Engineering and Design Using LEGOs

Content Area: **Undefined**
Course(s): **TAG Enrichment K**
Time Period: **Trimester 1**
Length: **Approximately 12 weeks**
Status: **Published**

Unit Overview

The Early Simple Machines LEGO kitis what is used for this unit. It provides opportunities for young children to develop an understanding of science concepts through investigation and hands-on activities. In this unit, students will build the assigned object using a build card. They will answer teacher questions and make predictions. They will begin to learn the basics of some simple machines (gears and levers). Because there are only 4 assigned build cards, the teacher will supplement in between with various teacher-created "themes" for students to use their creativity, imagination, and engineering skills to make something that relates to the "theme." When doing these "themes," the teacher will take into consideration simple machines they have already learned and the types of objects already built from build cards. Teacher will also elicit responses to questions asked regarding these "themes."

Essential Questions

- Can you help "Sam" and "Sara" build a pinwheel with wings that will turn faster?
- What do you think are the important things in making a good pinwheel?
- Can you help "Sam" and "Sara" build a device that can make the spinning tops spin?
- Can you predict whether the blue gear or the red gear will spin for a longer time?
- Can you help "Sam" and "Sara" build a seesaw that will balance?
- If we add weight (using 2x2 bricks) to the ends of the seesaw is it still balanced?
- Where would we have to add a single 2x2 brick to still have it balance?
- What is a gear? What does it do?
- Can you help "Sam" and "Sara" make their raft sail faster?
- What will make your raft sail faster, blowing the sail or waving your kit's lid?
- Will it sail faster using the small sail or the larger sail?
- If you could improve 2 things about your raft, what would you do to it and why?
- Can you make a raft that can hold a lot of things without sinking?
- What is a lever? Can you give some examples of things that you know that use levers?

Content

- investigate wind power
- investigate gearing
- investigate rotation
- investigating balance
- investigating weight
- investigating wind power
- design and build accurately the object assigned
- name levers and gears as two types of simple machines

Skills

- estimating
- counting
- predicting
- discussing
- measuring
- compare and contrast
- identify
- recognize
- investigate
- design

  building

  exploring

  communicating

Assessments

- teacher observation
- teacher inquiry through oral questions
- individual answers to teacher-directed questions
- problem-solving skills observed
- cooperatively working with partner to successfully achieve the task at hand
- ability to work independently at times

Lessons/Learning Scenarios

Pinwheel: Teacher will read scenerio to students and ask them Essential Question: Can you build a pinwheel with wings that will turn faster? Students will build the Pinwheel using Build Card #1. After teacher checks that the students have built the pinwheels correctly, they will then use a fan to predict which of the pinwheels will only start turning near the fan and which will start turning far from the fan. Next, they will test how far from the fan the pinwheels will start turning.

Spinning Tops: Teacher will read scenerio to students and ask them Essential Question: Can you build a device that can make the spinning tops spin? Students will build the Spinning Tops using Build Card #2. Because the top can work in two ways, the teacher will have students predict which top will spin for a long time and which will spin even longer. Next, the teachers will have the students test how long the tops will spin, first using the blue 8-tooth gear and then the red 24-tooth gear.

Seesaw: Teacher will read scenerio to students and ask them Essential Question: Can you build a seesaw that will balance? Students will build the Seesaw using Build Card #3. When students add weight (2x2 bricks) it will either balance or tip to one side. Students will predict when it will balance and when it will not. Students will also test brick position to see if that makes a difference.

Raft: Teacher will read scenerio to students and ask them Essential Question: Can you make a raft sail faster? Students will build the Raft using Build Card #4. Teacher will fill a container(at least 20 inches long) with water(2-4 inches deep so raft will float).Students will use their kit's lid to wave and make a breeze to move their raft. Then students will use their breath and blow the raft. Before doing this, they will make a prediction as to whiich will make the raft sail faster. Students then will switch the size of the sail and predict which sail will make the raft travel further and faster.

Standards

CCSS.Math.Content.K.CC.B	Count to tell the number of objects.
CCSS.Math.Content.K.CC.B.5	Count to answer “how many?” questions about as many as 20 things arranged in a line, a rectangular array, or a circle, or as many as 10 things in a scattered configuration; given a number from 1–20, count out that many objects.
CCSS.Math.Content.K.MD.A.1	Describe measurable attributes of objects, such as length or weight. Describe several measurable attributes of a single object.
CCSS.Math.Content.K.G.A	Identify and describe shapes (squares, circles, triangles, rectangles, hexagons, cubes,

	cones, cylinders, and spheres).
SCI.K-2.5.2.2	All students will understand that physical science principles, including fundamental ideas about matter, energy, and motion, are powerful conceptual tools for making sense of phenomena in physical, living, and Earth systems science.
SCI.K-2.5.2.2.C	Knowing the characteristics of familiar forms of energy, including potential and kinetic energy, is useful in coming to the understanding that, for the most part, the natural world can be explained and is predictable.
SCI.K-2.5.2.2.E.1	Investigate and model the various ways that inanimate objects can move.
SCI.K-2.5.2.2.E.2	Predict an object's relative speed, path, or how far it will travel using various forces and surfaces.
SCI.K-2.5.2.2.E.3	Distinguish a force that acts by direct contact with an object (e.g., by pushing or pulling) from a force that can act without direct contact (e.g., the attraction between a magnet and a steel paper clip).
SCI.K-2.5.2.2.E.a	Objects can move in many different ways (fast and slow, in a straight line, in a circular path, zigzag, and back and forth).
SCI.K-2.5.2.2.E.b	A force is a push or a pull. Pushing or pulling can move an object. The speed an object moves is related to how strongly it is pushed or pulled. When an object does not move in response to a push or a pull, it is because another push or pull (friction) is being applied by the environment.
SCI.K-2.5.2.2.E.c	Some forces act by touching, while other forces can act without touching.
TEC.K-2.8.1.2.F	Critical Thinking, Problem Solving, and Decision Making
TEC.K-2.8.2.2.G.1	Describe how the parts of a common toy / tool interact and work as part of a system.
WORK.K-4.9.1.4.1	Brainstorming activities enhance creative and innovative thinking in individual and group goal setting and problem solving.
WORK.K-4.9.1.4.A.1	Recognize a problem and brainstorm ways to solve the problem individually or collaboratively.
WORK.K-4.9.1.4.A.2	Evaluate available resources that can assist in solving problems.
	The design process is a systematic approach to solving problems.

Resources

- Build cards
- LEGO Simple Machines kits
- Containers with water
- Fan
- Timer