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*

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| **Project** | |
| **Title of Project** | **Tossed (part 1)** |
| **Project Developed by** | Daniel Brown, Chet Jackson, Dan Thomander |
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| **School** | **Cassia Regional Technical Center/Cassia High School** |
| **Pathway / Small Learning Community/Academy** | **Skilled and Technical Sciences, Mathematics** |
| **Course Title(s)** | **Electronics, Mathematics, Construction** |
| **Time Frame** | **5 days** |

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| **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** | **Can we make an accurate predictor model using experimental data?** |
| **Overview** | **Using multi-meters to measure the relationship between lumens and resistance on photoresistors to develop a mathematical model which they can use to make predictions. Students will then use the model to choose the correct resistor and photo resistor combination to use to achieve a the right trigger level to sense the “toss”** |

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| **Vocabulary/Key Terms** | | |
| ***List vocabulary words and key terms essential to student understanding.*** | | |
|  | **“Least-Squares”, regression, predictor-model, relationship.**  **Current, Conductor, Insulator, Resistance, Resistor, Volts, Ohms, Ohm’s law, photoresistor, short,**  **Dato, rabbet, fractions, SawStop, joiner, planer, chop saw, router, collet, CNC mill, sanding grits, rips, crosscuts, checks, bows, crowns, dimensions.** | |
| |  |  |  | | --- | --- | --- | | **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?* Students will examine real models of homes. **SAMPLE:** 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)? **SAMPLE:** 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?* **SAMPLE:** Lecture from local industry and community in home design, job shadow to… | | | | **Classroom Activities** | **Community** **Activities** | **Career** **Activities** | | **Students will graph captured data and use this data to make predictions. Students will also test their predictions by constructing an experimental electrical device.**  **Complete activity worksheet, which includes definitions, symbol recognition, a graphical representation of Ohm’s law, and a record of recorded measurements. • Students will measure and record the resistance of a variety of resistors. • Students will calculate resistance requirements to complete the project.** |  | **Safety- http://www.osha.gov/**  **Electronics pathway - http://www.pte.idaho.gov/Skilled\_Technical\_Sciences/Skilled\_Technical\_Sciences\_Home.html**  **US Department of Labor (Electronics) - http://www.bls.gov/ooh/Architecture-andEngineering/home.htm** | | |

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| **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*](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.)* |
| **The following Idaho Core math standard will be met in this activity:** HSA-CED.A.2 Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales. **Math:**  **HS.N-Q.1. Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret the scale and the origin in graphs and data displays.**  **HS.N-Q.2. Define appropriate quantities for the purpose of descriptive modeling.**  **HS.N-Q.3. Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.**  **HS.A-SSE.3. Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.**  **HS.A-CED.2. Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.**  **HS.A-CED.4. Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. For example, rearrange Ohm’s law V=IR to highlight resistance R.**  **HS.A-REI.2. Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise.**  **Electronic:**  **01.01 TASK: Work Ethics and Behavior**  **01.02 TASK: Interpersonal Relations**  **01.05 TASK: Communicating on the Job**  **01.06 TASK: Solving Problems and Critical Thinking**  **03.01 TASK: Interpret written, graphic and/or oral instruction**  **03.02 TASK: Develop pertinent written, graphic and/or oral instruction/information**  **03.06 TASK: Write technical reports and interoffice communications 5**  **03.07 TASK: Perform oral presentations**  **04.02 TASK: Solve Mathematical Problems Relating To DC Circuits**  **04.06 TASK: Apply Ohm’s Law And Power Formulas**  **04.07 TASK: Read and Interpret Markings to Identify Electronic Component Values and Tolerances**  **04.08 TASK: Measure Properties of a Circuit Using Analog and Digital Test Equipment**  **04.09 TASK: Use Applicable Laws in Series Circuit Analysis**  **07.01 Practice proper safety techniques.**  **Construction:**  **Performance Standard 2.1: Identify types of lumber and their uses**  **Performance Standard 2.3: Identify materials used for millwork**  **Performance Standard 5.3: Use power tools correctly and safely**  **Performance Standard 12.1: Identify parts of a cabinet** |
| **School to Career Competencies** *Please check (x) the competencies addressed by the project* |
| [x] Communicate and understand ideas and information  [x] Collect, analyze and organize information [x] Identify and solve problems [x] Use technology [x] Initiate and complete entire activities [x] Act professionally [x] 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.** |
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| **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?* |
| Students will complete an activity worksheet. Students will complete a finished, working light sensor that sounds an alarm when the lights go out. Students will complete a reflection paper  Students will know if their project was successful by creating the electrical device with the predicted resistor and photoresistor, then showing that the device measures the toss. |

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| **Recommended Resources / Sample Products** | |
| **Software or Materials Needed** *(Examples*) | **TI-Nspire calculator, various Vernier sensors (light, sound, voltage).**  **photoresistor, resistor, digital multimeter, soldering iron, printed circuit board, calculator.**  **⅛ inch masonite board, 1x6x8 pine, wood glue, 1 ¼ brad nails/ finish nails.** |
| **Teacher-Developed Materials** *(Examples of materials that can be shared with other classes. Please attach samples.)* |  |
| **Student-Developed Materials** *(Examples of products that can be shared with other classes. Please attach samples.)* | **Adjustable light box.** |
| **Websites Used** *(Examples*) | **e101.webs.com** |
| **Final Words** (In a sentence or two, highlight your project’s overall value.) | **These students are learning to look for relationships and finding relevance in mathematical models for making predictions. This class will strongly reinforce the math area of study, while simultaneously allowing the students to become more familiar with electronics and woodworking.** |
| **Teacher Tips/Extensions** (Use the first person to share a useful idea that helps with implementation and ensures success. Make it chatty, informal.) |  |
| **Extensions** *(List any ideas for students who may want to go deeper into the learning standards.)* | **This project could lead to a senior project and deeper understanding of different type of sensor-related electronics and woodworking skills.** |

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| **Timeline** |
| ***What sequence of teaching and learning experiences will equip students to develop and demonstrate the PTE standards and the Academic standards?*** |
| Activities by day:   * Day 1: (approximately 30 min.) Overview project. Review definitions, Ohm’s law, symbols, types of wood joints, datos, rabbets and an overview of types of building materials. * Day 2: (approx. 45 min.) Review and practice using tools – digital multimeter, soldering iron, table saws, chop saws, and learning how to use a measuring tape. * Day 3: (approx. 45 min.) Overview of schematic and preview necessary calculations. Basic knowledge of tool use, and tool safety used in project. * Day 4: (approx. 45 min.) Measure resistance and calculate required resistance. View the project and create a cut list and building material list. * Day 5: (approximately 1 and a half hours) Create project, write reflection paper. Take the cut list and perform all operations using the designated tools and create the project. Test knowledge learned. |

(Adapted from the Boston Public Schools Signature Projects.)