



## STEM Any Time, Any Place

### Build A Mind!

KEVA planks are an exceptionally versatile tool for teaching STEM concepts to children of any age or skill level. In fact, KEVA puts the STEAM in STEM (Art). Only one simple building block is used which allows for an infinite number of construction possibilities. Planks are assembled using various stacking techniques. Since gravity is the primary force acting on the blocks, compounding variables such as gluing skill or connector strength are eliminated. Construction progresses quickly so multiple trials or experiments can be conducted in the course of any challenge. Trial and error maximizes discovery.

### All Purpose Technology Lesson Plan

1. **Challenge** - Issue a challenge or specific parameters for a project. Most are very simple instructions with an unlimited number of possible responses.
2. **Build** - Allow construction time. Suggested time varies according to the number of planks available.
3. **Observe** - Lead students through observations and discussion of their structures. Suggested questions are listed below.
4. **Cleanup** - All planks are the same so all planks go into the same containers. Cleanup usually takes just a few minutes if all students help - even with thousands of planks.

### Questions

Use one or more of these questions after an activity to help children think through their discoveries.

What did you learn or discover as you built?

How is your final structure different from your original concept?

What was the most difficult part?

How are forces working in your structure? i.e. "This block was leaning against this wall with a sideways force so I needed to reinforce the wall."

How could you make your structure more attractive or more interesting?

What would you do differently the next time you try to build something like this?

What can you learn from structures others have built?

Tell me about your structure? (May be too broad of a question for some students.)

## 2 Challenges

### Stacking Game

Each player creates a square base with 5 block placed side by side. No other planks may touch the table or floor. Every player must place each plank according to the instructions of the leader. Leader will say *flat*, *edge* or *upright* for each plank to be added to the structure. Leader may use a die (1 and 2= *upright*, 3 and 4= *edge*, 5 and 6 = *flat*) or just randomly call out instructions.

#### Try these variations.

Tallest structure

Widest structure

Artistic structure

5 blocks per structure

10 blocks per structure

20 blocks per structure

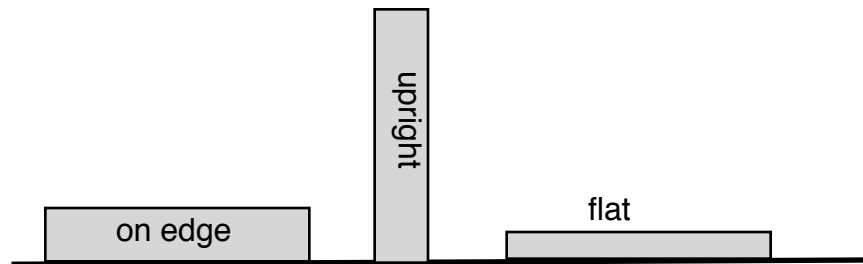
2 blocks at a time

left (off) handed building

last structure to fall

Use 1 or 2 planks instead of 5 for the starting base.

How does your strategy change with each new parameter?



### Bridge challenge.

With one plank touching the table, build the widest structure.

With two planks...

With four planks...

Build a bridge span as wide as possible with only four blocks touching the floor or table.

### Motion

Create a structure that will deliver a ping pong ball into a container that is 12 inches away from the drop point.

Make the ball bounce into the container.

Make the ball change directions on its way to the container.

### 2 Dimensional Designs

Create a 2D representation of a real object- apple, butterfly\* etc

Create a 2D design using patterns. Consider pattern repetition.

Linear patterns, circular patterns, spirals,

How many different ways can you make a square? triangle? hexagon?

\*examples are found online at [KEVAplanks.com](http://KEVAplanks.com)

### 3D Sculptures

Create a structure with a shape theme

Triangles

Squares

Polygons

Shapes can be structural or decorative.

### Speed building

Work in teams. Race to see who can build a tower 5 feet high.

### Spirals

Make a structure using spirals.

How many different types of spirals can you make?

How can you affect the the number of layers needed to make a complete revolution?

### Impossible Structures

Build a structure and remove some of the planks to create a sculpture that could not be built from the ground up. (Show a few examples) Eagle, hexagon uprights

**Build a non uniform sculpture-** Does not follow a pattern, non linear- free form (Island, stack of hay, tree etc.)

### Think like an architect

Build a tower as tall as yourself. Add patterns/structure to make it more beautiful or interesting- i.e. Think like an architect.

### Establish a constraint by which all must follow

All planks grouped in 3's

All in 2's

All in 5's

All in 2's side by side

All stacked flat

All stacked vertically

Only 10, 20 50 or 100 planks

Only 4 minutes, 10 minutes



## Games

**Sculptionary™**- One person builds and others must guess the object. A “blind” is an option. (An open upright book to block the view from others)

**Sculptura™**- One person calls out a stacking orientation and all students must stack accordingly- i.e. flat, edge, upright straight, upright angled. Every sculpture will be different. Stress listening skill and NOT looking at others’ work. a “blind” may be used.

**KEVAtalk™**- One person describes precise positioning and all try to build the same sculpture without seeing the master. Here, a “blind” is necessary. Start with no more than five blocks until students’ communication skills improve.

**Extraction™**- players build a tall tower together. Take turns removing one planks at a time without making the tower fall. During the game, ask students to predict what will happen before the plank is removed. Discuss the forces acting on the blocks. How do the forces change during the game?

## Minimalism

Build a sculpture using only 10 planks

Build objects with only the most essential elements-i.e. Airplane with 3 planks

## Some of the concepts children discover while building:

Balance

Counterbalance

Leverage

Velocity/mass/force relationships

Slope vs velocity

Momentum

Optimum proportions

2D vs 3D design

Linear vs parabolic shapes

Symmetry

Problem solving

Innovation

Teamwork

Quantitative math

Geometric shapes