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 2)** |
| **Project Developed by** | Daniel Brown, Chet Jackson, Dan Thomander |
| **E-mail Address** | [brodanie@cassiaschools.org](mailto:brodanie@cassiaschools.org), thodanie@cassiaschools.org, jacchet@cassiaschools.org |
| **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** | **How can you use math in real world projects.** |
| **Overview** | **Tossed (part 2) project in where students build a beanbag arcade system that puts to use the measurements and calculations from part 1 to build an interactive arcade. Students will use the knowledge gained from part one plus they will learn additional electronics, woodworking, math, and trade integration skills.** |

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| **Vocabulary/Key Terms** | | |
| ***List vocabulary words and key terms essential to student understanding.*** | | |
|  | **Troubleshooting, Amps, Current, Resistance, Microcontroller, Volts, Ohms, Ohm’s law, photoresistor, short, Dado, rabbet, fractions, SawStop, joiner, planer, chop saw, router, collet, CNC mill, sanding grits, rips, crosscuts, checks, bows, crowns, dimensions, fractions, radius, diameter, whole numbers, numerators, denominators.** | |
| |  |  |  | | --- | --- | --- | | **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** | | blueprints, schematic designs  make cut list build materials electrical parts  build classroom prototype  testing and troubleshooting classroom prototype  design changes and customizations to personal projects  build final projects  testing and troubleshooting individual projects  write up / posting projects |  | **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:**  **9-12.HSN-Q.A.3 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.**  **9-12.HSG-CO.A.2 Represent transformations in the plane using, e.g., transparencies and geometry software; describe transformations as functions that take points in the plane as inputs and give other points as outputs. Compare transformations that preserve distance and angle to those that do not (e.g., translation versus horizontal stretch).** 6.NS.A Apply and extend previous understandings of multiplication and division to divide fractions by fractions **HSG-CO.A.1 Know precise definitions of angle, circle, perpendicular line, parallel line, and line segment, based on the undefined notions of point, line, distance along a line, and distance around a circular arc.**  **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.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:**  **1.1.1 Describe general shop safety rules and procedures (i.e., safety test).**  **1.2.4 Demonstrate proper cleaning, storage, and maintenance of tools. Performance Standard**  **1.3.1 Identify test equipment and their appropriate usage.**  **1.3.2 Demonstrate the proper techniques when using test equipment.**  **1.3.3 Demonstrate safe handling and use of appropriate test equipment.**  **1.3.4 Demonstrate proper cleaning, storage, and maintenance of test equipment.**  **2.1.2 Explain the characteristics of voltage, current, and resistance (i.e., unit of measure, letter/symbol).**  **3.1.1 Identify and explain the main purposes of electronic components.**  **3.2.1 Identify and utilize the basic units of electronic measurements**  **4.1.5 Calculate voltage, current, resistance, and power in a series circuit.**  **4.1.6 Construct, measure, and analyze simple series circuit**  **Construction:**  **Performance Standard 3.3: Perform calculations using fractions, decimals, and percentages**  **Performance Standard 3.5: Perform measuring operations used in the building trades**  **Perform Standards 13.1: Coordinating with other trades.** |
| **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?* |
| The finale individual arcade system will be assessed by quality, functionality and writeups. |

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| **Recommended Resources / Sample Products** | |
| **Software or Materials Needed** *(Examples*) | **TI-Nspire calculator, various Vernier sensors (light, sound, voltage).**  **Microcontrollers, 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.)* | **“Toss” electrical device.** |
| **Websites Used** *(Examples*) | **e101.webs.com** |
| **Final Words** (In a sentence or two, highlight your project’s overall value.) | **These students are learning how to work together and gain knowledgeable experience. This class assignment will strongly reinforce the math area of study, while simultaneously allowing the students to become more familiar with both electronics and woodworking fields.** |
| **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 resistor alarms.** |

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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, tools and safety * Day 2: (approx. 45 min.) blueprints, schematic designs * Day 3: cut list build materials electrical parts * Day 4-6: classroom prototype * Day 7: testing and troubleshooting * Day 8: design changes and customizations * Day 9-11: Build final projects * Day 12: testing and troubleshooting * Day 13: write up / posting project |

(Adapted from the Boston Public Schools Signature Projects.)