Unit 02 - VEX Challenge

Content Area: **Science**
Course(s): **Robotics A**
Time Period: **Semester 1**
Length: **3 weeks**
Status: **Published**

Standards

9.4.12.CI.1	Demonstrate the ability to reflect, analyze, and use creative skills and ideas (e.g., 1.1.12prof.CR3a).
9.4.12.CT.1	Identify problem-solving strategies used in the development of an innovative product or practice (e.g., 1.1.12acc.C1b, 2.2.12.PF.3).
9.4.12.CT.2	Explain the potential benefits of collaborating to enhance critical thinking and problem solving (e.g., 1.3E.12profCR3.a).
9.4.12.TL.2	Generate data using formula-based calculations in a spreadsheet and draw conclusions about the data.
9.4.12.TL.3	Analyze the effectiveness of the process and quality of collaborative environments. Analyze complex real-world problems by specifying criteria and constraints for successful solutions. Criteria and constraints also include satisfying any requirements set by society, such as taking issues of risk mitigation into account, and they should be quantified to the extent possible and stated in such a way that one can tell if a given design meets them. Criteria may need to be broken down into simpler ones that can be approached systematically, and decisions about the priority of certain criteria over others (tradeoffs) may be needed. When evaluating solutions, it is important to take into account a range of constraints, including cost, safety, reliability, and aesthetics, and to consider social, cultural, and environmental impacts.

Enduring Understandings

- Establishing a strategy when approaching a problem will help highlight key aspects, encourage a comprehensive cost-benefit analysis, and result in a better outcome.
- Comprehension of the constraints of a project is crucial for a favorable solution.
- Solutions for complex problems often require a team of individuals with different experiences and expertise.
- Data-driven decision-making, objective viewpoints, and logical reasoning are necessary to establish a unified team.
- Environment, experience, access to equipment/materials, societal wants/needs, etc will all impact potential solutions to a problem.

Essential Questions

1. How does strategy play a role in robot design?
2. Why is determining objectives and strategy important before design development?

3. Do real life / game play constraints stifle or promote creativity?
4. What information needs to be established in the early stages of the engineering design process?

Knowledge and Skills

Knowledge:

- Engineering problems often have multiple viable solutions. It is the designers job to determine the most effective outcome.
- Several factors can be used to measure the success of a design. The best choice is not always clearcut and may create disagreement between designers.
- All problems will have criteria and constraints that will be considered while developing a solution.
- The most effective way to solve a dispute during the design process is to prove success through data collection and objective evidence.
- A team has the best chance of success if all members have faith in the same strategy and are committed to its implementation through the design process.

Skills: SWBAT

- discuss the process of strategic design.
- list potential offensive/defensive strategies for their robot design.
- develop a cost–benefit analysis to demonstrate the strengths of different tasks.
- distinguish their best viable solution based on cost-benefit analysis.
- defend a choice on strategy using objective measures.
- formulate goals for their designs that yield measurable outcomes.

Transfer Goals

In this unit, students will collaborate in teams to start tackling the challenge given to them—winning a game. They will gather information, clearly define the problem, analyze the situation, and consider constraints and conditions to develop potential solutions. To support their decision-making, students will use tools like a decision matrix and cost-benefit analysis to reach team conclusions. These activities will prepare them for the next unit, where they will continue the engineering design process from prototyping to the implementation stage. (Stages 5-9)

Resources

https://sites.google.com/whrhs-stu.org/ponzio/robotics/vex-edr/unit-02

Assessments

https://docs.google.com/document/d/1wR7bQF-8AQoRrt0g4C3hKja0yjwDjC9_BiAmONWbTcI/edit?usp=sharing

Modifications

https://docs.google.com/document/d/1ODqaPP69YkcFiyG72fIT8XsUIe3K1VSG7nxuc4CpCec/edit?usp=sharing