

Lesson 11 – Prototype Production

1. Background Narrative

Concrete can be formed into a valuable product by casting it in a mold. Students will pour concrete into small molds to make a valuable product.

Concrete products are made by pouring the concrete in a suitable mold of the desired shape. The surface qualities of the final product can be modified based on the choice of the material that the mold is made from (e.g., plastic provides a shiny and smooth surface).

In class, the students can consider the products they make to be prototypes of a final product. In the engineering design process, a prototype is made to test the concept and manufacturability of a particular product. Based on the success of the prototype, a producer or manufacturer might alter the design or the production process.

2. Performance objectives

- Students will create a product out of concrete.
- Students will demonstrate appropriate tool use.
- Students will demonstrate successful teamwork to accomplish their goals.

3. Standards

- NYS: 5.2, 5.6

4. Resources

- Teacher resource: concrete product manufacture and testing
- Concrete forms
- Cement
- Aggregates
- Buckets
- Trowels
- Measuring cups
- oil for mold release
- safety equipment (glasses, gloves, masks)
- LOTS of paper towels!

5. Vocabulary

prototype	product
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6. Instructional plan

Build a product using forms either purchased or built by the instructor. See teacher resource for ideas on recipes and products.

Sample plan for concrete stepping stones:

- Review concrete safety rules with class before beginning!
- Conduct class similar to the cylinder making day – all instruction and most of the material distribution should happen in the classroom before students leave their seats; stations should be set up around the work area, with teachers to assist; use a designated measuring cup for each station (and the water!) to avoid contamination of the materials.
- Divide class into pairs, provide each pair with a mold.
- Have each student mix enough concrete for half of the mold (see teacher guide for recipe).
- Have students oil their molds very thoroughly (either distribute oil or have a station set up with oil).
- Set stations up around the room with concrete ingredients. Provide each student with a bucket for mixing their concrete, and have them circulate through the stations to collect ingredients (dry first, then mix, then water). Do this in a similar way that the concrete cylinders were done.
- When the concrete is mixed, have each pair fill their molds. (if doing stepping stones, lightly tap the mold onto the tabletop to dislodge air bubbles)
- Set molds in designated classroom area to cure.
- Clean up!

Closure: Ask: Now that you have made your prototype, what specifications or criteria should you consider in order to determine if we've met the requirements of the problem statement (Make a useful product...)? (Consider strength, aesthetics, function etc.) Do you think your product will be successful? What might you change next time?

For next class: ask students to bring in an advertisement, for anything at all (e.g., magazine ad for car, radio, cell phone...)