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** |
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| **Title of Project** | **Ruben’s Tube** |
| **Project Developed by** | Nathan Hyer and Mo Oneida |
| **E-mail Address** | hyerna@tfsd.org, oneidama@tfsd.org |
| **School** | **Canyon Ridge High School** |
| **Pathway / Small Learning Community/Academy** | **Automated Manufacturing & Physics** |
| **Course Title(s)** | **Precision Machining I, II, and III, Physics** |
| **Time Frame** |  |

| **Authenticity** |
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| *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 we design a structure to better understand sound?** |
| **Overview** | **Ruben’s tubes are a great way to visualize sound waves in an exciting way. We will explore the characteristics of waves, sound travelling through gasses and the math used to calculate the instrument. Using this information we will design, manufacture and ensure safe operation of a Ruben’s Tube.** |

| **Vocabulary/Key Terms** |
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| ***List vocabulary words and key terms essential to student understanding.*** |
|  | **Sine Wave****Gas Pressure****Sound Wave****Standing Wave****Medium****Vibration****Wavelength****Amplitude****Hertz****Frequency****Ignition****Combustion****Fuel****Flow** |
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| **Active Exploration \* Applied Learning \* Adult Connections** |
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| *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. 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**  | **Community** **Activities** | **Career** **Activities** |
| **Introduce students to the vocabulary, concepts and tools pertaining to sound waves.** **Show students** [**Portland Rubens' Tube - Music Trials**](https://www.youtube.com/watch?v=gpCquUWqaYw)**Show students** [**Ruben's Tube Theory - Outreach, Chem Eng, Univ of Utah**](https://www.youtube.com/watch?v=BbPgy4sHYTw)**”****Use the formulae associated with sound waves to design a Ruben’s Tube.****Instructions on centering holes on a cylinder and equal spacing of holes.****Make a Ruben’s Tube.** | **Use the Ruben’s at the School football game. Use it as an attention getter for the Team Starter Introductions.** | **Read one of the four provided articles regarding Design, Engineering, Music, Physics and possible job opportunities involving sound. Use the provided Rubric for this report.** |

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| **Academic/PTE Rigor** |
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| **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.)* |
| **PTE Standards** Comply with safe and efficient work practices Identify and select proper machine controls Produce parts to blueprint tolerances Demonstrate the use of CAD/CAM system for part program development Read and understand a Safety Data Sheet (SDS). Use appropriate Personal Protective Equipment (PPE).

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 | **Academic Standards**CCSS RST.11-12.1 Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author make s and to any gaps or inconsistencies in the account.CCSS RST. 11-12.4 Determine the meaning of symbols, key terms, and other domain-specific words or phrases as they are used in a specific scientific or technical context relevant to grades 11-12 texts and topics.CCSS RST 11-12.7 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.CCSS RST. 11-12.9 Synthesize information from a range of sources (e.g. texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.CCSS WHT. 9-10.9 Draw evidence from literary or informational texts to support analysis, reflection, and research. CCSS SL. 11-12.2 Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data. |
| **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[X] 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 meet the standards according to the rubric or receive a score of at least a 3 if not successful. Students will be able to present the topic and answer the questions that are asked by fellow classmates and the teacher. Students will also be required to create a media presentation (PowerPoint, Prezi, or video) to use as a visual aid. Students will be provided with a rubric to self-assess their own project.  |
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| **Recommended Resources / Sample Products** |
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| **Software or Materials Needed***(Examples*) | **Computers for every student****Internet access****Student text book/instructions****Research materials** |
| **Teacher-Developed Materials***(Examples of materials that can be shared with other classes. Please attach samples.)* | **Rubric to assess paper****Rubric for student self-assessment** |
| **Student-Developed Materials***(Examples of products that can be shared with other classes. Please attach samples.)* | **Report on chosen area of focus.****Two functional Ruben’s Tubes** |
| **Websites Used***(Examples*) | **-**[**Ruben's Tube Theory - Outreach, Chem Eng, Univ of Utah**](https://www.youtube.com/watch?v=BbPgy4sHYTw)**-**[**Pyro Board: 2D Rubens' Tube!**](https://www.youtube.com/watch?v=2awbKQ2DLRE)**-**  |
| **Final Words**(In a sentence or two, highlight your project’s overall value.) | **This project introduces students to real life uses of the tools they use in school and how this pertains to future careers and business practices. This also gives a better understanding of the costs associated with a free market economy.**  |
| **Teacher Tips/Extensions** (Use the first person to share a useful idea that helps with implementation and ensures success. Make it chatty, informal.) | **Create a Pyro Board (2D Ruben’s Tube)** |
| **Extensions***(List any ideas for students who may want to go deeper into the learning standards.)* | **Senior Project** |

| **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?***  |
| * The students will have to learn how to correctly cite sources. Students will also have to stand in front of the class to present the topic that was chosen and to be able to answer questions that may be asked from peers, and the teacher.
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**Project Self-Evaluation**

Student name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Research topic: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Describe your project IN DETAIL:
2. What materials did you use?
3. What are three things you learned from working on the project?

a.

b.

c.

1. What are three things you learned from your research paper?

a.

b.

c.

1. How do you feel that your project will compare with others?

1. What problems did you encounter? How did you overcome these problems?
2. Did your project turn out the way you planned? If not, why?
3. What would you do differently if you could start all over (in regards to either the project or the research paper)?
4. What did you learn about yourself?
5. What grade do you think you deserve? Justify this grade in 50 words or more.

My grade: \_\_\_\_\_\_\_\_\_\_\_\_\_

Justification:

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_