

Integrated Project-based Learning: Combining PTE Standards and Academic Standards

Use this template for planning and sharing ideas for projects. This template is based on the 6 A's:

Authenticity Academic Rigor* Applied Learning* Active Exploration* Adult Connections* Assessment*

Project

Title of Project	Calculating Electrical Circuit Resistance
Project Developed by	Drew Barnes, Pat Van Patten
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School	Buhl High School
Pathway / Small Learning Community/Academy	Grades 11-12
Course Title(s)	Auto II, Algebra Topics
Time Frame	1 Day

Authenticity

Briefly describe your project. Include the key question and provide an overview of what students do and learn. Tell why the question is meaningful to the students and where one might see a similar question tackled by an adult in the workplace.

Key Question	How do you calculate total circuit resistance in series and parallel circuit?
Overview	Students will learn how to measure and calculate total circuit resistance, in both a series and parallel circuit. This will benefit students when trying to diagnose electrical concerns, much like they would working as an automotive technician in a real world employment setting .

Vocabulary/Key Terms

List vocabulary words and key terms essential to student understanding.

Resistance
Ohms
Digital volt-ohm-meter
Circuit
Series

Vocabulary/Key Terms

Parallel

Schematic

Reciprocal

Active Exploration * Applied Learning * Adult Connections

What classroom-based, community-based, and career-based activities does the project involve? Include a description of the active exploration, applied learning, and adult connections in the project (as needed).

Active Exploration How does the project engage students in real investigations using a variety of methods, media and sources? What field-based work will students perform? How does student learning and service support active career exploration? **REVIEW and CHANGE:** Students will examine real models of homes. Math will explain scaled units in architecture. They will have lessons on home construction and the building codes for bids. How knowledge is used in industry?

Applied Learning How do students apply what they have learned and researched to a complex problem (e.g. designing a product, improving a system, creating an exhibit, organizing an event)? Lecture on industry usage of this concept i.e. model designs. Application with their own proportions also will be explored along with industry standards.

Adult Connections Who from the community, workplace, postsecondary and/or industry partnership works with students on the project? Lecture from local industry and community in home design.

Classroom Activities

Building electrical circuits.

Measuring resistance in an electrical circuit.

Calculating total circuit resistance, series and parallel.
($1/Tr=1/R1+1/R2\dots+1/Rn$)

($Tr=R1+R2+R3+\dots Rn$)

Community Activities

Students will demonstrate how to calculate for electrical circuit resistance for invited community guest following the project (College of Southern Idaho [CSI] instructor, advanced CSI students and/or Advisory committee member(s)).

Career Activities

Building electrical circuits.

Measuring electrical circuits.

Reading electrical schematics.

Problem solving using customer concerns.

Job shadow ASE technician.

Academic/PTE Rigor

Standards Use the space below to list the state content standards and PTE industry standards addressed by the project. (A list of the content standards is available at <http://www.sde.idaho.gov/ContentStandards/default.asp>. This page, which includes selected high school level standards, is designed to let you easily create a list of standards you are addressing. You may then copy and paste the list into this template.)

Academic/PTE Rigor

ISDE Standards

AI.1.3.2 Apply number sense to contextual situations and judge reasonableness of solutions.

AI.1.3.1 Perform computations with exponents, radicals, and scientific notation.

NATEF Automotive Standards

Use wiring diagram during diagnosis of electrical circuit problems. [P-1]

Find shorts, grounds, opens, and resistance problems in electrical/electronics circuits; determine needed repairs. [P-1]

B6.04 TASK: Measure voltage drop, current flow, continuity and resistance in a circuit or component.

01.12 TASK: Demonstrate the ability to work as a team member.

04.01 TASK: Apply basic math skills.

School to Career Competencies *Please check (x) the competencies addressed by the project*

Communicate and understand ideas and information

Collect, analyze and organize information

Identify and solve problems

Use technology

Initiate and complete entire activities

Act professionally

Interact with others

Understand all aspects of an industry

Take responsibility for career and life choices

Student Goal(s) Once the project begins, ask students to generate one or two personal goals.

Assessment

How do you and the students know the project is a success? What are your criteria for measuring students' achievement of the disciplinary knowledge and applied learning goals of the project? What evidence do they use to demonstrate their progress? What deliverables do they need to complete prior to the final exhibition? How will students self-assess?

Measurement should match calculations, students must properly complete a worksheet with a number of problems using the appropriate formulas, assess students project using a competency based rubric.

Assessment samples attached.

Recommended Resources / Sample Products

Recommended Resources / Sample Products

Software or Materials Needed

(Examples)

DVOM

Calculator

Electrical Trainers (including leads, resistors, switches, bulbs, etc.)

Paper

Pencil

Teacher-Developed Materials

(Examples of materials that can be shared with other classes. Please attach samples.)

Practice worksheet.

Rubric.

Task Sheet.

Student-Developed Materials

(Examples of products that can be shared with other classes. Please attach samples.)

Students to be assigned:

“Develop an electrical circuit problem (i.e. ground, short) to test other students in the class.” Teacher will assess correct answer before presenting problems. Collection to be stored for future use. Sample attached.

Websites Used

(Examples)

<http://www.tpub.com/neets/book1/chapter3/1-26.htm>

Final Words

(In a sentence or two, highlight your project’s overall value.)

Students will gain a working knowledge of solving an equation with rational numbers in relation to electricity.

Students will gain confidence with repetition and variety of problems presented.

Teacher Tips/Extensions

(Use the first person to share a useful idea that helps with implementation and ensures success. Make it chatty, informal.)

The presence of the Math teacher in the Automotive lab (and vice versa) sends a clear message to the students that math is required in the lab setting. The two teachers working side-by-side demonstrates the integration of academic skills and technical skills. This project becomes a real world role-model for teamwork. Each brings a specialized set of skills to the table and each works with each other to problem-solve. Plan ahead and budget time to make the project effective.

Extensions

(List any ideas for students who may want to go deeper into the learning standards.)

Students can solve more complex equations/circuits, combining both series and parallel branches throughout the circuit.

Students can design a scenario (i.e. a customer problem) to be demonstrated at an open house, advisory meeting, etc.

Timeline

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What sequence of teaching and learning experiences will equip students to develop and demonstrate the PTE standards and the Academic standards?

- Students will have a general understanding of electricity, schematics, symbols, as well as a basic understanding of solving equations. The students who will be involved in this project will be learning similar math concepts in their academic class. Approximately 3 hours. Auto II, semester 1.

(Adapted from the Boston Public Schools Signature Projects.)