

# PROJECT BASED LEARNING IN CAREER PATHWAY COURSES

Project Title: <b>No Dead Zones Here: Designing a Wireless Network</b>		
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Course(s): Cisco Networking Academy: IT Essentials, Introduction to Networks; Computer Networking; PC Maintenance, CompTIA A+ certification	Level(s): High school; Tech school; CTE	
Project Days: 10-15 instructional days	Instructional Time: 2 hours per day	
<b>PROJECT DESCRIPTION</b>		
<b>Challenging Problem or Driving Question:</b> How does a wireless network design affect user efficiency?		
<p><b><u>You are:</u></b> You are a Network Technician assigned to a design team for HopperNet. Your design team has worked together several years designing networks for clients.</p> <p><b><u>You are faced with:</u></b> A client needs a wireless network for its building and surrounding property. You have been asked to design a wireless network that will allow persons to move throughout the building while remaining continuously connected to the network via their wireless devices. Your team is competing against several other networking companies for the design job.</p> <p><b><u>You must:</u></b></p> <ul style="list-style-type: none"><li>• CTE Technical Prompt: Your team must research, design, and evaluate a wireless network for the company. Steps in the design process will include researching various wireless standards. Considerations should include:<ul style="list-style-type: none"><li>✓ a hardware list</li><li>✓ power sources for hardware</li><li>✓ mapped wireless access point (physical topology)</li><li>✓ address scheme (logical topology)</li><li>✓ performance expectations including fault tolerance</li><li>✓ scalability, anticipating technology changes in the next ten years</li><li>✓ security</li><li>✓ FCC licensing if necessary</li></ul></li><li>• Literacy Prompt: Your team will research wireless technology to justify your design. You will document your resources used to support your work in your team's shared Project Design Notebook document on Google Drive. You will prepare a written proposal with APA citations and create a presentation for the client's designated representative.</li><li>• Math Prompt: Your team will calculate the area of coverage for the entire network based on blueprints of the job site. The final proposal will include the total cost of the network including all necessary hardware plus estimated installation costs.</li></ul>		

- 21<sup>st</sup> Century Prompt:

Your team will collaborate to research and design a wireless network based on the client's needs. You will document all work and outcomes in the shared Project Design Notebook document.

## ESSENTIAL STANDARDS

### CTE Technical Standards:

Indiana Department of Education Academic Standards Course Framework, "Bridges to the Internet":

<http://prosser.nafcs.k12.in.us/uploads/file/Prosser/Standards/Bridges%20to%20the%20Internet.pdf>

#### **Domain – Bridging, Switching, and Routing**

**Core Standard 1** Students integrate network technologies using bridging, switching and routing to build fault tolerant networks.

Indiana Department of Education Academic Standards Course Framework, "Networking Fundamentals":

#### **Domain 2 – Network Media and Topologies**

**Core Standard 2** Students apply and adapt appropriate network media and topologies to maintain a functional network.

NET-2.8

Specify the characteristics (e.g., speed, length, topology, cable type, etc.) of the various networking media types.

NET-2.9

Specify the main features of 802.3 (Ethernet), 802.5 (token ring), 802.11 (wireless), and FDDI networking technologies.

Indiana Department of Education Academic Standards Course Framework, "IT Essentials":

#### **Domain – Technology as a Planning and Productivity Tool**

**Core Standard 2** Students integrate technology to arrange materials and solve problems efficiently.

ITE-2.2

Use appropriate technology to plan, develop, edit and present material to different types of audiences both in a group or individually (i.e., paper, web page, multimedia presentation, publications, speech, hypermedia, etc.)

ITE-2.3

Integrate information and communication technology to analyze a real-world problem, design and implement procedures to monitor information, set timelines, and evaluate progress toward the solution

### Literacy Standards:

#### CC Literacy Standards for Technical Subjects

#### **Reading Standards for Literacy in Tech Subs, 11-12**

11-12.RT.1

Cite specific textual evidence to support analysis of technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.

#### Writing Standards for Literacy in Tech Subs, 11-12

11-12.WT.4

Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

11-12.RT.7

Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.

11-12.RT.8

Evaluate the hypotheses, data, analysis, and conclusions in a technical subject, verifying the data when possible and corroborating or challenging conclusions with other sources of information.

**Math Standards:**

**CCSI-Math Standards, Geometry 7.G**

**Solve real-life and mathematical problems involving angle measure, area, surface area, and volume.**

4. Know the formulas for the area and circumference of a circle and use them to solve problems; give an informal derivation of the relationship between the circumference and area of a circle.

6. Solve real-world and mathematical problems involving area, volume and surface area of two- and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes, and right prisms.

**CCSI-Math Standards, Geometry 8.G**

**Solve real-world and mathematical problems involving volume of cylinders, cones, and spheres.**

9. Know the formulas for the volumes of cones, cylinders, and spheres and use them to solve real-world and mathematical problems.

**21st Century Standards:**

**Problem Solving & Critical Thinking:** Use technology to collaborate and solve authentic problems.

**DESIGN PROCESS**

**Step 1: Ask/Inquire**

**Entry Event and Project Launch**

**What will you do during this phase of the process?**

Soft launch: 802.11 worksheet

Activity: Think-Pair-Share: *Why are there discrepancies between information?*

Discussion of 4-H project last year.

Share project.

Have teams meet to organize, choose a project manager & discuss workload.

Start Project Design Notebook document in a shared Google Drive folder.

Research

**Step 2: Imagine**

**What will my students do during this phase of the process? List student work & its assessment.**

Create a list of "need to knows": questions that they would like to ask the client

Continue research

Start "roughing out" design

**Step 3: Plan**

**What will my students do during this phase of the process? List student work & its assessment.**

Firm up design for network (including justifications)

"Soft" presentation to instructor

**Step 4: Create****What will my students do during this phase of the process? List student work & its assessment.**

Improve design for network (including justifications) based on instructor feedback

Create a hardware list including costs (Client’s Bill of Materials)

Create physical &amp; logical topologies

“Soft” presentation to advisory member

**Step 5: Experiment/Evaluate****What will my students do during this phase of the process? List student work & its assessment.**

Improve design for network (including justifications) based on advisory member feedback

Edit hardware list including costs (Client’s Bill of Materials) as needed

Edit physical &amp; logical topologies as needed

“Soft” presentation to other student teams

**Step 6: Improve****What will my students do during this phase of the process? List student work & its assessment.**

Finalize all client documents, including supporting APA annotations

Create the client presentation (PowerPoint video, etc.—team’s choice)

**Step 7: Communicate****What will my students do during this phase of the process? List student work & its assessment.**

Team presents to client’s representative(s), including all documentation

**STUDENT EVALUATION****Rubric(s)**

Checkpoint 1: Gantt chart, rough draft of design, 802.11 coverage math (Steps 1, 2, &amp; 3)

Checkpoint 2: Design with justification, rough draft of hardware list with costs, rough draft of physical and logical topologies, “soft” presentation (Step 4 with advisor with wireless knowledge)

Checkpoint 3: Any changes to design, hardware, etc. based on advisor’s recommendations (Step 5, presented to other teams in class for feedback)

Checkpoint 4: Final checklist to ensure all documents are ready for client and review of client presentation (instructor)

**Assessment(s)**

Final presentation to client (and/or an advisor) which must use technology (such as video to PowerPoint) with all supporting documents.

**INSTRUCTOR REFLECTION****What went well?****What could be improved?****How will you modify this project for next time?****SUPPORTING MATERIALS****Equipment/Technology**

Google Drive used to share folder &amp; documents

**Materials**

Computers with Internet Access

**Human Resources**

Advisory members or others with wireless knowledge

**Other**

Access to Google Drive or other cloud sharing resource

#### ADDITIONAL COMMENTS

- This project hinges to the client's floor plan and/or property and its complexity.
- Two afternoon students were in job placements, so paired them on a separate team "Consultants". They were responsible to read and know all materials, and advised other teams as needed.

## Thinking like a Professional: The Professional Notebook (optional)

What are the essential components of the Professional Notebook students will keep for this project?

Each team will maintain a shared Project Design Notebook document in a shared Google Drive folder, which will track all changes/additions/deletions to the document.

The document must include:

- Table of Contents
- Bill of Materials (for the client) which includes cost of each item
- Gantt Chart (for the design team)
- Project Design Notes **updated daily** during the term of project, including all URL of reference materials.

How will you use the Professional Notebook to assess the work on this project?

Documents in the shared folder will be checked for each team's member's edits, additions, etc. The document will be used to assess each team member's participation and to assess the final projects given to the client.