

Engineering-Based Science Projects



Engineering Design Process

The Engineering Design Process is a systematic approach used to solve problems or meet needs, applying knowledge to create works under various constraints. It emphasizes learning through creative thinking, synthetic thinking, and hands-on practice to solve complex problems in real-world contexts in a step-by-step manner.



Engineering Design Process Steps

Step 1:
Identify the
Problem



Step 2:
Gather information
and concepts related
to the problem



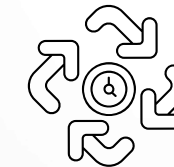
Step 3:
Design a solution
to the problem



Step 4:
Plan and implement
the solution



Step 5:
Test, evaluate, and
improve the problem-
solving method or
prototype



Step 6:
Present the problem-
solving method,
results, or prototype



Engineering Design Process

Step 1: Identify the Problem

This step involves understanding the problem or challenge by analyzing the constraints of situations encountered as everyday problems in order to define the scope of the problem.

Step 2: Gather Information and Concepts Related to the Problem

This step involves collecting information and concepts from science, mathematics, and technology related to potential solutions, in order to identify a variety of approaches to solve the problem defined in Step 1.



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Step 3: Design a Solution

This step involves applying the information and concepts gathered in Step 2 to design a prototype or problem-solving method, taking into account available resources, limitations, and conditions as defined in the given situation.

Step 4: Plan and Implement the Solution

This step involves determining the sequence of steps for building the prototype or solving the problem, then proceeding to construct or develop the prototype to address the problem.



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Step 5: Test, Evaluate, and Improve the Solution or Prototype

This step involves testing and evaluating the performance of the prototype or method to determine whether it can effectively solve the problem or whether there are defects that need to be corrected and improved, then proceeding to make the necessary improvements.

Step 6: Present the Problem-Solving Method, Results, or Prototype

This step involves communicating the problem-solving approach, outcomes, and prototype to others, including the design process, findings, and any improvements made throughout the development.



Science Projects Using the Engineering Design Process

Consists of 3 phases of implementation



Examples of Science Projects Using the Engineering Design Process

Engineering Design Project: Coconut Shell Lamp by Mathayom 1 (Grade 7) Students

Phase 1: Project Initiation

Students survey everyday problems around them and identify the following issues:

- Insufficient lighting in the bedroom, making it difficult to read.
- Clothes hung to dry indoors dry slowly and develop a musty smell.
- Feeling sleepy during afternoon classes.
- Learning materials are frequently lost.

Phase 2: Project Development

Selected problem: Insufficient lighting in the bedroom, making it difficult to read.

- Step 1: Identify the problem by formulating questions using the 5W1H principle.
- Step 2: Gather information and concepts related to the problem.
- Step 3: Design a solution.
- Step 4: Plan and implement the solution.
- Step 5: Test, evaluate, and improve the solution or prototype.
- Step 6: Present the problem-solving method, results, or prototype.



จาก lamp the world save the world, โดย Patchara, 2554.



Activity !!

Each group designs a science project using the Engineering Design Process based on an assigned situation – 1 situation per group.

- **Waste and Environmental Management: Behavior-Stimulating Smart Waste Sorting Bin.**
- **Low-Cost Science Teaching Materials: DIY Renewable Energy Experiment Kit.**
- **Design and Build: Simple Laboratory Hazard Alert System.**
- **Local Agriculture and Water: Portable Soil Moisture Meter.**
- **Energy Management in School Buildings: Heat Insulation from Recycled Materials.**
- **Health and Nutrition at School: Simple School Lunch Nutrition Analysis Tool.**

