Energy

A Note on Teamwork and Presentations to Further Connect WRS to the Activity:

- Identify the competency or unit in your program that would be most appropriate for teaching this activity synchronously. Students learn best in context.
- Divide the class into competitive teams (at least two).
- Have the teams brainstorm ideas and establish rules for brainstorming: all ideas are accepted.
- Have teams arrive at consensus and choose their best idea to propose.
- Teams should establish norms, roles, and expectations for team members.
- Teams will clearly define their mission and the idea of their proposals.
- The teacher should act as the judge of the quality and feasibility of the ideas.
- Teacher should also provide enough background to get students started and monitor student behavior along the way, providing helpful feedback when necessary.

Students should share work and reflect on how well the team worked together.

Resource

Electric Power Generation; Transmission; Distribution, and Storage; Fuels; Energy Efficiency; and Motor Vehicles. All sectors, except for fuels, experienced net positive growth in 2021. Jobs in clean energy industries drove increases, especially in solar, wind, and electric vehicles. https://www.energy.gov/policy/us-energy-employment-jobs-report-useer

Scenario

You (students) work for a research and development department for one of the emerging automakers in the industry. Work as a team to propose a persuasive argument for or against future investment in fuel systems other than carbon-based.

The underlying problem: Fuel efficiency, environmental cost, and consumer/production affordability.

You must address the following within your presentation, but you may emphasize additional points.

1. Determine the technology you would recommend (or would you recommend a combination?).
2. Back up your decision with science (evidence)-based facts and financial data from the current market economy.
3. Your proposal ***AND/OR*** evaluation of the process for your proposal (how your team worked together) must address the top five workplace readiness skills.

WRS Connection

Each of the following Workplace Readiness Skills with their definitions is followed by a series of process questions that students may pull from and answer to include within their presentations.

1. Creativity and Innovation—We define creativity and innovation as:

- Discussing the importance of creativity and innovation in the workplace
- Brainstorming and contributing ideas, strategies, and solutions
- Developing and/or improving products, services, or processes
- Identifying and allocating available resources.

Process Questions

a) How did you come up with your idea for one or more fuel systems?
b) What was your creative process to come up with this idea?
c) Is this a new idea (as far as you know) or does it come from some emerging idea?
d) How would you change this idea to make it innovative?
e) What resources are you basing your argument on?
f) How do you define or summarize your idea (frame your idea as a story or pitch to persuade investment)?
g) With your idea, what is improved: a product, a service, or a process?
h) What resources are needed to help bring your idea to life: time, people, technology, funding?

2. Critical Thinking and Problem Solving—We define critical thinking and problem solving as:

- Recognizing and analyzing problems
- Evaluating potential solutions and resources
- Using a logical approach to make decisions and solve problems
- Implementing effective courses of action.

Process Questions

a) What problem are you trying to solve? Define it clearly.
b) What is affected by your solution? What are the personal and social impacts?
c) How many solutions did you consider?
d) What was your process for choosing a solution?
e) Is your solution feasible?
f) What motivates industry decision makers to follow the solution?
g) Which aspects of your program of study were helpful to finding an appropriate solution?
h) Does your solution have a cost or some negative consequences or risks? If so, identify them.

3. Initiative and Self-Direction—We define initiative and self-direction as:

- recognizing the importance of proactive, independent, decision-making
- identifying workplace needs
- completing tasks with minimal direct supervision
- applying solutions.

Process Questions

a) If you were an intern and had this idea/solution to this problem, what would be the steps you might follow to propose the solution?
b) To whom would you propose it?
c) How would you propose it?
d) Could you implement this solution alone and inspire others to imitate you?
e) Would your solution encroach upon other policies?
f) What are the benefits of proposing your solution or innovation to your superiors?
g) What are your perceived barriers for having your proposal accepted by others?

4. Integrity—We define integrity as:

- recognizing the importance of having integrity in the workplace
- complying with local, state, and federal laws
- adhering to workplace policies and procedures
- exhibiting honesty, fairness, and respect toward self, others, and property.

Process Questions

a) How do you, in the way you frame your argument, account for global warming and similar elements that may affect current perception?

b) In what ways does your argument support or counter public policy?
c) What factors contribute to return on investment or bottom-line profitability?
d) Does your argument account for a downside or flaws (i.e., possible problems) in your reasoning?
e) Have you fairly presented any problems that may be a part of your solution? Does your solution cause other problems?

5. Work Ethic—We define work ethic as:

- demonstrating diligence (e.g., working with persistence to accomplish a task)
- maintaining dependability (e.g., being reliable)
- accounting for one's decisions and actions
- accepting the consequences of decisions and actions.

Process Questions

a) What is risked by your proposal and are you willing to face consequences.
b) What setbacks are you likely to encounter when trying to have your idea accepted?
c) How will you show resilience and drive and a positive mindset as you work with persistence to accomplish your task?
d) How might your solution impact morale of consumers and businesses?
e) How does your idea positively affect the world?

We strongly encourage teacher feedback on these activities, if implemented, as well as success stories and examples of your completed work. Reviews may be sent to Darren Morris, Instructional Designer, CTECS, dmorris@ctecs.org.

For teachers who wish to expand the activity into a larger project, the following PBL Design Principles and Teaching Practices are provided

PBL Project Design Principles

1. **A Challenging Problem or Question:** The project is framed by a meaningful problem to be solved or a question to answer, at the appropriate level of challenge
2. **Sustained Inquiry:** Students engage in a rigorous, extended process of posing questions, finding resources, and applying information.

3. **Authenticity:** The project involves real-world context, tasks and tools, quality standards, or impact, or the project speaks to personal concerns, interests, and issues in the students' lives.
4. **Student Voice & Choice:** Students make some decisions about the project, including how they work and what they create, and express their own ideas in their own voice.
5. **Reflection:** Students and teachers reflect on the learning, the effectiveness of their inquiry and project activities, the quality of student work, and obstacles that arise and strategies for overcoming them.
6. **Critique & Revision:** Students give, receive, and apply feedback to improve their process and products.
7. **Public Product:** Students make their project work public by sharing it with and explaining or presenting it to people beyond the classroom.

PBL Teaching Practices

1. **Design & Plan:** Teachers create or adapt a project for their context and students, and plan its implementation from launch to culmination while allowing for some degree of student voice and choice.
2. **Align to Standards:** Teachers use standards to plan the project and make sure it addresses key knowledge and understanding from subject areas to be included.
3. **Build the Culture:** Teachers explicitly and implicitly promote student independence and growth, open-ended inquiry, team spirit, and attention to quality.
4. **Manage Activities:** Teachers work with students to organize tasks and schedules, set checkpoints and deadlines, find and use resources, create products and make them public.
5. **Scaffold Student Learning:** Teachers employ a variety of lessons, tools, and instructional strategies to support all students in reaching project goals.
6. **Assess Student Learning:** Teachers use formative and summative assessments of knowledge, understanding, and success skills, and include self and peer assessment of team and individual work.
7. **Engage & Coach:** Teachers engage in learning and creating alongside students, and identify when they need skill-building, redirection, encouragement, and celebration.