Information Technology

Scenario: The Internet of Things (IoT)

You are a recently hired technician with an IT background. Your company is in the business of creating "things" for the Internet of Things (IoT) for consumer use. IoTs are, "web-enabled smart devices that use embedded systems, such as sensors, to collect, send and act on data they acquire from their environments." Your company has a design sprint in one month where all the other employees such as yourself, will share their ideas. Devices do not require human operation, although people may interact and retrieve data to help them make decisions (e.g., Fitbit). Many IoTs are apps on smart phones, utilizing that device's extensive capabilities. Others may be proposed as a unique proprietary device.

Resources:

Definition of IoT: https://internetofthingsagenda.techtarget.com/definition/Internet-of-Things-IoT

18 Examples of IoT in 2022: https://www.softwaretestinghelp.com/iot-devices/

> With these lesson ideas, teachers have the kernel information to complete short activities. Given that teachers will need to use state-approved course outlines, we encourage teaching in context of your program. However, if teachers wanted to expand this into formal project-based learning, allow the scenario to help you get started. 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.

Activity description:

1) Your idea proposal should include a description (teachers may shorten this list or provide additional guidelines).

- What is it?
- How does it help the consumer?
- How does it operate? For example: a sensor collects data by connecting to an IoT gateway or other edge device where data is either sent to the cloud to be analyzed or analyzed locally.
- What type of data does it collect?
- Is this a completely new invention or is it an innovation that uses existing IoT but improves on them?
- An illustration or depiction of the process.
- Who is your target market? Demographics?
- If it is selected for production, what are its related costs (you do not have to include actual prices)?
- What would you call it?

2) You must also address the following Workplace Readiness Skills (if not in your proposal, then as a separate reflection of the activity—teachers may ask you some of these questions at the end of your proposal):

a) 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.

Example questions for Creativity and Innovation:

- How did you come up with your idea?
- What was your creative process?
- Is this a new idea (as far as you know)?
- Are you innovating (improving an IoT) from an original idea that already exists?
- How do you define or summarize your idea?
- What is improved: a product, a service, or a process?
- What resources are needed to help bring your idea to life: time, people, technology, funding?

b) 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.

Example questions for Critical Thinking and Problem Solving:

- What problem are you trying to solve? Define it clearly.
- What is affected or improved by your solution? How does it help?
- What are the personal and social impacts of your idea? How many solutions did you consider before selecting the one you proposed?
- What was your process for choosing a solution?
- Is your solution feasible?
- What motivates consumers to use or purchase the solution?
- Which aspects of your current program of study were helpful to finding an appropriate solution?
- Does your solution have some negative consequences or risks or flaws? If so, identify them.

c) 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.

  Example questions for Initiative and Self-Direction:

  - ☐ How would you propose your idea?
  - ☐ To whom would you propose it?
  - ☐ What are the benefits of having your proposal selected (to yourself and your company)?
  - ☐ If your company values these creative sprints, what could you do to be more proactive?
  - ☐ Did you work alone or as part of a team?
  - ☐ If you were part of a team, did you think the team was successful? What was your role?

d) 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.

  Example questions for Integrity:

  - ☐ Would your idea violate copyright of other IoT?
  - ☐ If you used them, did you credit your sources? How could it help you to do so?
  - ☐ Did the spirit of competition undermine your integrity?
  - ☐ How would you rate the value of your idea? How would your classmates rate your idea?
  - ☐ How can being self-critical about your idea (admitting a certain amount of weakness or flaw) actually help your proposal?
  - ☐ If you worked in a team, did you fulfill your responsibilities (your role) to the team?

e) 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.

  Example questions for Integrity:

  - ☐ How might your solution impact morale and encourage a strong work ethic?
  - ☐ What work ethic issues did you deal with when creating your proposal?
  - ☐ If your idea was not selected for production, what could you do to demonstrate your work ethic?
  - ☐ Did you need to overcome any barriers or challenges when creating your proposal?
  - ☐ How might your experience in this activity positively affect your workplace behavior?

For short activities we offer the following suggestions:

- 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.

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.