered by input elements.

```
inputField.on("change", function() {  
  var newText = d3.event.target.value;  
  console.log(newText);  
});
```


<Time to Code>






Activity: On Change

In this activity, you will use **D3** to reverse the input text and display it on the page.

Suggested Time:
20 Minutes



Activity: On Change

| Instructions | Bonus | Hints |
|---|---|--|
| Use d3 to select the input (<code>#text</code>) and output (<code>.output</code>) elements from the page. | Instead of reversing the string, try to calculate the number of characters in the string. | You may need to iterate through the object using <code>Object.entries</code> and <code>forEach</code> .  |
| Use d3 to attach an event listener to the input field. This event should call the <code>handleChange</code> function any time that the input text changes. | | |
| Finally, complete the <code>handleChange</code> function to select the text from the input field and reverse the string. This function will use d3 to set the output element to the value of the reversed string. | Edit the <code>index.html</code> file to change the <code>h1</code> tag to an unordered list <code>ul</code> . Append each word: <code>count</code> as a <code>li</code> element. | |



Time's Up! Let's Review.



Countdown timer

40:00

(with alarm)




Activity: Button Clicks

In this activity, you will use **D3** to create click handlers for upvotes and downvotes.

Suggested Time:
20 Minutes

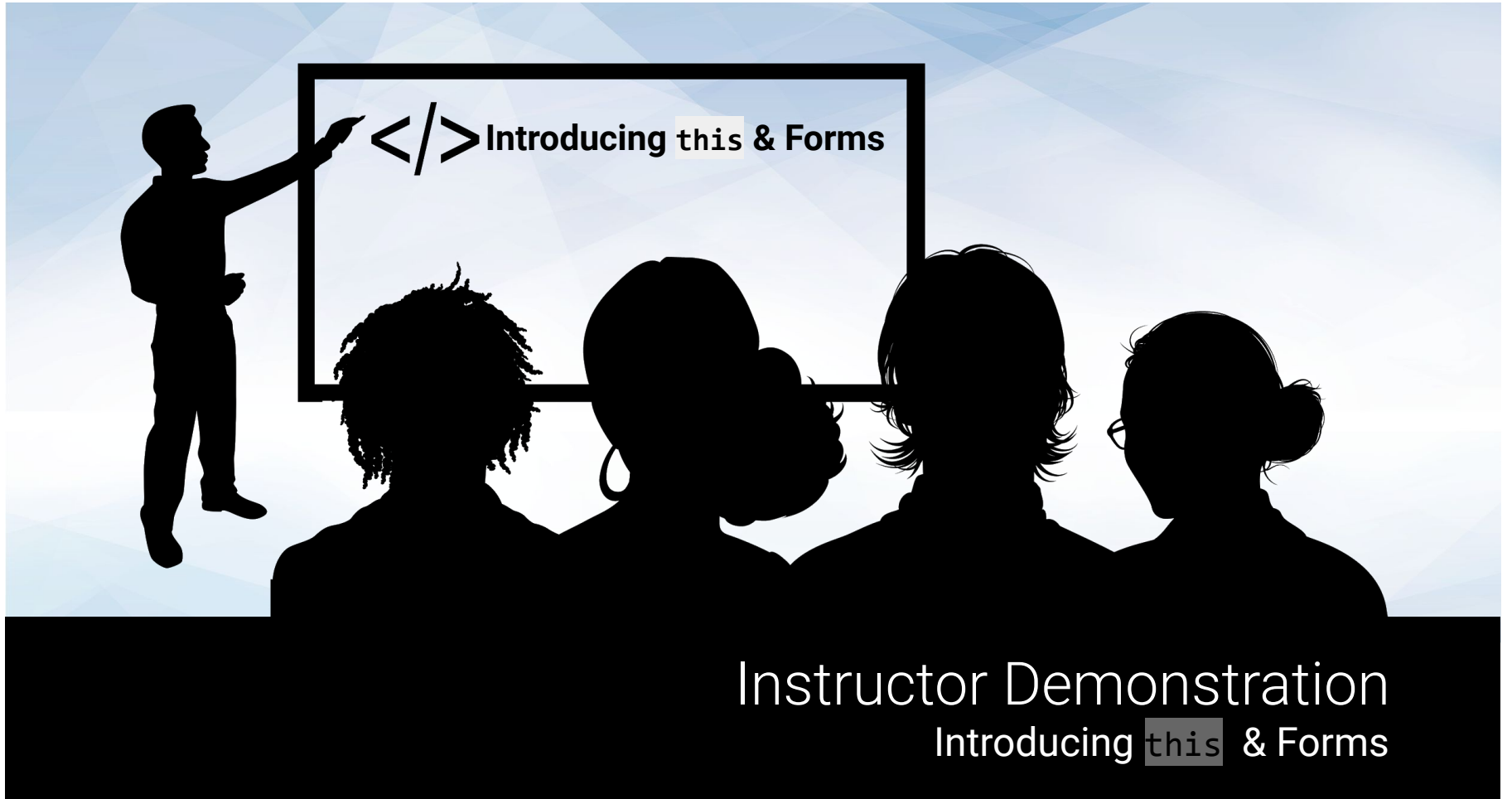


Activity: Button Clicks

| Instructions | Bonus | Hints |
|--|---|---|
| <p>Use d3 to select the input (<code>#text</code>) and output (<code>.output</code>) elements from the page.</p> | <p>Instead of reversing the string, try to calculate the number of characters in the string.</p> | <p>You may need to iterate through the object using <code>Object.entries</code> and <code>forEach</code>.</p> |
| <p>Use d3 to attach an event listener to the input field. This event should call the <code>handleChange</code> function any time that the input text changes.</p> | | |
| <p>Finally, complete the <code>handleChange</code> function to select the text from the input field and reverse the string. This function will use d3 to set the output element to the value of the reversed string.</p> | <p>Edit the <code>index.html</code> file to change the <code>h1</code> tag to an unordered list <code>ul</code>. Append each word: <code>count</code> as a <code>li</code> element.</p> |  |



Time's Up! Let's Review.



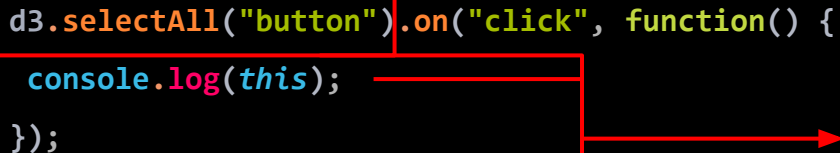
Instructor Demonstration

Introducing `this` & Forms

Introducing `this` & Form


- In JavaScript the `this` keyword refers to the object it belongs to. It has different values depending on where it is used.
- It can be very resourceful to identify which element triggered an event.

```
d3.selectAll("button").on("click", function() {  
  console.log(this);  
});
```

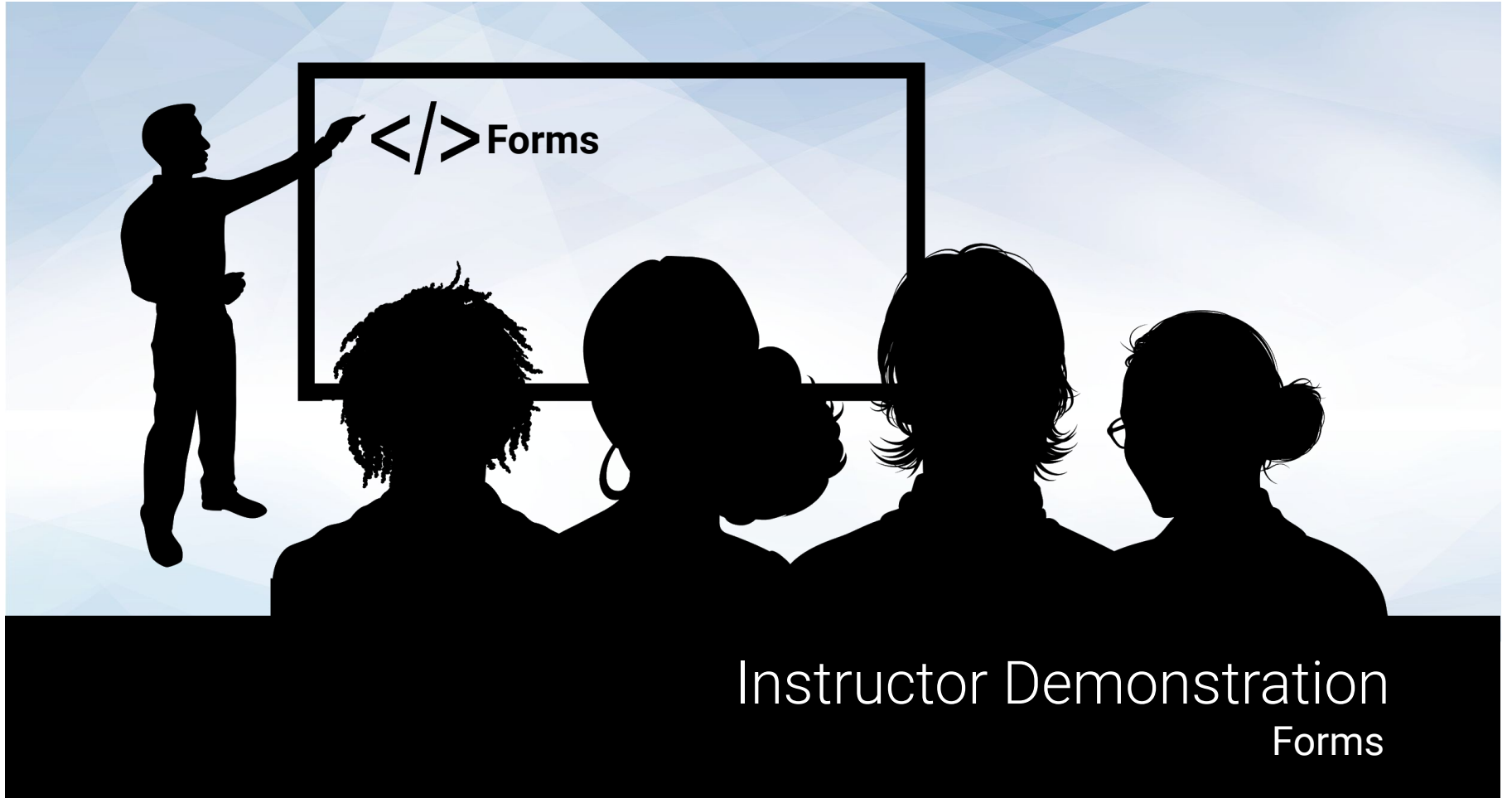


Selects all the buttons in the document.
A function is triggered that will log `this` to the console.

```
d3.selectAll("li").on("click", function() {  
  var listItem = d3.select(this);  
  listItem.style("color", "blue");  
  var listItemText = listItem.text();  
  console.log(listItemText);  
});
```



`li` element is assigned to the variable `listItem` via `d3.select(this)`.
Selecting the element with D3 makes it possible to use D3 functions such as `style` or `text` on the element.



Instructor Demonstration

Forms

Forms

```
var button = d3.select("#button");
var form = d3.select("#form");
button.on("click", runEnter);
form.on("submit", runEnter);

function runEnter() {
  d3.event.preventDefault();
  var inputElement = d3.select("#example-form-input");

  var inputValue = inputElement.property("value");
  console.log(inputValue);
  d3.select("h1>span").text(inputValue);
```




Activity: Form Filter

In this activity, you and your partner will use **D3** to create click handlers for upvotes and downvotes.

Suggested Time:
25 Minutes



Activity: Form Filter

| Instructions | Bonus | Hints  |
|---|--|---|
| <p>Use d3 to select <code>upvote</code> and <code>downvote</code> buttons on the page.</p> | <p>Use an array to save information about each vote:</p> <ul style="list-style-type: none">• Store whether it was an "upvote" or "downvote".• Store the current count at each click.• Use an array of arrays or an array of objects to store the data. | <p>Don't forget to use the <code>.on</code> function to attach the click handlers to the buttons.</p> |
| <p>Create click handlers for the upvote and downvote buttons.</p> | | <p>You will need one click handler for each button.</p> |
| <p>The click handlers should do the following:</p> <ul style="list-style-type: none">• Select the current vote count from the <code>h3</code> tag.• Increment or decrement the count depending on which button was selected.• Update the vote count <code>h3</code> tag using D3. | | <p>You will need to use <code>parseInt</code> to convert the <code>h3</code> vote count to a number before you can add or subtract from it.</p> |



Time's Up! Let's Review.