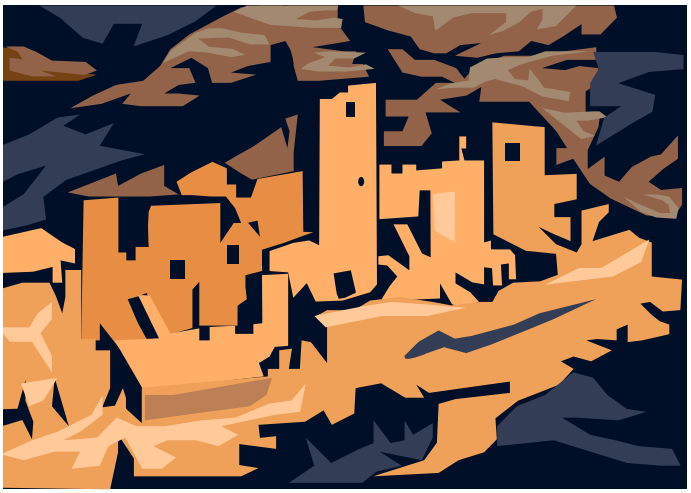
USU 4-H KEVA Planks Tote



Supplies

- Paper*
- Pencils*

Design and Build p. 2

- KEVA Planks
- 2 KEVA Instruction Books
- Flat, level surface*

*Not included in tote

BIG IDEA:

Engineering and design processes are necessary for everyday life and problem solving.

UNDERSTANDINGS:

People work together to find, design and create.

Individuals work to meet goals but must find solutions that fall within specific constraints.

ESSENTIAL QUESSTIONS:

How do constraints affect how something is designed and built?

Why is it beneficial for people to work in teams?

THREE DIMENSIONS, UTAH SCIENCE STANDARDS, AND INTENDED LEARNING OUTCOMES:

See pg. 5-6

Activity 1: Design and Build

Time: 30+ min

Grade Level: K-12

Materials:

- Paper
- Pencil
- KEVA Planks
- Flat Level Surface

To Do:

1. Ask students what type of things they can do and learn about with KEVA planks. KEVA stands for Knowledge, Exploration, and Visual Arts. Give students 5 to 10 minutes to work with the blocks and to get a feel for building and designing with them.
2. Putting the block aside, discuss with the students what they think an engineer is and what engineers do. Ask what types of engineers they know about and what types of materials they work with.
3. Tell students that they will be working as engineers. Explain that engineers have specific goals and constraints. Have students work in partnerships or teams. You may start out by giving a few goals without constraints but ultimately it is important the students learn to work with constraints too, just like real engineers. A number of ideas for goals and constraints can be found below but feel free to come up with your own ideas.
4. For each challenge, allow students to have a design phase. This phase can last anywhere from 5 to 15 minutes.
5. Have students build their structure. Emphasize following their design and recording revisions that were made and using teamwork.
6. Test the structures to see if the specific goal was met.
7. Have students reflect on what worked well and what they would do differently next time.
8. Repeat steps 4-7 as much as desired.

Goals:

- Design for height. Choose a goal, like 2ft tall, for everyone to work to reach. Consider having the goal be who can build the tallest.

- Design for strength. Build a structure that can support a specific weight, like a pound of butter or a stuffed animal. Add a height challenge so that the structure has to be a specific height and still support the specified weight.
- Design for beauty. Have students design a structure for appearance.
- Build a runway for a Ping-Pong ball to get it from a specific place or height to a specific destination.

Constraints:

- Money. Have each plank cost a certain amount. Have students either begin with a budget or record how many planks they use. If a structure topples, you may choose to only allow students to only use half of the fallen planks (round up if odd number). The other planks will count as damaged and unusable.
- Resources. Give students a limited, finite number of planks to use.
- Time. Enforce a challenging time limit for designing and completing a structure.

Combine any goals and constraints you wish to combine. Use the KEVA instruction book for more ideas and goals. Encourage students to come up with their own goals and constraints.

REFLECT:

- What challenges were the most difficult? Which constraints were the most difficult to work with?
- Why is designing beforehand important?
- What challenges did you face in working as a group? What did working as a group enable you to do better?
- Generally, the person who designs and the person who builds are different people. How would you need to change your design plans so that someone else could follow them the way you intended?

APPLY:

Taking exact measurements and working carefully is a very important part of designing and engineering. Engineers make very exact design plans. If the plans are not exact, the product likely will not come out as imagined. Oftentimes, people besides the designer are the ones doing the plans to make the product. Another reason it is important for engineers to make thorough and accurate plans is because the materials they use are very expensive and cannot be wasted. Plans get revised before anything is built and even after the object is built

there are still usually problems to be solved and things to improve.

Team work is also an important part of engineering and design. There are many different types of engineers, mechanical engineers, chemical engineers, electrical engineers, and civil engineers, that all work together to complete specific projects. Teamwork enables people with different skills to come together and create something that they could not have created by themselves.

Three Dimensions, Utah Science Standards, and Intended Learning Outcomes

Note: These applications of National and State Science Standards are not comprehensive. They are meant to serve as suggestions. While only standards for elementary levels have been listed, standards for more advanced grade levels can also be applied. Additionally, this tote is an excellent tool to facilitate inquiry for any age group.

THREE DIMENSIONS

K-2-ETS1-2. Engineering Design (Activity 1: Design and Build)

Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.

Science and Engineering Practices:

- Develop a simple model based on evidence to represent a proposed object or tool.

Disciplinary Core Ideas:

- Designs can be conveyed through sketches, drawings, or physical models. These representations are useful in communicating ideas for a problem's solutions to other people.

Crosscutting Concepts:

- The shape and stability of structures of natural and designed objects are related to their function.

3-5-ETS1-1 Engineering Design (Activity 1: Design and Build)

Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on material, time, or cost.

Science and Engineering Practices:

- Define a simple design problem that can be solved through the development of an object, too, process, or system and includes several criteria for success and constrains on materials, time, or cost.

Disciplinary Core Ideas:

- Possible solutions to a problem are limited by available materials and resources (constraints). The success of a designed solution is determined by considering the desired features of a solution (criteria). Different proposals for solutions can be compared on the basis of how well each one meets the specified criteria for success or how well each takes the constraints into account.

Crosscutting Concepts:

- People's need and wants change over time, as do their demands for new and improve technologies.

UTAH SCIENCE STANDARDS

K-Grade 2

Standard 1 (Activity 1: Design and Build):

- The Processes of Science, Communication of Science, and the Nature of Science. Students will be able to apply scientific processes, communicate scientific ideas effectively, and understand the nature of science.

Standard 3 (Activity 1: Design and Build):

- Students will gain an understanding of physical Science through the study of the forces of motion and the properties of materials.

INTENDED LEARNING OUTCOMES (ILO'S):

1. Use science process and thinking skills.
2. Manifest science interests and attitudes.
3. Understand important science concepts and principles.
4. Communicate effectively using science language and reasoning.
5. Demonstrate awareness of the social and historical aspects of science.
6. Understand the nature of science.