

STEAM Performance with Teaching Artist, David Novak

This performance addresses the TN Academic Standards for 5th-grade including:

Social Studies

5.05 Examine the contributions and impact of inventors on American society, including:

Alexander

Graham Bell, George Washington Carver, and Thomas Edison. C, E, H

5.06 Examine the impact of important entrepreneurs on American society, including: Andrew Carnegie, Henry T. Ford, and Cornelius Vanderbilt. C, E, H, P

Science

5.ETS1: Engineering Design

1) Research, test, re-test, and communicate a design to solve a problem.

2) Plan and carry out tests on one or more elements of a prototype in which variables are controlled

and failure points are considered to identify which elements need to be improved. Apply the results of

tests to redesign the prototype.

3) Describe how failure provides valuable information toward finding a solution.

Theatre

5.T.P2.B Demonstrate the use of technical elements in a theatrical work.

5.T.P3.A Present theatrical work informally to an audience.

5.T.Cr1.B Propose design ideas that support the story and given circumstances in a theatrical work.



1+1=4: Bucky's Geometry of Inside and Outside

Goals:

- Build models demonstrating structural integrity
- Model three basic platonic solids
- Model stable structural systems

Key Concepts:

- Synergy: the behavior of whole systems unpredicted by the behavior of their parts.
- System: a division of Universe into inside and outside.

Lesson Plan for
Buckminster Fuller's Universe

Some of these activities are incorporated into David Novak's adaptation of "R.Buckminster Fuller: THE HISTORY (and Mystery) OF THE UNIVERSE" written by DW Jacobs, from the life, work and writings of R. Buckminster Fuller.

Introduction to modeling materials: toothpicks and mini marshmallows.

Why is the triangle the most (and only) stable structure?



- The necklace exercise: Begin with 6 vertices and 6 vectors using toothpicks and marshmallows. Reduce by removing one vertex and vector at a time, until you have a stable structure.
- Synergy: $1+1=4$. Using the same material, form 2 triangles. Open and intersect them to form a tetrahedron.
- Systems: Add lines and vertices to form an octahedron and icosahedron.

Additional Activities included in Lesson Plans for Classroom exploration:

Structure

- Manipulate a single index card so that it stands up from a flat surface
- Create a large composition from the individual cards
- Observe and discuss the resulting forms for structure and stability.

Tension/Compression & The 12 principles of freedom.

- Beginning with a hoop, a length of pvc 'hub' and 2 lines, center the 'hub' inside the hoop.
- Increase the number of lines until the pipe is stable.

Natures Design Solutions

Activity: Observations of natural forms and systems.

Story: Narrative pattern in natural systems

Concepts: Precession

Bucky: Dymaxion Car, 4D House

Spaceship Earth

Introduction to Dymaxion Map

Geometry: Earth Measuring

Spaceship: The value of a global 'deck plan'

Concepts: Spaceship Earth, Universe



The World Game

Activity: Mapping world resources on a Dymaxion map.

Concepts: Ephemeralization, Anticipatory Comprehensive Design Science