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| Note: The blue boxes in this style guide provide guidance about how to complete each section. When you are finished completing your materials, please delete each blue box (e.g., Table / Delete Table). |
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| Part 1: Learning Experience Description |
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## Learning Experience Title

Full-Stack Web Development: Preparing Computer Science Students for Modern Web Applications

## Abstract

This 15-week learning experience is designed for undergraduate Computer Science students, focusing on full-stack web development. The course will provide comprehensive training on both frontend and backend technologies, covering modern web development frameworks, databases, and deployment techniques. Students will engage in hands-on projects, assessments, and lab work designed to simulate real-world development environments. By the end of the course, students will have built and deployed a fully functioning web application, gaining skills that are immediately applicable in professional settings.

## Learner Audience / Primary Users

The primary audience is undergraduate Computer Science students, particularly those interested in web development and software engineering. These learners will typically have some foundational programming knowledge, although experience with web technologies is not required.

## Educational Use

This learning experience is designed as part of a Computer Science curriculum, specifically tailored for courses on web development. It will also serve as a professional preparation module for students planning careers in web development or full-stack engineering roles.

## Language

English

## Material Type

Instructional Material, including:

* Videos
* Hands-on Lab Activities
* Projects
* Assessments
* Course-related Reading Materials

## Keywords

* Full-stack development
* Web development
* Frontend
* Backend
* JavaScript
* Node.js
* Databases
* Deployment
* APIs
* Real-world applications

## Time Required for Learning Experience

This is a 15-week course, with approximately 5-6 hours per week of videos, labs, project work, and assessments, totaling around 75-90 hours of learning.

## Targeted Skills

* Building dynamic, responsive web applications using modern frameworks
* Developing and integrating APIs for communication between frontend and backend
* Working with databases (SQL and NoSQL)
* Version control and collaborative development using Git and GitHub
* Deploying applications on cloud platforms

## Learning Objectives

By the end of this learning experience, learners will be able to:

* Build a full-stack web application from scratch using modern web technologies.
* Integrate frontend and backend components using APIs.
* Set up, manage, and query both SQL and NoSQL databases.
* Implement user authentication and secure data handling.
* Deploy web applications on cloud platforms (e.g., AWS, Heroku).
* Collaborate effectively using Git and GitHub for version control.

## Prior Knowledge

Learners should have foundational programming skills in a language such as JavaScript or Python. Basic understanding of HTML and CSS will be helpful but is not required.

## Required Resources

* A computer with access to a code editor (VSCode preferred)
* Internet access for collaborative tools and cloud services
* Git and GitHub accounts for version control
* Accounts for cloud hosting services (e.g., AWS, Heroku, DigitalOcean)
* Access to educational platforms for video lessons (if applicable)

| Part 2: Learning Experience |
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## Instructional Strategies and Activities

**Warm-Up**

* Time: 10 minutes
* Activity: Begin each session with a quick review of the previous week’s topics. This includes questions to assess retention and a brief discussion to stimulate interest in the current session’s content.

**Introduction**

* Time: 15 minutes
* Activity: Introduce key concepts for the session, connecting their importance to real-world applications in full-stack development. Engage learners by discussing how today’s skills can directly impact web application functionality and user experience.

**Presentation / Modeling / Demonstration**

* Time: 30 minutes
* Activity: Demonstrate coding techniques and explain complex concepts using code samples and visual aids. Break down each component of full-stack development (frontend, backend, databases) and provide live coding sessions to model best practices.

**Guided Practice**

* Time: 30 minutes
* Activity: Learners will implement small parts of a web application under guidance. Instructor will provide feedback and support as they practice coding and integrating front-end and back-end components.

**Assessment**

* Time: 15 minutes
* Activity: Conduct a mini-assessment to verify understanding, such as a short quiz on key terms or a small coding exercise. Provide corrective feedback and further explanations if needed.

**Application**

* Time: 20 minutes
* Activity: Allow learners to apply the day's skills in a real-world context, such as modifying a feature in their project or integrating an API into their app. This reinforces learning and facilitates knowledge transfer to new situations.

| Writing the Instructional Strategies and Activities:  Using the outline below and the information covered in Module 3, design the instructional strategies, activities, and materials. Be sure to keep all aspects of the Design Guide in mind while working on this section to ensure you are meeting the desired objectives, staying within your articulated Learning Experience scope, and meeting the needs of your defined audience. This section should focus on the design and sequencing of activities and materials to guide and support your learners as they progress through the Learning Experience to achieve the learning objectives. The instructional activities you design and develop should focus on what the learner will be doing during the Learning Experience. This is where you can let your creativity shine by designing activities that will engage your learners with the content. | |
| --- | --- |
| **Learning Experience Segment** | **Important Considerations** |
| ***1. Warm-up***  Review previously learned content to begin a new Learning Experience. Create an environment for learning  ***Time***: Estimated time for planned warm-up activities | ***Think about:***  How will you get and hold learners attention?  How will you tie Learning Experience objectives to learner interests and previous classroom activities?  What questions might you ask to stimulate your learners’ thinking about the subject matter?  ***Specific activities to consider:***   * Create an activity that reviews previously learned content to begin a new Learning Experience. * Create an activity to focus on the topic to be taught. |
| ***2. Introduction***  Create motivation for the new topic. What’s in it for them? Don’t start teaching your Learning Experience yet, just create interest in it.  ***Time***: Estimated time for planned introduction activities | ***Think about:***  How will you introduce and explain key skills and concepts?  ***Specific activities to consider:***   * Create an activity to focus learners’ attention on the new Learning Experience. * Describe the purpose of the Learning Experience by stating and / or writing the objective. * Describe the content and benefits by relating the objective to learners' lives. * Assess learners' prior knowledge of the new material by asking questions***.*** |
| ***3. Presentation / Modeling / Demonstration***  Present, model, or demonstrate the new information or skill using a variety of strategies; check for learner comprehension.  ***Time***: Estimated time for planned presentation activities | ***Think about:***  How will you model this skill or strategy for the learners (e.g., examples, demonstrations, discussions)? How will you break complex skills or bodies of information into understandable components?  ***Specific activities to consider:***   * Create an activity to introduce new vocabulary. * Introduce new information with a variety of strategies using visuals, description, explanation, and written text. * Check for level of learner comprehension by asking questions, using polls, etc. |
| ***4. Guided Practice***  Let the learners practice the new skill. Model the activity. Make it safe for them to make mistakes. Remember that the best Learning Experiences have more practice than presentation.  ***Time***: Estimated time for planned practice activities | ***Think about:***  How will learners practice the skill or concept targeted by the standard? How will you gradually withdraw support as learners become capable of independent performance?  ***Specific activities to consider:***   * Model the activity or skill that learners are to practice the activity or skill. * Monitor learner practice by moving around the room. * Provide an immediate feedback of the activity to learners. |
| ***5. Assessment***  Assess the learners to see if they can perform the skill just practiced. Assess using oral, written, or applied performance assessments.  ***Time***: Estimated time for planned evaluation activities | ***Think about:***  How will you assess learners’ mastery and their readiness to move forward? How will you correct misunderstandings and reinforce learning?  What activities will you suggest for enrichment and remediation?  ***Specific activities to consider:***   * Create an activity to assess each learner’s attainment of the objective. * Assess using oral, written, or applied performance assessments. * Create an activity that helps learners reflect about their learning and/or the strategies used to teach the Learning Experience. |
| ***6. Application***  Create an activity in the classroom where learners apply the new information or skill to their own lives. Simulate real world application of the skill as much as possible.  ***Time***: Estimated time for planned application activities | ***Think about:***  How will you engage learners in reflecting on what they have learned?  What will you use to draw ideas together for learners at the end? What additional Learning Experiences can you preview for learners that will follow as a result of this Learning Experience?  ***Specific activities to consider:***   * Provide an activity that requires learners to apply the learning beyond the Learning Experience and connect to their own lives. * Provide an activity to transfer the skills to a new situation. |
| Source:  Gigante, L. (2012), [What do Common Core State Standards have to do with me and my classroom lesson?](http://www.casas.org/docs/institute/f9-common-core-lesson-planning), presentation at CASAS National Summer Institute 2012 | |

## Key Terms and Concepts

API, Backend, Cloud Deployment, Database, Frontend, Full-Stack Development, Git, GitHub, JavaScript, Node.js, SQL, NoSQL, Version Control

| Writing the Key Terms and Concepts:  Provide an alphabetical list of the major terms and concepts discussed in the Learning Experience. Include definitions of terms and concepts that are:   * Important to achievement of the learning objectives * Unfamiliar to learners who might not have previous knowledge about the topic of discussion |
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| Part 3: Supplementary Resources & References |
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## Supplementary Resources

* [W3Schools](https://www.w3schools.com/) – Introductory tutorials for frontend and backend development
* [JavaScript.info](https://www.javascript.info/) – Detailed JavaScript resources
* [MDN Web Docs](https://developer.mozilla.org/) – Comprehensive web development documentation
* [Heroku](https://www.heroku.com/) – Cloud platform for deploying applications
* [Git](https://git-scm.com/) – Official Git documentation

| How to Select Supplementary Resources:  If applicable, list resources that can supplement the instructional materials. These resources will benefit learners who want to read more about the topic for their assignments or further interest. Try to select resources that can be easily accessed by learners, such as websites and other online resources. |
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## References

MDN Web Docs. (n.d.). *Introduction to web APIs*. Mozilla. Retrieved from<https://developer.mozilla.org/en-US/docs/Learn/JavaScript/Client-side_web_APIs/Introduction>

W3Schools. (n.d.). *HTML, CSS, JavaScript, SQL, Python, PHP, Bootstrap, Java, and XML tutorials*. Retrieved from<https://www.w3schools.com>

Heroku. (n.d.). *Deploying applications with Heroku*. Heroku Documentation. Retrieved from https://devcenter.heroku.com/articles/deployment

Git Documentation. (n.d.). *Git documentation and resources*. Retrieved from<https://git-scm.com>

| How to Write References  The reference section provides information about any source you cite in your Learning Experience. Your citations and references should match, meaning each source you cite in must appear in your reference list, and each reference should be cited in your Learning Experience. As a guideline, provide the citations and reference list in American Psychological Association (APA) style. |
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## Attribution Statements

Original content contributed by Cody Squadroni for the Full-Stack Web Development Learning Experience.

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