

Engineering Intensive: Animal Engineers & Designing for Survival Needs			
	Day 1	Day 2	Day 3
Opening Whole Group Time 20 min	Engineering is... Introduce the engineering design process: Think, Make, Try (TMT) Introduce hummingbirds as animal engineers Real nest exhibit item for hummingbirds and book(s) about animal nests and use of natural and recycled materials Birds build nests to protect their young from weather hazards and from predators <i>"Engineers find and solve problems the engineering design process. Humans are engineers, but so are animals, and today we will learn about from animal engineers"</i>	Definition of a "tool" and how this fits into engineering Examples of human-made objects for animals 3D printed nest (3D printer) Birdhouse (hammer, nails, saw); Try things out to experiment to see what you might use on Day 3 <i>"Engineers find and solve problems using tools and materials, as well as the engineering design process. Engineers start by thinking about how to use a new tool safely and they experiment with it and try it out to see what it can do. They also try out new materials to learn about their traits (properties?) to see what might work best for their solutions and designs."</i>	*TMT review using another type of animal as a model engineer (beyond birds) that makes shelter; maybe look at beavers and dams OR other local animal *Real exhibit items that show other ways in which humans design for animals or the environment: animal crossing bridge, bear lockers and trash can covers to prevent raccoons (using different materials) *Even if we don't mean to, we have an impact upon the environment and animals/habitats around us *As human engineers, we can design solutions that help animals and the environment create shelters. *Look at examples of other types of animal shelters and discuss how you could help that type of animal; pick 3-4 local animals that live in distinct Bay Area habitats to focus on *Think about and other examples of engineering created to help them (bear proof lockers, cow grates in Marin to keep them in on Point Reyes without fences) <i>"Engineers can use tools and the engineering design process to solve problems for animals and the environment we all live in. Let's see how we can do that at our own school and in our own neighborhood."</i>
Stations or Challenge Time in Small Groups 40 min	Design Prompt: "Let's take on the role of animal engineers as we build nests that will protect eggs from extreme rainy weather or predators" 1) THINK station – butcher paper down on the table, do one together at the carpet talking through ideas,	Activity Prompt: "Today, we will explore both familiar tools and new tools as we learn about different ways in which engineers create solutions for problems. You will have a chance to experiment with new tools, and to participate in building one classroom, collaborative project that you will get to keep!"	Design Prompt: "Let's take on the role of human engineers who use tools and the engineering design process to create shelter for animals in the environment they live in." 1) THINK station – butcher paper down on the table, do one together at the carpet talking through ideas,

	materials, adding labels 2) MAKE station – natural materials, craft materials, some larger cardboard, recycled materials such as milk cartons, pizza boxes; upper grades, can only access 10 materials, unlock more after first time trying things out 3) TRY station – weather AND predators (chopsticks with decorations) for grades 3-5; use 3D-printed eggs that are hummingbird sized, or use polymer clay that is baked for eggs	1. 3D printer tool station – 3D printer running print of 3D printed nest but at smaller scale; clay and wiki stix are available for children to create 3D sculpture as well *provide tablets so that students can modify different designs/create designs related to classroom collaborative birdhouse project (perhaps they will 3D print a model of the bird that can live in or a symbol that represents their class and is the name for the birdhouse) 2. Hammer and nails station – have tree stump to practice hammering into, as well as pumpkin & golf tees for younger children who aren't ready for hammer/nails; *explicit instruction around aligning wood pieces together and hammering at appropriate areas (Sketch it out first) for birdhouse project 3. Miter saw station – wood, foam, corkboard, sticks of different sizes available, practice sawing through different materials *explicit instruction around sketching out a drawing of a birdhouse, measuring, cutting wood into those appropriate sized pieces 4. Weaving station – cardboard/laser cut loom and pliers; demonstrate weaving with little looms and model how to weave with natural materials versus string *add a platform/hammock like thing underneath birdhouse to "Catch baby birds if they fall" using weaving 5. Sandpaper station – foam, sponges, other materials that work for this, playing around with sanding down different materials and seeing the impact 6. Another material station – look at combination of natural and manmade materials and compare how you can manipulate them into certain things; sorting activities and investigation activities like nature studio	materials, adding labels; explicit prompting around which tools or materials from previous day make sense for that design *have facilitators/adults check in with a specific table and discuss similarities and different in designs between children 2) MAKE station – natural materials, craft materials, some larger cardboard, recycled materials such as milk cartons, pizza boxes; only some of tools from day 2 will be available (not miter saw or 3D printer) unless children really want to use them and have a stated reason in doing so 3) TRY station –Work with a partner to find test out your design based on the problem you decided to solve.
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Clean up 5 min			
Closing Whole Group Time 15 min	What was hard about being an engineer today? <i>Create chart of “material name/type”, “use”, “feedback” to start discussing physical properties</i> What materials did you use that worked really well for you? What materials did you use that were tricky for you? What was fun about being an engineer?	On a whiteboard, invite children to describe and name tools they used today and describe what they used it for (link tool and purpose); provide images on laminated cards, descriptor words as scaffolds if necessary Introduce one specific local animal you want the whole group to plan for and build shelter for and invite students to sketch out different ideas on a large poster/butcher paper strip *then, as a group, choose one design and create something on a tablet that can be 3D printed overnight and be part of the collaborative solution Homework before next day's program (provide 1 “thinking and planning sheet” per student): sketch out what you might build using one of these new tools and materials, as well as things we used yesterday if you are going to engineer shelter for animals in our habitat in order to protect them from weather, predators, or to allow them to keep living in an urban area	What was hard about being an engineer today? <i>Create chart of “problem” and “solution” and invite children to explain their designs and how they incorporated tools or what they learned about nests previously.</i> What tools or materials did you use in your design? How does your design solve the problem we were solving? What was the problem you were trying to solve? <i>Leave chart behind with class after taking a photo of it for assessment/records</i> What was fun about being an engineer?
Feedback/Evaluation	Pass out post-its to all children and ask them to place them on the material, activity area, or portion of the experience that they most enjoyed and want us to keep	Place large butcher paper strip in the class with a line drawn in the middle and ask children to draw or write down one thing that they did today that was completely new for them, and one thing that they've done before and really enjoyed doing again	Ask children to draw a picture of an engineer and label what this engineer is doing/using