

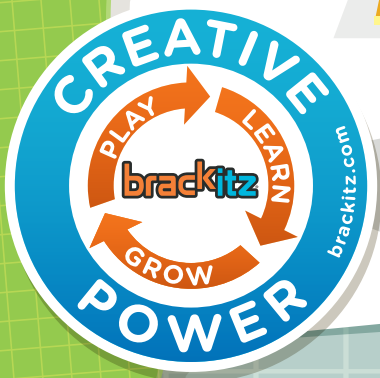
# brackitz®

U1 L3  
V2.0

LESSONS

FREE OUR

FRIEND!



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# ★ Lesson 3: **FREE OUR FRIEND!** ★



Students continue with the gingerbread character as their building and engineering inspiration. Given an immediate problem to help solve, students have a play-based introduction to solving problems by designing and building devices.

## Objectives:



“I can create a 2-D design as a guide for a 3-D design ” and “I can create a 3-D design to help solve a problem.” Students will demonstrate they can create a Brackitz design to try and solve a problem, practice beginning the design process (testing a design) and continue getting familiar with the Brackitz system.

## Standards

**ECERS-R** **Language-Reasoning:** Books and pictures, Encouraging children to communicate Using language to develop reasoning skills | **Activities:** Fine Motor, Art, Math/Numbers | **Program Structure:** Group time

**NGSS** **Science and Engineering Practices:** Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem

**CCSS-Math** 2.MD.A, 2.MD.A.1, 2.MD.A.3, 2.MD.A.4, 2.MD.A.9, 3.MD.A.3, 3.MD.B.4

**CCSS-ELA** L.2.6, CCRA.SL.1, L.2.5, L.2.5a, L.3.6, SL.3.1, SL.3.1b, SL.3.1d, W.3.1b

**Time needed:** 35-40 minutes

## Materials and Supplies:

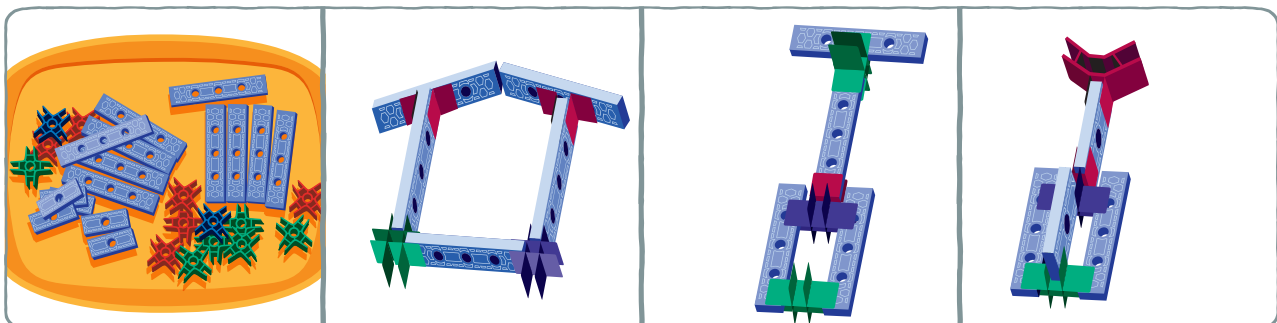
3-D figure(s) with some depth made out of dough or cardboard from Lesson 2, box, paper, pencils/crayons, Brackitz planks and 4-way connectors

## Setup and preparation:

Have trays, boxes, or plates ready with the same number of planks and connectors for each group of 2-3; help students cooperatively form groups of 2-3 to work together. Find a box or boxes smaller than a shoe box.

## Background knowledge:

Prior to this lesson, the only background knowledge students need is to be able to pick things up and grasp them. A reminder of the agreed upon dimensions of the creature will help students build with the creature in mind.



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40-45 minutes



## Whole Class

5-10 minutes



Instructor asks, "Who remembers our special Gingerbread friend?" (Remind class; especially check/reinforce the agreed upon DIMENSIONS ) "You built beautiful homes to keep her/him safe. But what if s/he is ready to get out and explore our classroom? One problem: We have a lot of kids and s/he could be scared if we all crowded around. It would be helpful if we could open her box without touching it. That way we can give her/him space. What are ways to open something without touching it? Let's brainstorm!"

**Goal: Have students consider creating and using a tool!**

## Instructor Notes and Tips

Help students consider real world solutions. Solutions like "Magic" and "Blow the box up" are unrealistic. A good way to hone in to helpful, realistic ideas is to praise something specific about a proposal while raising the next question about it. E.g.

- Magic = "It would be handy and fast if we had magic, because we could be across the room to make our friend happy but magic is hard to come by and we might want to solve this faster."
- Explosion = "That would be exciting, but can we think of a way that won't hurt our friend?"

## Group Exploration

15 minutes



**Part 1:** "I'm setting up our pretend houses here, and we will need to stand over here." (marks floor) Can you each think of a tool we could use to open the box without getting close to it? What would it DO? How would it WORK? What would it look like? What dimensions will it need to have? Draw it so you have a beginning plan. Make your drawing almost as a guide for someone else to use it to build your tool."

**Part 2:** "In your groups, pass your drawing to your neighbor. Let them see what your plan was. Now you're looking at a new drawing too. It takes many engineers to make good solutions. What ideas on someone else's design seem like good ideas? How can you compromise and make one group drawing as a design idea?"

**Part 1:** Visit groups asking for ideas that will meet the goal (engineering criteria) is building something they can safely use from a distance. Keep making sure students are paying attention to the distance/length, and other dimensions their tool will need to have.

**Part 2:** Help students pass drawings in a circle. Ask them to consider what good ideas another student may have had. Ask - could these ideas be good? Could both work together? Help students with language like, "Let's try \_\_\_ first and then we could try \_\_\_ next" as they work towards compromise. Praise collaborations that use ideas from more than one group member; step in if someone is insisting on their own design with no changes or additions from other group members. "Engineers work together and compromise - let's try to see how the ideas could work together so that you can practice engineering."



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## Group Challenge

15 minutes



your group has agreed on a compromise design, you can start building. I used the pieces from your homes so you could build tools today. But this box could be the Gingerbread's home so test your tool

on this box as many times as you need to. Does your tool work right away or do you need to keep changing it to make it work better?

Having pre-arranged trays, boxes, or plates with the same amounts of Brackitz planks and connectors can save time on organizing tools. You may also wish to have multiple boxes so groups can test without taking turns. As groups test their tool, keep reminding them to ask, "How will we know if our design worked?" (**Goal: If it can open the box and allow you to be far away without breaking or being unsafe.**)

## Reflection

5 minutes



Did you get your tool to work? It's ok if you didn't. When something doesn't work the first time, or the second, or the twentieth time, it is a chance to learn what parts of your design might be working, and what parts might need to be changed. How do you know if it works or doesn't work? (**Testing it on the box, does it open it, can you be far away, is it sturdy, is it safe**). How many times did you have to rebuild your tool or try to make it a different way?

Make sure that before this lesson closes out students understand that testing a design and finding out what is working and what needs improvement is the best way to make good designs and "be engineers." Most designs fail on the first attempt and need to be improved many times before others can use them. Encourage students to see this as a way of making their creations better and better. Create a culture of, "what you did today was take the first steps to making better designs" rather than insisting on "finished products."

## CHALLENGE ADVANCED STUDENTS

**In discussion, ask:** "What's the ideal distance for us to be from the homes/boxes to open it?" Involve students in defining the design criteria!

**In the challenge/build, scale up by:** introducing systematic testing of the tool. With each test, ask the group to pick one thing to change on their design. This is a more structured and mature approach to design-test-redesign but some students may be able to handle it.

## SIMPLIFY FOR YOUNGER GROUPS

**In discussion, ask:** "What are some tools that are used to help get something done, but with some distance from what is happening?" (tongs, hoses, weed whackers, etc. )

**In the group exploration and challenge build:** Assign students or groups a design partner to share ideas with, get feedback from, and to do their testing for them. Facilitate the exchanges between them to help keep it positive and helpful.