# Lego Tree of Life *

This hands-on activity allows students to watch evolution proceed over many, many generations due to mutations that get expressed in the phenotype (visible trait) of "Lego animals," which the students assemble. Students will see that generations are connected to a common ancestor as they construct evolutionary trees.

* This activity was developed by Mike Webster, Mike Alfaro, and Louise Mead. It was modified with permission by the Concord Consortium.

## *Learning Goals*

*Big Idea 11: Descent with modification*

- Species evolve from common ancestors.

## *Lesson Plan*

**Note:** The Evolution Readiness (ER) project has supplied you with one box of Legos. You might like to borrow a second box from an ER colleague or the site coordinator to ensure you have enough colors/shapes of every kind for student creations.

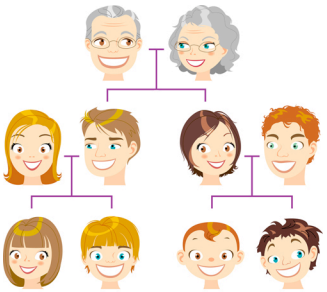
This activity can be done as a full class, in small groups of approximately 4-6 students, or in two large groups. If done as a full class, call on students one or two at a time to choose a card and construct the next animal in the lineage.

### 1. Estimated time

This activity should take approximately 45 minutes.

### 2. Introduce the activity (Engage)

Ask students if they have ever made a family tree. Have them describe why it's called a "tree." Show the following tree (see larger version on last page at the end of this guide) and ask questions about it. How does the tree show relationships between people? Between generations?



**3. Guided inquiry (Explore)**

**Materials**

Each group of students will need:

- A set of Legos to create "animals."
- Straws – to show connections between species.
- A set of cards – to indicate what happens at each time step.
- Paper (optional)
- Colored pencils or crayons (optional)

Introduce the activity by telling students that they will have a chance to watch evolution take place over many, many generations. They will see that generations are connected to a common ancestor.

First, have students create a simple animal – two or three Lego pieces (body, head, and one other part, if they want). Students can be creative when choosing colors and sizes of Legos to represent body, head, appendages, etc. This is "Time 0."

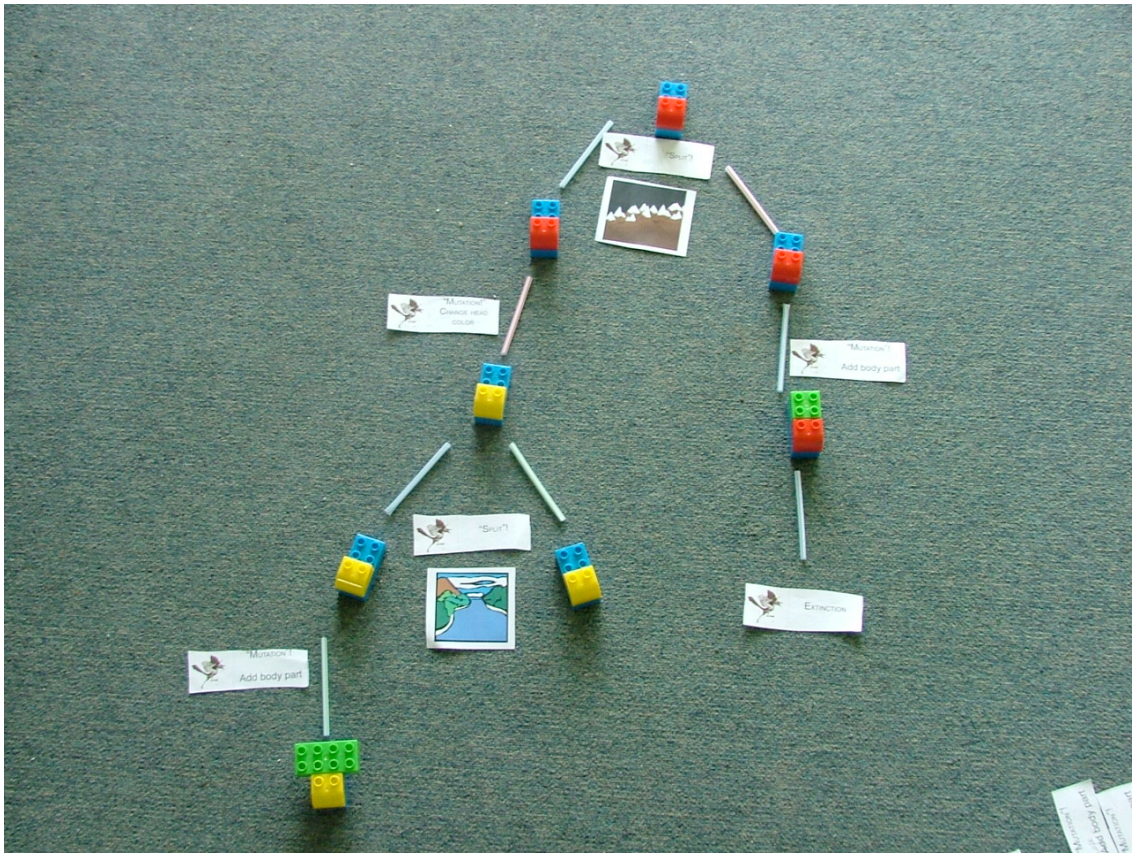
**Optional:** Have students draw the Lego creatures on a piece of paper or have someone in the group keep a record – just like any scientist would – recording results of an experiment – in case any portion gets disturbed or misplaced.

One student chooses a card and follows the instructions. If the card is a mutation card, the student makes a copy of their animal, and then makes a "mutation" by adding, subtracting, or changing a body part as directed. If the card says "Split" (mountain/river), they duplicate their animal and place it on either side of the mountain or river.


Discuss "mutation," which means that there were random changes in the genotype (genes) of some members of the species that gave them an evolutionary advantage. When students draw a “Split” card for the first time, discuss what that means: the population was separated, for instance, by a river or mountain range.

Students now have one (or two) species at "Time 1." Using the straws, the students connect the Time 0 animals to the Time 1 animal(s).

**Note:** It is important for the students to understand that they are creating only a single individual animal, *but it represents an entire population (or species) and that any changes can occur because mutations or other processes create variation in the population.* Tell students that this is a model. We cannot portray all the aspects of a population (we’d have too many individuals of Lego animals), so we use one to represent the entire population.




For the second time step, the students repeat the first time step for one (or both) of the species present at Time 1. This process repeats for each time step: the student draws a card for each species at Time x to create new species for Time x+1.

**Note:** Students may have to cannibalize the initial species if parts become scarce, and hence some of the ancestral species in the earlier time steps will have disappeared. Such patterns correspond to the fossil record, such that exactly what an ancestral species looks like cannot always be determined based on the fossil evidence. Alternatively, you can tip over the animals of generations except the most recent so they are lying on their sides. Describe the fossil record and tell students that archeologists rarely get to uncover complete fossils like these. If students have been recording their creatures in a notebook, ask them to consider if that represents an accurate tree. Now ask what a fossil record might look like. Fossil records are often incomplete and scientists must infer things they cannot see.

**4. Discuss the activity (Explain)**

Use the following questions at the end of the activity:

- Looking at only the species in the last generation, describe the variation that you see. Why is this variation present?

- Which animal is the common ancestor? (You can have students point to the common ancestor of a particular lineage or split or the whole tree.)
- How different are the end animals from the common ancestor?
- Pick a branch of your evolutionary tree and describe the pattern in the animal traits. (Try comparing them to species that are not descended from the same ancestor.)
- Why would it be good to have different features (e.g., tails, wings, long necks, or legs)?
- Why might the animal have gone extinct?
- How long do you think it would take to go from the top to the bottom of this evolutionary tree? (Answer: millions of years!)

**5. Clipbirds (Elaborate)**

When students do the Clipbirds activity, remind them of this Lego Tree of Life game.

The “split” mountain and subsequent generation of two distinct identical "daughter" species corresponds to the separation of the clipbirds into East Clipland and West Clipland. Speciation is either caused by some type of change, such as a mutation, which causes two groups to be reproductively isolated from one another, or involves some type of geographical isolation and subsequent reproductive isolation. In the Lego game, the process of speciation is shortened and seen to occur in a single generation. The Clipbirds activity helps students understand that the process is generally longer, and often in response to (1) some type of event that isolates populations and (2) changes in the population caused by natural selection in response to varying environments