

Cityscape creations

Subject Area(s)	physics, technology
Associated Unit	None
Associated Lesson	None
Activity Title	Cityscape creations
Header	None

Image 1

ADA Description: Students creating a Lego building

Caption: Students creating a Lego building

Image file name: students.jpg

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Grade Level 4 (3-5)

Activity Dependency None

Time Required 45

Group Size 3

Expendable Cost per Group US\$0

Summary Students will work in groups to design and construct a building from LEGOs, based on design principles which aim at creating a stable structure. The students will learn basic LEGO building principles, like make a wide and heavy base and stable connections between pieces, and will use this knowledge to design a building. Students will plan extensively, and after constructing the building, assess the motivation for making changes from or adhering to their original design.

Engineering Connection The explicit goal of this activity is to teach students to design and build a stable LEGO structure, which is inherently an engineering undertaking. However, the activity asks the students to participate in an authentic design process, making a plan and working from it, that is a fundamental part of real-world engineering. In addition, assessing how and why their finished products differ from the original is a basic element of the engineering or scientific process, which offers the students a chance to reflect on their design.

Engineering Category (3) provides engineering analysis or partial design, or (4) provides complete engineering design process.

Keywords LEGOs, building, structures, design

Educational Standards

- State science:
 - Standard 4.5 (Physical Setting): Energy and matter interact through forces that result in changes in motion.
- State technology:
 - Standard 5.1 (Engineering Design): evaluate the ideas and determine the best solution and explain reasons for the choices
 - Standard 5.1 (Engineering Design): plan and build, under supervision, a model of the solution using familiar materials, processes, and hand tools

Pre-Requisite Knowledge

Learning Objectives

After this activity, students should be able to:

- Understand how to rigidly connect two Lego pieces
- Build a stable Lego structure
- Iterate and refine an initial design towards an ultimate goal

Materials List

Each group needs:

- Lego bricks, plates, connectors, axles, beams, etc.
- Paper and pencils for planning

Introduction / Motivation

Stable structures enable people to satisfy basic needs, like surviving the elements, and more complicated social desires, like living in cities. Who designs the buildings in a city? How do they get their ideas? Do you think they always stick to their original plan? What kind of things do they need to know about where they are going to build? Engineers are involved in almost every building constructed in the US. They must use what they know about physics, science, and math to make buildings that are safe and functional. Today we will learn some basic ideas about how to build with LEGOS. Using this foundation, we will become engineers and learn about the engineering design process through the construction of a building.

Vocabulary / Definitions

Word	Definition
Pivot	To rotate, revolve, or turn about a point
Floor	A story or level of a building
Base	The lowest or bottom part

Procedure

Background

Today we are going to learn about buildings. What are some features of buildings like your house? Why do you think they are built like that? For example, why would someone want a

house that could move and sway (like houses in regions that are subject to earthquakes)? Today we want to make a stable building, that is, a building that's not likely to fall or break. We will design and plan our building first, then build it and see if we had to change our plans along the way, like a lot of engineers have to do.

Before the Activity

- Gather Lego supplies with approximately 8-10 plates, 20-30 beams and 60-80 connector pegs per group
- Prepare a worksheet for each student

With the Students

1. Introduce the students to LEGOs- both regular and Technic bricks if available- including connectors, beams, axles, etc.
2. Tell the students that they will be using LEGOs to build a building. What are the basic properties buildings usually have? Why?
3. Present the students with two basic building principles- a stable base for the structure and stable connections between parts.
 - a. Define a pivot and show how one can be made by connecting two beams with only one connector peg. Why may this be undesirable in your house?
 - b. Define a stable base- is it broad or narrow, light or heavy? Why is this desirable in your house?
4. Organize the students into small groups of two or three and ask them to plan a stable building using these principles for 5 minutes. Have some record of this plan, in words or drawings.
5. Ask the students to build this building for 15 minutes.
6. Bring the class together. Have student groups show each structure and plan.
7. How do the realizations differ from the plan? Why? How could the buildings be further improved?

Figure 1 [left justified]

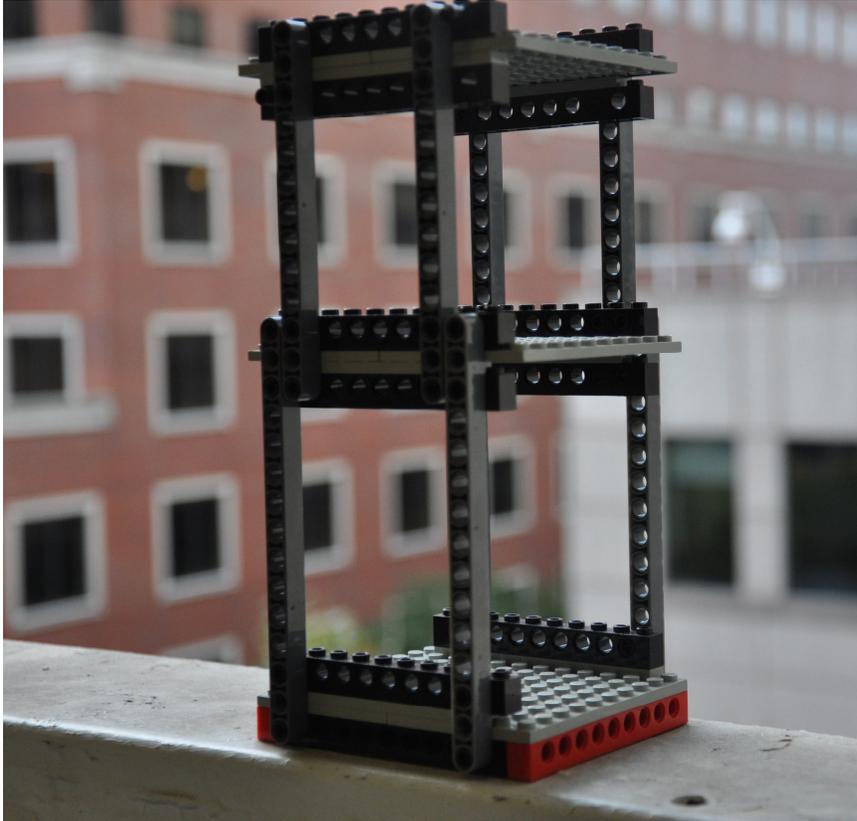


Figure 1

ADA Description: Example building constructed with LEGOs exemplifying stable structural principles

Caption: Figure 1: Example building

Image file name: building.jpg

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Attachments

Worksheet (CC_worksheet.doc)

Worksheet (CC_worksheet.doc)

Safety Issues

- None

Troubleshooting Tips

Make sure that there are ample LEGO plates and beams. These will be essential in constructing tall buildings.

Investigating Questions None

Assessment

Pre-Activity Assessment

Title: Buildings

What are some properties that buildings you see have? Do they sway in the wind? Do they fall down if you push them? Why do you think buildings have these properties?

Activity Embedded Assessment

Title: Design iterations

On the worksheet, students are asked to determine the similarities and differences between their structure and their original design. If there are differences, why were they made? How could the design be further improved?

Post-Activity Assessment

Title: Class Feedback

Each group presents their building to the class. Class gives feedback for further improvement to the stability of the structure.

Activity Extensions None

Activity Scaling

- For lower grades, plan with the class as a whole, then have each group of students build a portion of the structure. Combine these to create the building.
- For upper grades, design a challenge for the students, like making the tallest building or one that can support a lot of weight. End the lesson with an experiment to see which building performs the best.

Additional Multimedia Support

References

Other

Redirect URL <http://gk12.poly.edu/amps-cbri/>

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