

Lesson 3: Sketching and Prototyping

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Grade Level

Kindergarten

Lesson Overview

The third lesson will be a 30-to-60-minute experience that gives each child time to work independently with concrete moveable materials to create a “sketch” on paper and then an adult led brainstorm with 3-4 children to create a team prototype (a 3D representation of the habitat) incorporating ideas from all the children.

This lesson has three activities. The first activity is a teacher modeling of the “sketch.” The second activity, a “sketch” focuses on personal inspiration and exploration with materials. The third activity, a group “prototype,” focuses on collaboration and building.

Learning Objectives and/or Standards

- To use observations to describe patterns of what and animals (including humans) need to survive. (NGSS K-LS1-1)
- To use a model to represent the relationship between the needs of different plants or animals (including humans) and the places they live. (NGSS K-ESS3-1)
- To ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool. (NGSS K-2-ETS1-1)
- To develop a simple sketch, drawing or physical model to illustrate how the shape of an object shapes to function as needed to solve a given problem. (NGSS K-2-ETS1-2)
- To analyze data from tests of two objects designed to solve the same problem to compare the strengths and weaknesses of how each performs. (NGSS K-2-ETS1-3)

Preparation

- Split class into working teams (ideally 3-4 children)
- Line up classroom volunteers or other adults who can facilitate each team
- Prepare and distribute days in advance a visitors guide for each adult helper that lists vocabulary and guiding questions. Consider both NGSS and Design Thinking language (e.g., “habitat,” “coexist,” “ecosystem”, “empathizing,” “noticing and caring,”

“brainstorming,” “experiment,” “observe,” “prototype,” “inspiration,” “collaborate,” “generate ideas,” “identify user (worm) needs,” and “identify opportunities”).

- Gather large assortment of materials to be used both for individual sketches and team prototypes

Materials and Resources

- Copy of the completed Needs (and Considerations) Chart for each team
- Access to the actual living things studied in this unit for observation (in their individual spaces/containers)

- *For individual sketches you'll need:*

Construction paper to represent habitat space
paper cut into shapes of animals
magazine cut outs
playdough
manipulatives
figures
pipe cleaners, etc.

- *For team prototypes you'll need:*

Shoe box or other cardboard box to represent habitat space
paper cut into shapes of animals
magazine cut outs
playdough
manipulatives
figures
pipe cleaners, etc.

Activity 2: Teacher Model (30 minutes)

Teacher will model how to use the materials to make an individual “sketch.” For example, “Today I want to think about making a model of a habitat where all of our animals can live together. I’m going to use pencils, or crayons, or playdough, or cut outs, or maybe YOU have other ideas to begin thinking about how to do this.” Teacher models this (only get started, so that you don’t show them everything. Keep them thinking and being creative). Children will then work individually and as a group to create prototypes.

Activity 2: Inspiration (30 minutes)

After the teacher demonstration and discussion of what it means to focus on process not product, children will work individually at the table of their team. An adult will be at the table to support. Children will use construction paper (various shapes and sizes) to represent habitat space. On the paper they attach/place/draw various representational objects (e.g., paper cut into shapes of animals, magazine cut outs, playdough, manipulatives, figures, pipe cleaners) – considering different configurations for a habitat

Some children may need support to help getting started with their sketches. First, try open-ended questions and add scaffolding as needed. For children who need additional support, ask more specific questions related to food, water, shelter, and light. Encourage conversations among group members about suggested ideas.

Activity 3: Collaborate and Build (30 minutes)

After children have completed their individual sketches, each child describes his/her sketch to other members in the group. The adult will lead a conversation where children will express what works and doesn't work with each other's models (adults and children need to be mindful that all ideas are valued, try not to use language like "better" or "best ideas"). The children now work as a group with a cardboard box to represent their habitat space. With adult promptings and support, the children work together to attach/place/draw various representational objects (e.g., paper cut into shapes of animals, magazine cut outs, playdough, manipulatives, figures, pipe cleaners) onto and into the cardboard to create their group prototype. Encourage children to move actual parts from their own "sketches" into the group prototype to focus on combining the ideas of many people instead of creating something new. The focus is on process not product, and practicing collaboration skills with peers.

During individual and group work, use design thinking language to support the idea of "working together and creating" (e.g., collaborate, generate ideas, brainstorm, sketch, experiment, prototype, build).

Troubleshooting

If you don't have adults to help, you'll need to consider grouping so that some groups are able to work independently, while you work with other groups that need more help.

Assessment

Teacher and adult volunteers should use informal observations to evaluate students' grasp of material. Teacher should look for children being able to: communicate orally, incorporate new vocabulary, ask relevant follow up questions, etc. For students who need more, consider small group work to scaffold learning.