



How People Make Things

Rich Task Activity

Deforming

This engaging rich task has been developed by the Education Department at the Children's Museum of Pittsburgh. Rich tasks are open-ended investigations designed for you to work alone or in a group and may be conducted during, before or after your visit to How People Make Things to enhance your experience.

Modeling Dough

In these activities, you'll use modeling dough to explore three manufacturing processes – **deforming, cutting** and **molding**.

Suggested Materials:

- Modeling dough (see recipe below)
- Rolling pin
- Garlic press
- A few small containers, for example: a cupcake tin, baby dish, thimble or candy mold
- Cookie cutters
- Rotary wheel or knife

Task tools

An inquiring mind!

Procedures/Investigation:

Deforming

Deforming is a process where *material is forced* into a new shape. Forcing is pushing or pulling upon an object. Although it's easy to force the shape of modeling dough to change, many materials deformed in manufacturing require more force to shape them. To deform metal, plastic and wood, people use tools like hammers, mallets and even air. Use your rolling pin and garlic press as tools to “deform” or force the modeling dough into a new shape.

- Roll the rolling pin over a ball of dough to flatten it. Try rolling it into a thick layer, then make it thinner and thinner. You can make it a circle, oval or strange shape of your own!
- Push a ball of dough through the garlic press, using the handle to force it through the small holes. Now it is a very different shape, like pasta.

Molding

Molding is *adding material to a mold* to make a new shape. Dough easily takes the shape of a mold. In manufacturing, many materials are molded, like plastic and metal. Often, this kind of molding requires a state change. A state change is when a material changes from a solid to a liquid or a liquid to a solid. Our dough will remain in the solid state, but will still change shape when added to the mold.

- Press a ball of dough into each of the small containers you found to mold it into their shape.
- Carefully remove the dough, and you'll see that they retain the shape of each mold. Did any also pick up textures from your container molds?

Cutting

Cutting is *removing material* to form a new shape. Unlike deforming and molding, this time you will create a new shape by removing some of the dough. In manufacturing, people cut materials like paper, cardboard, wood and metal, using tools like stamps, saws or die-cutting machines.

- Press the dough into a flat layer, then press the cookie cutter onto it. The cookie cutter divides the center shape from the extra dough on the outside of it. Pull away the extra dough to discover your cut dough shape.



-
- Form the dough into a cube and use the knife or rotary wheel to slice the cube into square layers. Try this with other three-dimension shapes, like a ball, egg shape or wiggly worm shape. What shape are the individual layers?

Questions to Think About

- The dough was deformed by applying a force, like the pressure of the rolling pin or the squeeze of the garlic press. What other forces could you apply to deform it? Does it stretch? Wrinkle? Twist? Cover more area or less?
- The dough was molded in a solid state but many other materials need to change states to assume the shape of a mold. Chocolate is heated to a liquid, then poured into a mold and cooled to make candy shapes. Can you think of other things that are molded using a state change between liquid and solid?
- The dough was cut by removing some of it, like the outside of the cookie cutter shape or the rest of the cube. Cutting is a “subtractive” process, because the cutter subtracts material to leave the desired shape. How is that mathematical word related to cutting? How would you apply the “additive” process to the dough?

Ways to Extend Your Investigation

- Try the same activities using silly putty. Does it accept different forces than the dough, like stretching, or resisting, like the garlic press? Is it harder or easier to mold or cut? The characteristics of the material affect which processes manufacturers use to change its shape.
- Try other tools to deform, mold or cut the dough. Which tools work best? Which tools are designed to work with a soft material and which are not? When designing or manufacturing tools, people think not just of what will deform, mold or cut, but how they will best do those things with specific materials.

International Technology Education Association Standards

- ITEA STL The Nature of Technology – 3. Understanding the relationship between technologies and the connection between technology and other fields of study.
- ITEA STL Technology and Society – 6. Understanding the role of society in the development and use of technology.
- ITEA STL Technology and Society – 7. Understanding the influence of technology on history.
- ITEA STL Design – 9. Understanding troubleshooting, research and development, invention and innovation, and experimentation in problem solving.
- ITEA STL Abilities for a Technological World – 13. Assess the impact of products and systems.
- ITEA STL The Designed World – 19. Understanding and selection and use of manufacturing technologies.

National Academic Standards

- NA-VA.K-4.1 Understanding and Applying Media, Techniques, and Processes.
- NA-VA.K-4.2 Using knowledge of Structures and Functions
- NA-VA.K-4.4 Making connections between visual art and other disciplines.

- NS.K-4.2 Physical Science
- NS.K-4.5 Science and Technology