PLTW COMPUTER SCIENCE

Activity 2.2.1

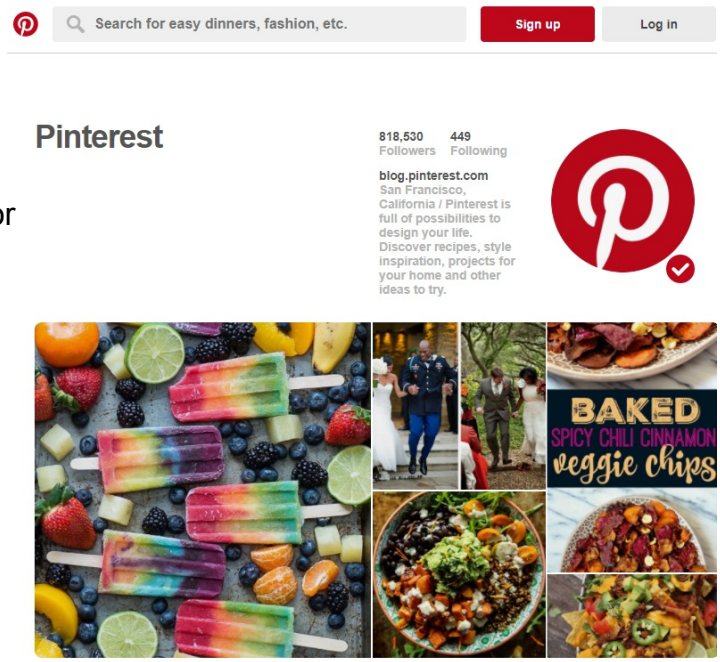
HTML5 and JavaScript

Introduction

For a website to be successful today, it can't just look good; it also has to allow for user interaction. JavaScript (not to be confused with Java) has been one of the most popular web programming languages since it was created in 1996. JavaScript turns a static HTML page into an interactive page.

The HTML5 standard, developed by the World Wide Web Consortium (W3C), connects HTML and CSS to JavaScript libraries that had been developed separately for Chrome, Firefox, and other common web browsers. By standardizing the JavaScript libraries that manipulate HTML and CSS, the HTML5 standard makes it easier for web developers to create interactive web page elements that work reliably across different browsers.

What kind of interaction do you like on websites?



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Materials

- Computer with browser
- Cloud9 account and workspace

Resources

2.2.1 sourceFiles.zip

Procedure

Part I: Explain HTTP Protocol and W3C Process

As noted in an earlier activity, W3C develops many of the standards and protocols for web technologies. They have a process that they follow to ensure that technical specifications and recommendations for technologies are the best they can be.

> Refer to your downloadable resources for this material. Interactive content may not be available in the PDF edition of this course.

1. Form pairs as directed by your instructor. Meet or greet each other to practice professional skills. Make sure to address:
    - How you will handle version control
    - Brainstorming norms

2. For more in-depth information about this process, go to **http://www.w3.org/2005/10/Process-20051014/intro.html**. Read the excerpt below and then fill in the blanks with one of the following terms: activity, working groups, or technical reports.

    *Excerpt: An **Activity** organizes the work necessary for the development or evolution of a Web technology. W_3C starts an Activity based on interest from the Members and Team.* **Working Groups** *typically produce deliverables (e.g., software, test suites, and reviews). There are Good Standing requirements for Working Group participation. The W_3C technical report development process is the set of steps and requirements followed by W_3C Working Groups to standardize Web technology, specifications, and guidelines called* **technical reports**.

    Fill in the blank: The W_3C advisory committee must review every proposal for a(n) _____ _____ . _____ made up of representatives of the W_3C membership group, invite experts, and W_3C team members to work on the _____ , which may involve writing one or more _____. These go through an extensive review process that includes Requests For Comments (RFC). At any point in the process, a(n) _____ may be terminated.

    Requests for comments are documents produced by the IETF (Internet Engineering Task Force) that describe proposals for adoption as Internet standards.

One of the protocols that we will examine and use further in this lesson is HTTP. An RFC on the technical report containing the method definitions for HTTP can be found at **http://www.w3.org/Protocols/rfc2616/rfc2616-sec9.html**. Here are summaries of two of the most relevant methods to use:

- GET – Send data as requested to the client, such as a web page. The client might provide some data as part of the request in the query string of the URL.
- POST – Accept data from the client, such as posting a comment on a blog. This is used any time the state of the server will be changed.

Which of these two methods would be used if you were submitting credit card information to amazon.com to complete a purchase?

Part II: JavaScript Introduction

JavaScript allows a web page to behave dynamically. The page can change how it appears based on user interaction or other factors. To demonstrate the capabilities and help you to gain some skill working with JavaScript code, we will examine a couple of simple tasks, adding time and browser data to a site, as well as have you add a feature of your own choosing. First you will examine some sites that make good use of JavaScript.

rowser to **http://www.webbyawards.com/winners**. Under **CATEGORY**, hover d select **Education**. Examine one of the sites in greater detail as directed by your

the purpose of the site and the particular functionality that makes the site

loud9 workspace that you created in the previous lesson. From the **File** menu, **d Local Files...** and upload the resource file `221jssample.html`. In Cloud9's panel, double-click on `221jssample.html` to open it.

our Cloud9 workspace will serve documents only if Apache is running; start licking the green arrow. Apache will serve your entire workspace at a URL like the Replace `c9workspacename` with your Cloud9 workspace name and `e` with your Cloud9 username.

d9 workspace URL:

```
9workspacename-c9username.c9users.io/221jssample.html
```

should load which says, “JavaScript will find out the date and the browser.”

ue for learning a new language is to copy and paste various snippets that you find to existing code and observe the effects. We'll take that approach here. If you plore JavaScript more on your own using this method, you'll eventually come to atterns in the syntax and then, with the help of some online tutorials and official on, you could become an ace in no time!

g code for displaying the current time was found at: **quackit.com/javascript/tutorial/javascript_date_and_time.cfm**. Copy the beginning with the `<script ...>` tag and ending with `</script>`) and paste it ML code after your closing `</h1>` tag.

```
ype="text/javascript">
rentTime = new Date();
rs = currentTime.getHours();
utes = currentTime.getMinutes();
fix = "AM";  // use AM by default

utes < 10)
es = "0" + minutes;

rs >= 12) {
x = "PM";
 = hours - 12;
```

```
rs == 0) {
 = 12;


t.write("<b><div id='d1'>" + hours + ":" +
s + " " + suffix + "</div></b>");
```

and refresh it in the browser tab where you viewed it before.
ern established by lines 14, 17, and 18 of the JavaScript code shown above to
variable called `seconds` and store the current number of seconds in it.

`ocument.write` command beginning on line 28 so that the number of seconds
displayed.

ode and test it by refreshing the tab in which you are viewing
`le.html`. The time should update when you refresh the page but not otherwise.

As an extension activity, use the Internet as a resource to determine how to
script so that the page updates every second to display the current time.

of browser uses a different JavaScript engine to interpret JavaScript. During the
owser Wars of the late 1990s, Microsoft Internet Explorer and Mosaic's Netscape
add features to JavaScript, and the two browsers' versions of JavaScript became
t. In 2014, JavaScript was officially standardized again with HTML5, but some
se older browsers. To create a web page that renders well on all browsers, a web
code must use **feature detection** to determine whether the user's browser
a JavaScript feature before using the feature. **Standardization** is like an
treaty: an agreement among parties to use a shared design for hardware or

think are the advantages of standardization, and what are the advantages of
-standard versions of a protocol or language?

you will implement feature detection. All HTML5-enabled browsers have a
unction `getElementById` to get a particular HTML element to manipulate with
llowing code detects whether the browser implements
`mentById` function before trying to use the function. (Code from
eloper.mozilla.org/en-
sing_Web_Standards_in_your_Web_Pages/Developing_cross-
nd_cross-platform_pages.)

llowing code beginning on line 30, noting that line 38 below is line 31 from step 5,
hat line 40 below is line 32 from step 5.

```
minutes + " " + suffix + "</div></b>");
     function hideElement(id_attribute_value) {
       if (document.getElementById &&
              document.getElementById(id_attribute_value) &&
```

```
                        document.getElementById(id_attribute_value).style
                ) {
t.getElementById(id_attribute_value).style.visibility = "hidden";
                };
              }
 </script>
 <button type="button" onclick="hideElement('d1');">hide div</button>
ody>
```

e, overwrite the server copy, and refresh it in the tab you have been using to view

form a compound conditional statement. It combines three expressions with (`&&`). The first expression `document.getElementById` checks to see if that vailable. If it is not available, that expression would evaluate to false. If it were to then the conditional test would **short circuit**. Short circuiting occurs in a logical sion when the first condition is false. Since both conditions must be true in order e expression to be true, the program can save itself some execution time by not evaluate the second condition. Similarly a logical OR (||) expression will evaluate first condition is true, since it doesn't matter what the other one is. In that case it is mputationally that the first statement is true.

ion on line 32 checks to see if there is an element in the document with the given `ute_value`. The final expression on line 33 checks to make sure that the element previous expression has a style. A nice example of short circuiting would be if o element with the given id. In that case trying to retrieve that element's style ce unexpected results.

llowing values, after which expression would the following conditional short

```
&& y==4 && y >x)
```

rnet to help you add the date to this site.

Part III: The Design Phase of Web Design

Throughout this lesson you will begin to learn technical skills and gain knowledge that will allow you to make some truly useful websites for real clients. We'll focus on one such application of web programming as you explore JavaScript, PHP, and MySQL, all of which are commonly used in web development. However, just because we're examining the creation of an online art gallery, don't let that limit your creativity. These same skills could make an online game, store, or social networking site!

Imagine that your principal has asked you to create an online gallery for the display of student artwork. They would like users to be able to search for student artwork by a variety of criteria and

have the site display only images that meet those criteria. The site should have a login for art students that allows them to upload pictures and information about the pieces in those pictures. In addition, students should be able to enter or change their personal information. The website may consist of multiple pages.

As you develop a design plan for this website with your partner, keep in mind the principles of human-computer interaction (HCI) discussed in previous lessons and listed below. You do not need to be concerned with any of the details of coding this website at this point in the activity.

1. Structure: The interface should be organized, putting related elements together.
2. Simple: Common tasks should be easy.
3. Visible: Information and options should be easy to find, without the distraction of unnecessary information.
4. Feedback: Users should be informed of actions, changes in state, and errors.
5. Tolerance: Mistakes should be easy to undo and reasonable input should be interpreted.
6. Reuse: Design should be consistent across components.

15. To help you get started with the design process, answer the following questions. Your instructor may ask you to record answers to these in an engineering notebook:

    - How many pages will your site have?
    - What will be the primary function of each individual page?
    - How will your user navigate between pages?
    - How will information about images and pieces be displayed?
    - What information about images, pieces, and/or artists will be displayed?
    - Where will they be displayed?
    - How will the different parts of your site look?
    - By what criteria should a user be able to search for images?
    - How will they enter those criteria?
    - Draw a sketch of what your site would look like.

16. As directed by your instructor, share with at least two other pairs the ideas that you came up with for the design of the website. Create a list of the best qualities from all three of your groups.

17. You will now brainstorm as a class to produce even more design ideas. Follow the procedure laid out in the following sub-steps.

    - As directed by your teacher, share your list of best ideas from step 14 with the whole class.
    - Brainstorming participants can suggest additional ideas that are variations of ideas suggested earlier.
    - Do not provide feedback on ideas at this point to avoid ruling any out.
    - Once a whole-class list of ideas has been generated, discuss the advantages and disadvantages of each idea. Use the **Scrum poker** ideal of assigning two values to each idea (first value is the difficulty to code the idea; second value is the monetary value of the idea). In Scrum poker, each participant produces a value in private and then all participants reveal their values to the whole group. This method helps to avoid bias. Use a scale of 1–10 with 10 representing the highest difficulty for the first value and the most

potential for financial gain for the second value.
    - Use Scrum poker as directed by your instructor to determine which ideas you would focus on to develop a successful website. Prioritize ideas that are easy to program and result in the most monetary value.

18. Name one company in your area that would need people on staff who are able to handle the design phase of a website. If you are having difficulty, use the Internet to find a local company that has a website. At some point they have had to communicate ideas to a web developer about design.

Part IV: Analyzing a Website

Now you'll take a look at a version of an online art gallery in order to better understand the usefulness of dynamic web languages.

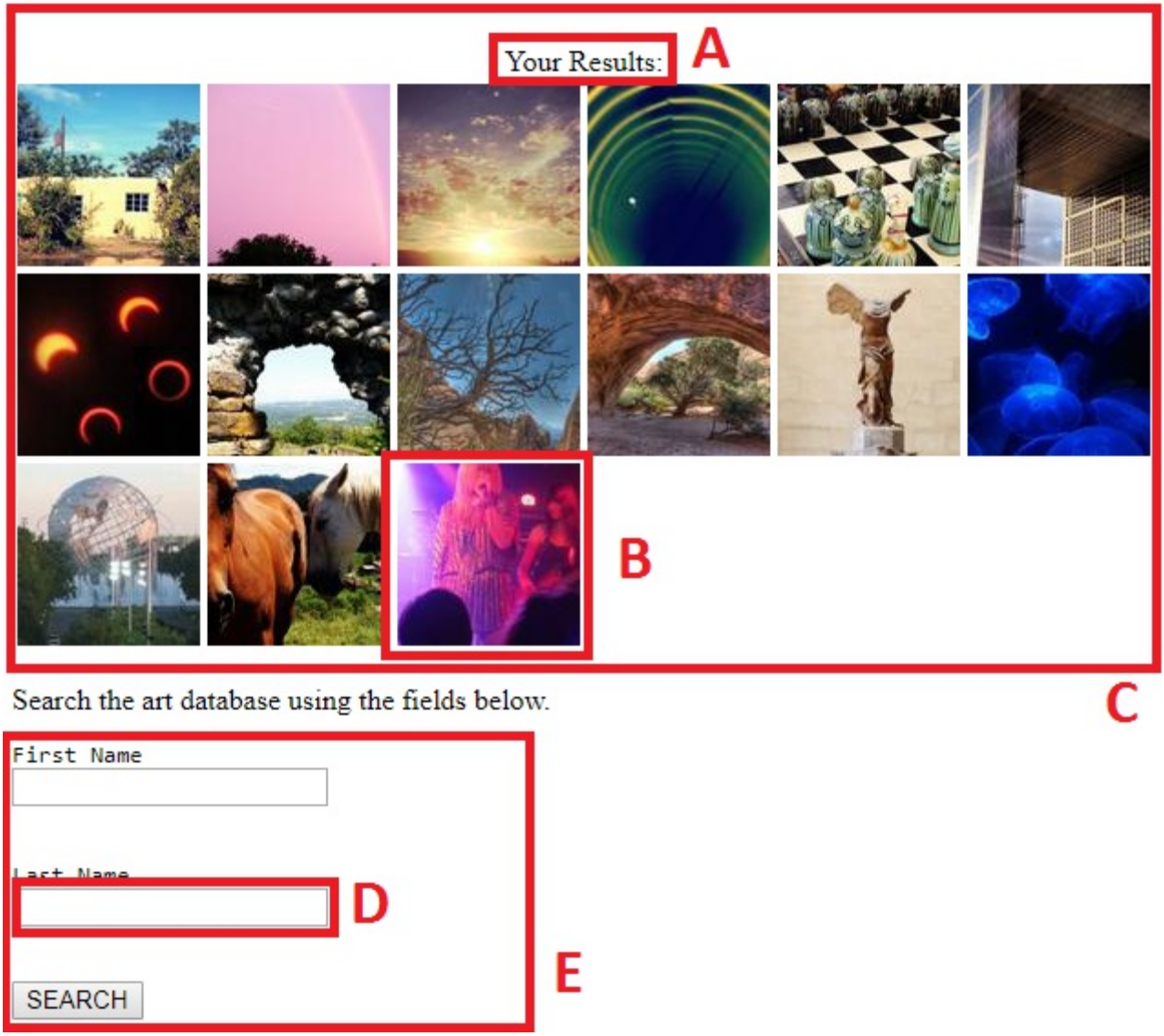
19. Examine the page `221indexA.html` in two different tabs: one that requests the page from the Apache web server and renders it, and another tab that access the page within the Cloud9 editor. What languages are used to write the code that you see?

20. Answer the following questions as you test out this site:

    - What can you see?
    - What can you do?
    - What notable functions are missing from the site? Hint: Don't forget to consider HCI and accessibility concerns.
    - Look at the code for the site. Rate each line of code on a 1 to 5 scale as follows:
        - I know what this line of code is and could have thought of it on my own.
        - The line makes sense when I read it, but it would have been difficult for me to come up with on my own.
        - This line of code makes no sense to me.
    - After you have rated all of the code, describe what kind of code makes sense to you (ratings 1 or 2) and what does not (3, 4, or 5).

    We need to quickly review HTML so that you know which parts of the web page are being affected by functionality that we add later.

21. Using the images below, write the tag or tags that tell the browser to render the highlighted areas of this page.



- The text reading “Your results:”
- The image of the concert
- The entire table containing the heading and images
- The form input text box under “Last Name”
- The form

You can use JavaScript to create event-handlers for events of all kinds, including mouse, keyboard, and timer events. When the document first loads, the browser has a **document object model (DOM)** for the document. The DOM is a tree of HTML elements. An event-handler can modify the DOM, and the browser will update the rendered page for the user. An example of an event-handler is demonstrated by `221indexB.html`. This file adds functionality to site by using a programming language; HTML and CSS as merely markup languages, while JavaScript is a programming language that can use much of the power of the client's computer.

22. Repeat the actions in step 18 for `221indexB.html` and then answer the following questions.

    - What happens when you point to the image in the upper left?
    - What languages were used to develop this version of the site and what, in broad terms,

is the role of each? (Hint: look at the code.)

- Language 1:
  Role of Language 1:
-
- Language 2:
  Role of Language 2:
-
- Language 3:
  Role of Language 3:

Part V: Modify a website with JavaScript

JavaScript–not to be confused with Java, which is an entirely different language–has made the 221index page more interactive. JavaScript is a **client-side scripting language**. This means that much of the functionality added by JavaScript is handled by the browser on the user's computer, without needing to make more GET requests to the server. Server requests are still needed when the browser needs new data from the server.

23. You could achieve the functionality you observed in step 20a using only HTML with no JavaScript. Each image could link to a different page that enlarges one image.

    - What do you think are the advantages of using JavaScript to do client-side scripting instead of only using HTML/CSS?

      A web server could send the entire website's data to the client and use client-side scripting to allow the user to move among the different views of the data without additional requests to the server. Most websites don't send all the site's data though. **Server-side scripting** uses code executed on the server (typically written in PHP, *Python*, C#, or NodeJS) to customize the data sent based on data provided by the user in the web request.

    - What do you think are the advantages to using server-side scripting instead of implementing all interactivity with JavaScript?

24. Modify this website so that there is a pop out for three more images on the page, similar to the one that appears when you point to `pic1thumb.jpg`.

    How much work would it be to modify all the images on the page in the same way? When you are done, what did you notice about the amount of work you needed to do to accomplish this task?

Part VI: Identify the limitation of client-side scripting

In following activities you'll learn to use code to automate the creation of pages like this. If we

wanted to add an additional page with images from another artist, it would mean replicating a lot of the coding that you did in this lesson which could be a minor pain.

25. How much and what kind of extra work would it be to create a page like this for every art student in your school in this manner?

Conclusion Questions

1. What do you see as some of the advantages of using a client-side scripting language like JavaScript?
2. What kind of improvements could you make to this page using CSS and HTML?
3. Your favorite shopping websites likely use POST or a similar method to send information back to a server to allow purchases. This technology has been responsible for major changes in the way we do business. Use the Internet to research trends in **e-commerce** (buying and selling of goods online) since 1999 and give a summary report of your findings here. You may use the following link to help you get started: **http://www.ecommerce-land.com/history_ecommerce.html**
4. What do you see as the advantages and disadvantages of using only HTML and CSS to create a website as opposed to including JavaScript?
5. What do you see as the advantages and/or disadvantages of choosing a career in web design?