**Complete Lesson Plan: What Happens When You Enter a URL in a Browser?**

**Stage 1: Desired Results**

**Learning Goals**

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| **Cognitive Level** | **Learning Goals** |
| **Remembering** (Knowledge Acquisition) | - Define what a URL (Uniform Resource Locator) is. |
|  | - Identify the components of a URL (protocol, domain, path, query parameters). |
|  | - Recall the basic steps of how a browser retrieves a webpage. |
| **Understanding** (Comprehension) | - Explain the role of DNS (Domain Name System) in resolving domain names to IP addresses. |
|  | - Describe the client-server communication process in HTTP/HTTPS. |
|  | - Summarize the function of a browser’s rendering engine. |
| **Applying** (Skill Application) | - Demonstrate how to inspect a webpage’s network activity using browser developer tools. |
|  | - Use the command line to manually perform a DNS lookup. |
|  | - Apply knowledge of HTTP requests by making API calls using a browser or tool like Postman. |
| **Analyzing** (Critical Thinking) | - Compare HTTP and HTTPS in terms of security and encryption. |
|  | - Examine the impact of slow DNS resolution on webpage loading speed. |
|  | - Differentiate between GET and POST requests in web browsing. |
| **Evaluating** (Critical Thinking) | - Assess the importance of caching in optimizing webpage loading speed. |
|  | - Evaluate the security risks associated with an unsecured connection. |
|  | - Justify the need for browser cookies and session storage in maintaining user experience. |
| **Creating** (Innovation) | - Design a basic HTML page and host it on a local server to visualize network requests. |
|  | - Construct a simple explanation or animation to teach others how the web works. |

**Understandings and Essential Questions**

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| Enduring Understandings | Essential Questions |
| - The process of accessing a webpage involves multiple systems, including DNS, HTTP, and rendering engines. | - What happens behind the scenes when you type a URL into a browser? |
| - The internet relies on client-server architecture for communication. | - How does the browser retrieve and display a webpage? |
| - DNS resolution is critical for converting human-friendly domain names into machine-readable IP addresses. | - Why is DNS essential for web browsing? |
| - HTTP/HTTPS protocols define how browsers and servers communicate. | - How do HTTP and HTTPS differ, and why does it matter? |
| - Browsers parse and render HTML, CSS, and JavaScript to display web content. | - How does the browser interpret and display webpage content? |
| - Security and performance considerations affect user experience. | - What factors influence how fast and secure a webpage loads? |

**Stage 2: Evidence**

**Performance Tasks**

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| Performance Task | Criteria / Rubrics |
| **Trace the URL Journey**: Students will create a detailed step-by-step flowchart illustrating what happens when a URL is entered into a browser. | - Accuracy in depicting the request-response cycle (DNS lookup, HTTP request, server response, rendering). |
|  | - Clear labeling and logical sequencing of steps. |
|  | - Use of appropriate technical terminology. |
| **Network Inspection Activity**: Students will use browser developer tools to analyze network activity and explain key HTTP request-response elements. | - Ability to navigate and utilize network inspection tools effectively. |
|  | - Identification of request/response headers and status codes. |
| **DNS Lookup Experiment**: Students will perform a manual DNS lookup using the command line and document their findings. | - Successful execution of DNS lookup commands. |
|  | - Accurate interpretation of IP address resolution. |
|  | - Reflection on the importance of DNS in web browsing. |

**Other Evidence**

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| Evidence Type | Description |
| **Quizzes / Tests (Optional)** | Short quiz assessing key concepts like HTTP/HTTPS, DNS, and caching. |
| **Observations (Required)** | Instructor monitors students as they use network tools and command-line utilities. |
| **Class Discussions (Required)** | Students discuss performance factors affecting webpage loading and security implications. |

**Stage 3: Plan Learning Experiences and Instruction**

**Engage (up to 5 min)**

**Objective:** Spark curiosity and connect prior knowledge to the topic.

* Show a short animation or infographic illustrating the journey of a URL from browser to webpage.
* Ask students: *“What do you think happens behind the scenes when you enter a URL?”*
* Conduct a quick poll on common misconceptions (e.g., “The browser directly fetches the webpage from the internet”).

**Explore (up to 5 min)**

**Objective:** Allow students to investigate and make observations.

* Have students use **tracert (Windows) or traceroute (Mac/Linux)** to track the path of a data request and analyze the number of hops involved.
* Encourage students to share their findings and discuss how their requests are routed.

**Explain (10–15 min)**

**Objective:** Provide direct instruction and clarify concepts.

* Explain the step-by-step process:
  1. DNS resolution
  2. Establishing a connection (TCP/IP, HTTPS handshake)
  3. Request processing on the web server
  4. Response transmission back to the browser
  5. Rendering by the browser (HTML, CSS, JavaScript)
* Demonstrate how to inspect **network activity** using browser developer tools.
* Show an example of **HTTP request-response cycles** using a real webpage.

**Elaborate / Extend (up to 10 min)**

**Objective:** Deepen understanding through application.

* Divide students into small groups and assign each group a specific part of the URL journey (e.g., DNS, HTTP requests, server response, browser rendering).
* Have each group create a **mini-presentation or visual diagram** explaining their assigned process.
* Conduct a **peer-sharing session**, where groups teach one another.

**Evaluate / Performance Task**

**Objective:** Assess students’ understanding and application.

* Students complete the **Trace the URL Journey** performance task by creating a flowchart of the process.
* Instructor circulates, providing feedback and ensuring logical accuracy.
* Students explain their diagrams to a partner and answer questions.

**Wrap Up**

**Objective:** Summarize learning and reinforce key points.

* Conduct a quick **Q&A session** where students ask lingering questions.
* Provide a **one-minute summary challenge**, where students summarize the URL journey in 60 seconds.

**Homework (if needed)**

* Optional: Students write a short reflection on *why security measures (e.g., HTTPS) are essential in modern web browsing.*