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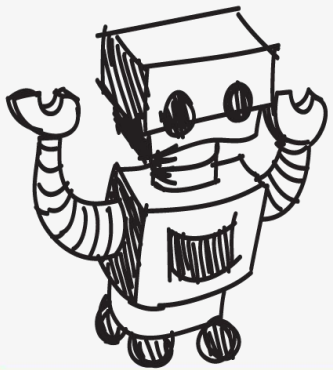
TRY Engineering

Lesson Plan:

Desert Island Survival

IEEE

The Design Challenge



The Design Challenge

- You are a team of engineers all working together to design and build a hut that can withstand a windstorm. The hut must be no bigger than 36 square inches and at least 5 inches high. It must have a working door.

Defining the Challenge: Criteria & Constraints

Criteria

- The hut cannot be bigger than 36 square inches
- The hut must be at least 5 inches high
- The hut has to have a working door
- The hut must withstand a windstorm for 10 seconds
- Use the tape sparingly

Constraints

- The hut cannot be taped to the table or stool during construction or testing
- Use only the materials provided

Material

Required for Build – per team

- 4 Index cards
- 2 Pieces of construction paper 8x10
- 4 Pieces of newspaper
- 10 Craft sticks
- Graph paper (36 sq inches)
- Ruler
- 10 Pieces of masking tape (3 inches long)
- 4 Straws

Testing Material Process

Testing Material

- Hair Dryer or Small Fan

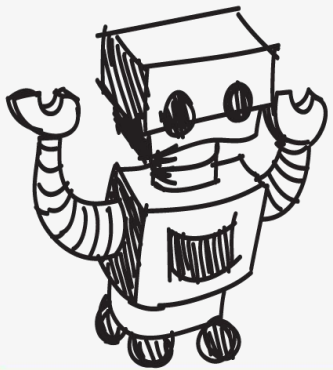
Testing Process

Demonstrate the speed for the students. Place the hut design on a table or stool. The hair dryer or small fan should be held 12 inches away from the hut design. Point the hair dryer or small fan on full speed toward the hut design for 10 seconds. If the hut does not blow off the table or stool and stays in place for 10 seconds, they have succeeded.

Consider...

- Before you get started building, present the rubric (see Student worksheet) to the group. Discuss the rubric with the students – so they know exactly what is required. Discuss what factors are needed for success. Some students will realize that the weight of the hut is an important factor.

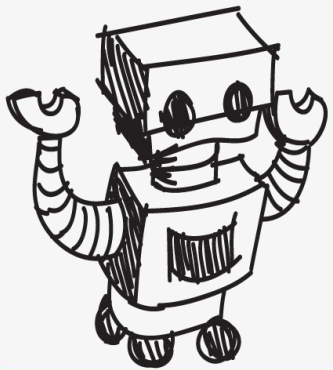
Reflect & Debrief



Reflection

- What would you change if you could change your design?
- What did you learn from the other team's designs?
- How did you work together as a group?

Engineering Design Process



The Engineering Design Process

Learn about the engineering design process (EDP). The process engineers use to solve problems.

(Video 1:47)

Source: TeachEngineering YouTube Channel http://www.youtube.com/watch?v=b0ISWaNoz-c

Engineering Design Process

- Divide into teams
- Review the challenge and criteria & constraints
- Brainstorm possible solutions (sketch while you brainstorm!)
- Choose best solution and build a prototype
- Test then redesign until solution is optimized
- Reflect as a team and debrief as a class

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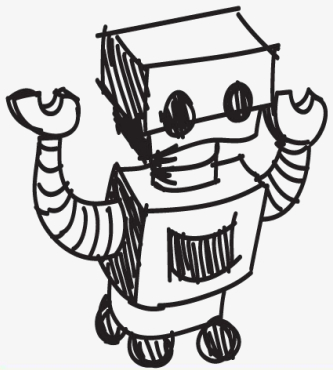
Productive Failure

- The engineering design process involves productive failure: test, fail, redesign. Iterate again and again until you have the best possible solution.
- It is important to document iterations to keep track of each redesign. Use the engineering notebook to sketch ideas, document iterations and any measurement and/or calculations.
- It’s also important to showcase the fact that there can be multiple solutions to the same problem. There’s no one “right” solution.

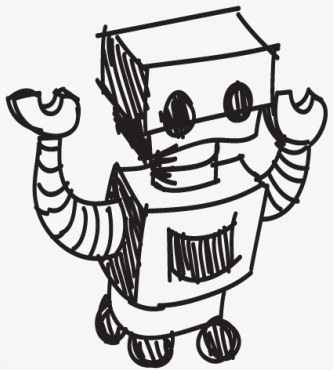
Vocabulary



Vocabulary

- Criteria: Conditions that the design must satisfy like its overall size, etc.
- Engineers: Inventors and problem-solvers of the world. Twenty-five major specialties are recognized in engineering (see infographic).
- Engineering Design Process: Process engineers use to solve problems.
- Engineering Habits of Mind (EHM): Six unique ways that engineers think.
- Iteration: Test & redesign is one iteration. Repeat (multiple iterations).
- Prototype: A working model of the solution to be tested.
- Rubric: A scoring guide used to evaluate performance, a product, or a project.

Engineering Fields



What is Engineering?

Learn about engineering and how engineers are creative problem solvers and innovators who work to make the world a better place.
(Video 3:43)

Source: TeachEngineering YouTube Channel - http://www.youtube.com/watch?v=H9VDkvqGmVo

Related Engineering Fields

- There are several types of engineering fields that are involved with the engineering and design of structures. Here are just some of the related engineering fields.
  - Civil Engineering
  - Mechanical Engineering
  - Electrical Engineering
  - Environmental Engineering

- Download the Engineering Fields Infographic
  How will **YOU** change the world?

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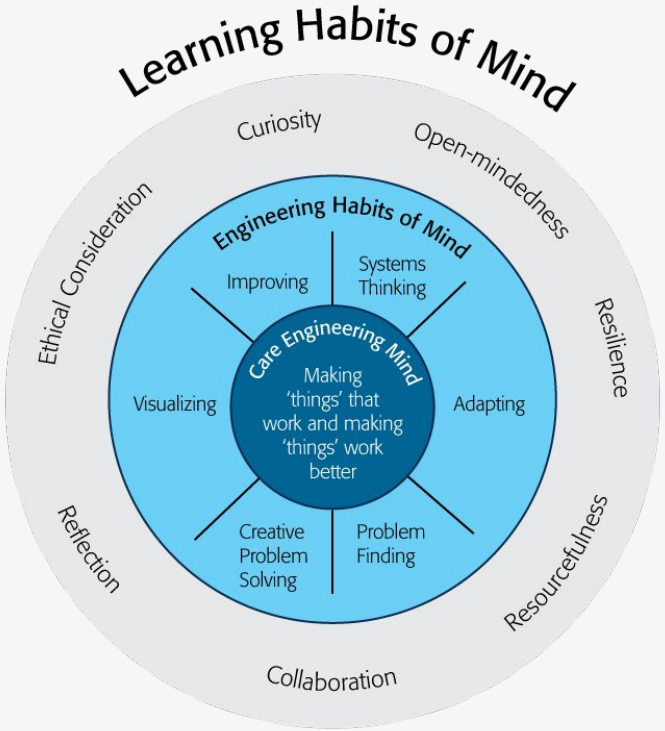
Engineering Habits of Mind



Engineering Habits of Mind (EHM) is about how engineers think everyday. The Core Engineering Mind is about making things that work and making them work better.

Source: https://online-journals.org/index.php/i-jep/article/view/5366)

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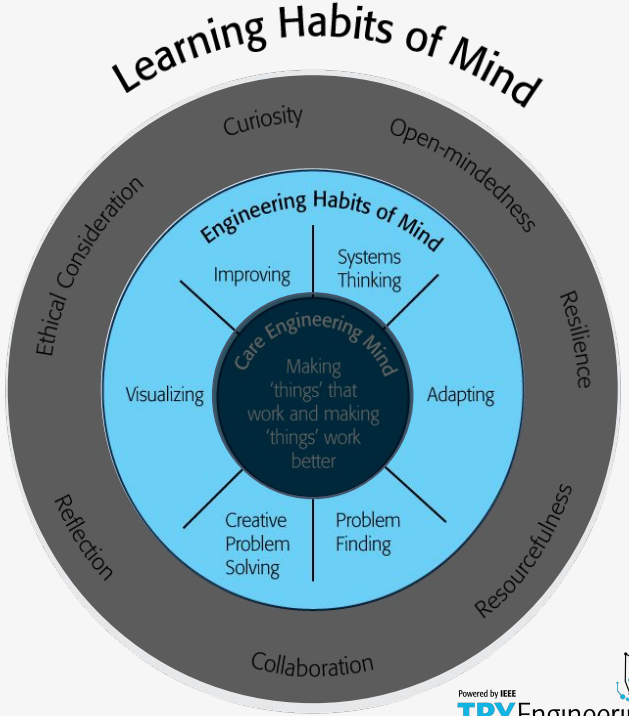
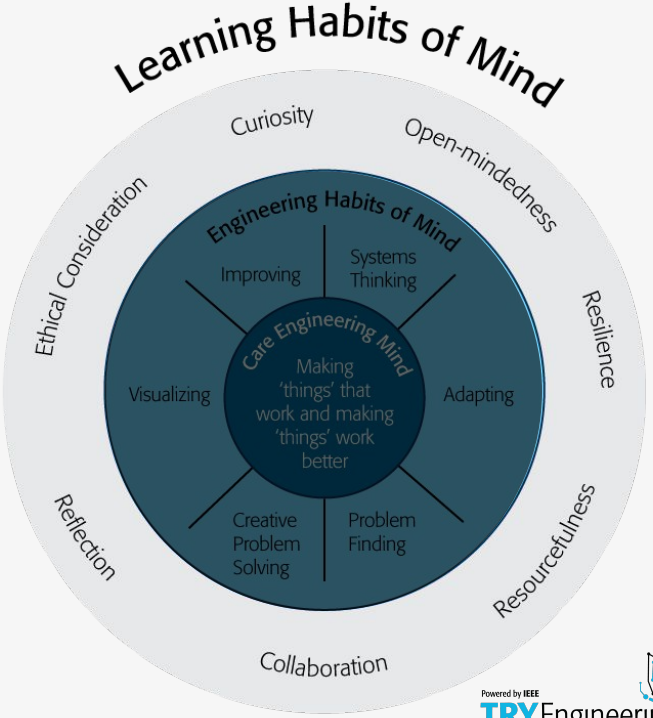
Engineering Habits of Mind Checklist

- ❑ **Systems thinking**
- ❑ **Problem-finding**
- ❑ **Visualising**
- ❑ **Improving**
- ❑ **Creative problem-solving**
- ❑ **Adapting**



Learning Habits of Mind Checklist

- Open-mindedness
- Resilience
- Resourcefulness
- Collaboration
- Reflection
- Ethical Consideration
- Curiosity

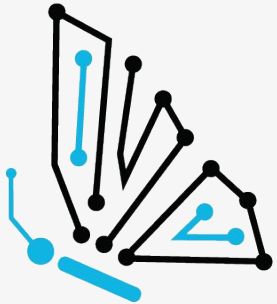


Greatest Engineering Achievements of the 20th Century

Source: http://www.greatachievements.org/

Learn more about how engineers make the world a better place

For more engineering lesson plans and resources like games, engineering careers, and STEM opportunities visit IEEE's TryEngineering.org



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