

The logo for 3Doodler EDU, with '3Doodler' in a blue, bubbly font and 'EDU' in a yellow, blocky font.

# Design Challenge

## Buckminster Fuller Facilitator's Guide

### 🚩 The Challenge

Using the 3Doodler and plastic strands, create a Buckminster Fuller-inspired structure to cover one of your teammates. The structure must be created using geodesic structures and must not exceed 1.5 meters in any direction.

### 👁️ Overview

⌚ Total Time: 250 minutes (5 Class Periods)

This challenge introduces participants to the design and humanitarian concepts developed by Buckminster Fuller. Teamwork, perseverance and problem solving are at the center of this challenge, as well as geometry and estimating—a great group math activity! This challenge could be part of a one-day maker challenge, or could be a one week in-class project. The Investigate and Plan Phases can be assigned as homework to allow flexibility in the schedule.

## 🔗 Challenge Background

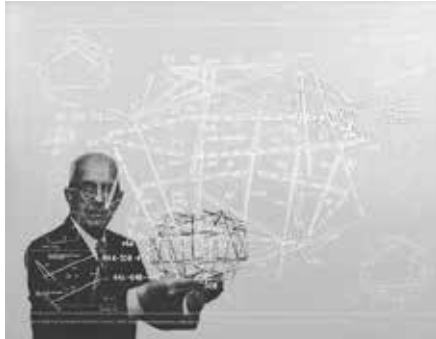


Fig.1



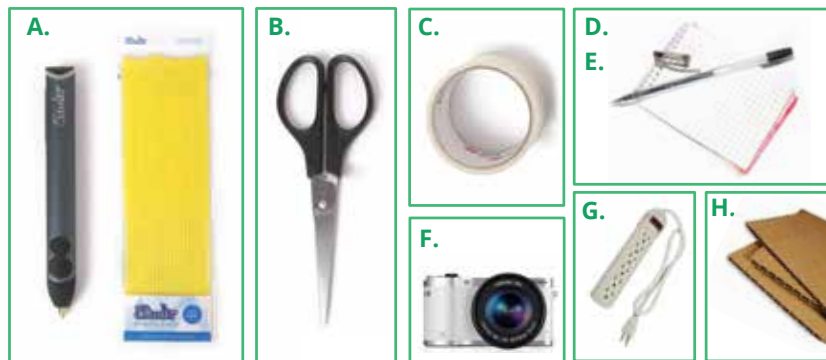
Fig.2

Buckminster Fuller was a visionary passionate about using architecture to solve problems of poverty, homelessness and the environment. He worked with geodesic dome structures and used the triangle as the basis for creating structures. The curvature nature of the domes he designed were strong and also cut down on heating and cooling costs. Epcot Center at Disney World is a popular example of a geodesic dome structure.

## ✂️ Materials & Tools

### ⚠️ Before You Start Doodling

We recommend using a DoodlePad or clear tape placed over paper as a foundation to keep your Doodles in place and so that you can peel them off with ease.



- A.** 3Doodler Pens and Plastic Strands of various colors (one per student, or have students work in pairs or small groups)
- B.** Tools (from your 3Doodler box) plus needle-nose pliers or scissors for snipping plastic ends
- C.** Clear plastic tape or DoodlePad for Doodling foundation
- D.** Paper for Doodling foundation and extra sketching/note-taking space
- E.** Drawing utensils (markers, pens or pencils)
- F.** Camera or video recording device to document the Challenge and results
- G.** Power strips and extension cords
- H.** Extra paper and/or cardboard to give shape to structures

## Challenge Organization

### Challenge Documentation

Take photos & videos of your process using a camera. Document what to do and what not to do. Share your experience with the online community using #3DoodlerEDU!

Challenges are organized into 50-minute periods so they can fit into a traditional classroom structure, or be combined into a single workshop with breaks in between activities. This Challenge is designed to have participants work in short sprints to quickly explore the concepts.

## Class 1: Investigate

Total Time: 50 min.

### Investigate (50 min.)

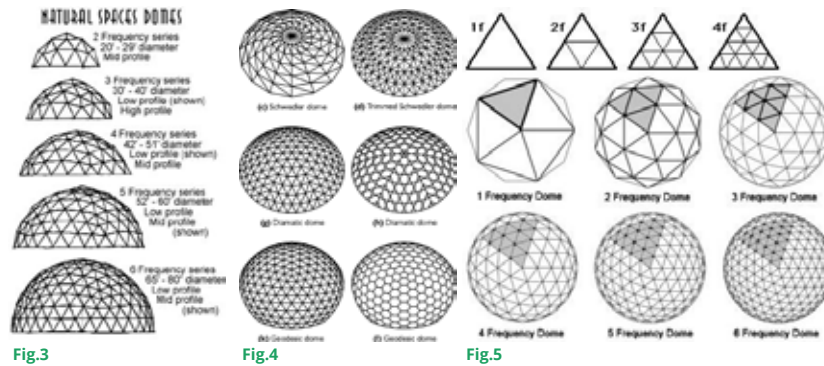


Fig.3

Fig.4

Fig.5

**Step 1:** Answer the following questions:

- Who was Buckminster Fuller?
- What kinds of problems did he want to address?
- What shapes were used to create his geodesic structures?

**Step 2:** Find three projects that incorporate Buckminster Fuller's structures and determine what can be applied to the design of your own structure. Gather images of the example projects and note how and what will be used to create your team's.

**Step 3:** Practice making some of the geodesic shapes with the 3Doodler to see how they fit together.

### Facilitator's Notes

*This phase could also be completed as a take-home research assignment. If done in class, and if time allows, participants can use this investigation period to also play with the 3Doodler pen to Doodle small-scale versions of geodesic structures.*

## 🖥️ Class 2: Plan

🕒 Total Time: 50 min.

### 📋 Plan (🕒 30 min.)

#### 🔗 Remember to Snip Those Ends

We recommend pliers or scissors for snipping plastic ends. Make sure to keep your plastic ends clean to prevent clogs and jams. Snip plastic after removing it from the 3Doodler pen to make sure it's clean for the next time.

Teams will develop a proposal that considers the following:

- Select a team member that the structure will cover
- Determine the circumstances in which the structure will be used
- Consider features such as deployability, compactibility and portability
- Provide a rough sketch of the structure the team will create
- Create measured template(s) for the shapes to be constructed
- Provide an estimate of the number, size and types of shapes needed to create the structure.

#### 📝 Facilitator's Notes

Participants will work together to develop their proposal. If working during a class period, meet with each team to assess their progress and offer suggestions or cues to the types of information they may be missing or need to consider.

## 🖥️ Class 3 & 4: Build

🕒 Total Time: 100 min.

### 🏗️ Build (🕒 30 min.)

Your team will have 2 class periods to build your structure using 3Doodler pens, strands and paper or cardboard as templates. Teams are recommended to test out their structure throughout the Build phase to ensure proper coverage of the selected team member.

#### 📝 Facilitator's Notes

On the Build day, make sure that there is enough room for teams to work and spread out. Make sure there are ample outlets, power strips and extension cords so that teams can reach all areas of the structure they are creating.

## 🖥️ Class 5: Present & Evaluate

🕒 Total Time: 50 min.

### 🗣️ Present & Evaluate (🕒 30 min.)

**Step 1:** Teams will present the results of the Build to fellow classmates. Teams will receive feedback on their project to incorporate in their reflection and for future iterations.

**Step 2:** Teams will be evaluated on the following criteria:

- Success of covering a team member without falling apart.
- Creative use of materials and structure design
- Quality of investigation, planning and proposal phases
- Incorporation of special features

#### 📝 Facilitator's Notes

Have participants provide feedback to each other's teams and make suggestions on improvements. Document the final challenges and note the issues and successes for each team. If time allows, you can add a Re-iterate phase where students try to improve their Doodled domes based on the test results and group feedback.



## 🔍 More Information:

For more information on Buckminster Fuller, please visit:

- <https://bfi.org/>

### 🖼 Images:

Cover Page: <https://goo.gl/z68eVD>

Fig. 1: [https://c2.staticflickr.com/8/7021/6597798731\\_862a87a73f.jpg](https://c2.staticflickr.com/8/7021/6597798731_862a87a73f.jpg)

Fig. 2: <https://goo.gl/EHDci2>

Fig. 3: <https://s-media-cache-ak0.pinimg.com/236x/3f/b3/ff/3fb3ff2cf609237ba38d6d61ab308197.jpg>

Fig. 4: <https://goo.gl/iGrZsB>

Fig. 5: <https://s-media-cache-ak0.pinimg.com/564x/1a/9a/4b/1a9a4b2faa4afe55f52e4f9c8f9a3f23.jpg>