

Students were eager to utilize the DECIDER design process because they wanted to help a region in need by providing a sustainable light source.

introducing the "DECIDER" design process

The importance of utilizing a quality design process for engineers and students who strive to be future engineers cannot be underestimated. Engineers are faced with solving important problems every day and must follow a step-by-step design process to arrive at solutions. Students who are taught an effective design process to apply to engineering projects begin to see problems as an engineer would, consider all ideas, and arrive at the best solution. Using an effective design process is an important tool for a successful technology and engineering class where students think and act as real engineers do.

Do a Google search for "design process," and the search results will include many different steps to various design processes from a multitude of educational institutions. Choosing a design process to adopt within a technology and engineering course or program could be overwhelming. The authors set out to adopt an effective design process to utilize within Technology and Engineering courses at West Orange High School in order to increase student achievement. It was most effective to pick a design process with an acronym so that students could be more successful in recalling the steps. When evaluating the various design processes, either the name was effective and the steps of the process were flawed, or the name was flawed and the steps

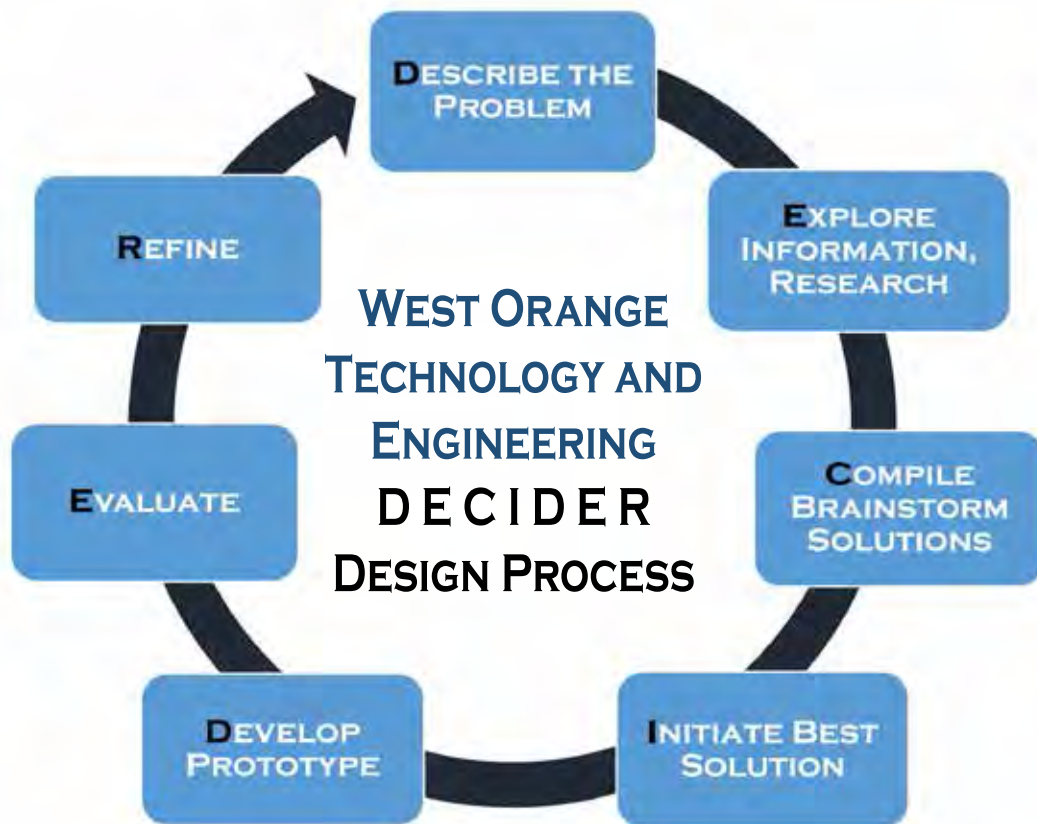


2-liter bottle light.

of the process were effective. The goal was to find a design process that was efficient because it can be applied at all levels of engineering and was also simple to follow with a logical acronym.

We were faced with this dilemma and decided to create our own design process that met those criteria. We faced the same drawbacks of the many design processes we evaluated—finding it difficult to balance between writing effective steps that created a useful acronym. After brainstorming a variety of steps in different combinations we arrived at our final solution—the "DECIDER" design process. The DECIDER design process is a purposeful acronym because it helps the students to realize they are the "decider" in the

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process of making the decisions to arrive at plausible solutions. The actual steps were written to be applicable for all individuals at any level whether it is a high school technology and engineering student or an industry-leading engineer.

The DECIDER Design Process in Detail

Describe the Problem

- What is the problem or the challenge?
- Problem can be clear (example: increase gear ratio) or unclear (increase efficiency of a simple tool).
- Steps to describing the problem are vital because identifying the wrong problem leads to wasted time and resources:
 - Determine the problem's origin.
 - What is and what is not the problem?
 - What do you want to achieve, or what is your goal?
 - Create a problem statement.
- Must have value to be worth solving, determine who is impacted by the solution.
- What is the goal, what do you want to achieve? (Example: design will solve the problem.)
- Location of the problem.
- Constraints (how much time, money, and materials are needed?).

- Identify measurable solution (Example: solar car that drives 30 mph).

Explore Information/Research

- Background information to help develop ideas.
- Gather all relevant information.
 - Interviews
 - Observations to produce data

Compile and Brainstorm Solutions

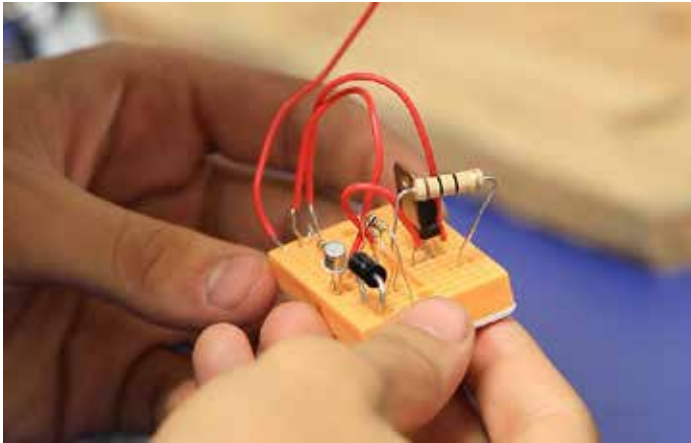
- List all possible solutions.
 - Think outside the box
- Sketches are effective "rough" designs.
- Trade-offs identified.

Initiate the Best Solution

- Taking all aspects (constraints, trade-offs, etc.) of compiled solutions, choose one solution to initiate.
- Finalize orthographic/isometric designs for solutions.
- Identify bill of materials.

Develop the Prototype

- Fabricate your prototype or model according to your final designs where appropriate.



Circuits.

Evaluate

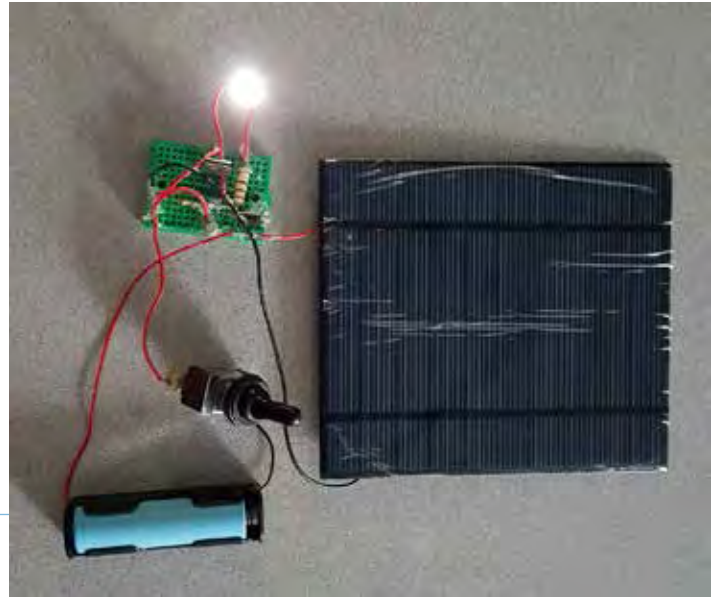
- Conduct tests.
- Determine if the solution solved the problem (according to problem statement).
- What are the strengths and weaknesses of the solution?
- Possible questions to consider in refinements:
 - Does the solution work consistently?
 - Does the solution work efficiently?
 - Are the proper materials being utilized?
 - Is the solution safe?
 - Is the solution aesthetically pleasing?
 - Environmental impact?

Refine

- What improvements can you make to your final design or prototype based on evaluation results?

Students are at their best when they are inspired and motivated to learn new technology and engineering content. That inspiration is cultivated from challenging students through innovative real-world problem-solving projects. At West Orange High School we strive to apply the DECIDER design process to project scenarios that generate enthusiasm amongst the students. For example, in our Engineering and Design Solution course, we present a Solar Street Lamp project.

The students are presented with the problem statement: "Liter of Light and the West Orange Community need solar lights to provide regions in need with high-quality solar lighting for people with limited or no access to electricity. Your challenge is to fabricate a freestanding, waterproof, solar-powered streetlight. Each group must design and create one (1) original freestanding solar streetlamp that is stable and protects all electronic components from extreme weather conditions."



This project both motivated and solved a real-world problem (regions with limited or no access to electricity). Students applied the DECIDER process to arrive at a tangible solution that resulted in different streetlamp designs that were completely functional and suitable for distribution. The circuits for the lamps were distributed to places in need throughout the world. Students were eager to utilize the DECIDER design process because they wanted to help a region in need by providing a sustainable light source.

The DECIDER design process has been a very effective tool for our department in helping our students to arrive at effective solutions, and we believe that all those who adopt it will find the same success with it that we have.



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