



4. Hungry Alligator Teacher Notes

Students will build and program a mechanical alligator that makes sounds and is motorized to open and close its jaw.

Objectives

Science

Trace the transmission of motion and transfer of energy through the machine.
Identify the pulleys and belts and the slowing down mechanism at work in the model.
Consider the needs of living animals.

Technology

Create a programmable model to demonstrate the knowledge and operation of digital tools and technological systems.

Engineering

Build and test the alligator's movement.
Improve the alligator's behavior by adding the motion sensor and programming sounds to coordinate with the movement.

Mathematics

Understand how the distance between an object and the motion sensor is important to how the sensor functions.
Understand and use numbers to represent the type of sounds played and the amount of time the motor turns on.

Language

Prepare and deliver a demonstration about alligators using the alligator model.
Use technology to create and communicate ideas.
Communicate in spoken or written forms using the appropriate vocabulary.

Vocabulary

Belts, motion sensor, and pulley. Blocks: Motion Sensor Input, Motor On For, Motor This Way, Motor That Way, Number Input, Play Sound, Repeat, Start On Key Press and Wait For.

Other Materials

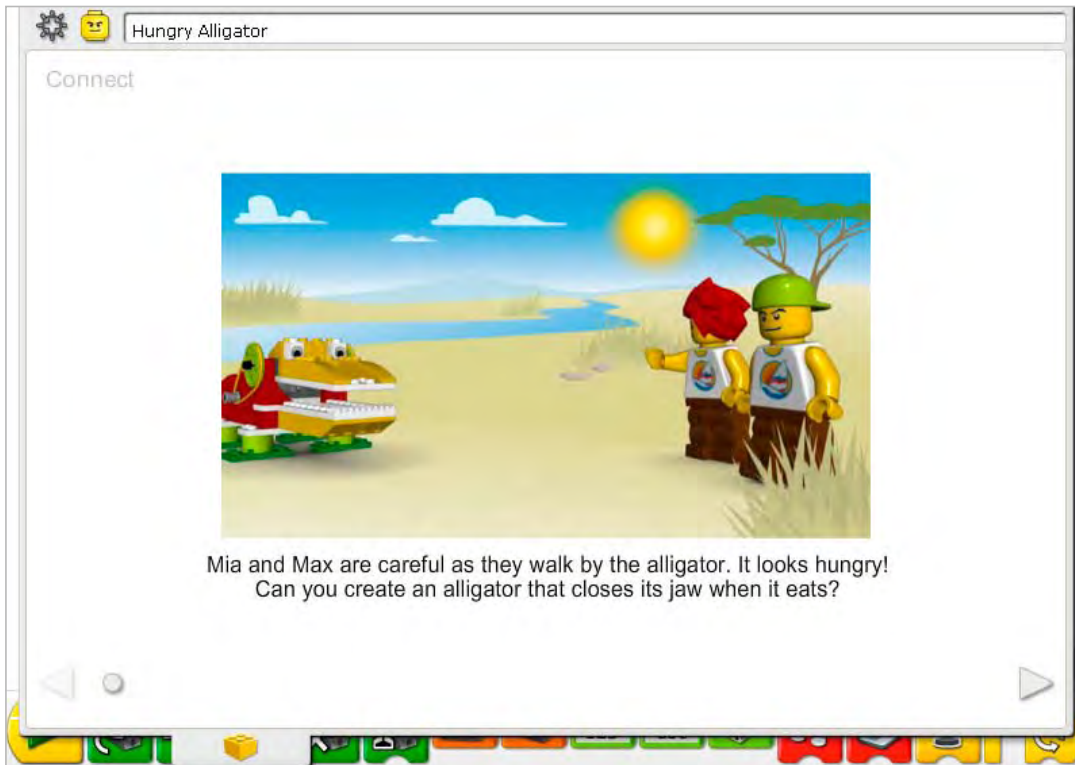
Optional for Extension: Construction paper, cardboard, grass, rocks.



Connect

Review the Connect animation and discuss:

- What was the alligator doing when Mia and Max saw it?
- What happened as they stood near the alligator?
- Do alligators really eat caps?
- Why does an alligator have a large jaw?
- What kind of food does an alligator eat?
- Would you pet an alligator? Why or why not?



Here are other ways of connecting:

Pretend you are an alligator. How does an alligator walk? Use your arms to show how the alligator opens and closes its jaw.

Have you seen a real alligator in person or on television? What did it do?

Is an alligator like a dinosaur? Why or why not?

Alligators lived as far back as some dinosaurs. However, dinosaurs are extinct, alligators are not. Alligators are reptiles: they lay eggs, have scales on their skin, and are cold-blooded. Cold-blooded means they must use the sun and means outside their body to stay warm. Dinosaurs seemed to have had these traits also.

Did you know...

You can use belts and pulleys to slow down the motor speed?

See the model in Getting Started:

9. Decrease Speed.

How much slower is the large pulley than the small pulley?

The large pulley turns only one time for every three times the small pulley turns. The large pulley is three times slower than the small pulley

Construct



The screenshot shows a software window titled "Hungry Alligator" with a "Construct" tab. The text in the window reads: "Build an alligator that can close its jaw when it eats. Our model... Uses the motor to turn a crown gear... The crown gear turns another gear... The gear turns a small pulley and a belt... The belt turns a large pulley... The pulley closes the alligator's jaw. Try this idea or create your own!" To the right of the text is a 3D model of a yellow and red LEGO alligator with a motor and gears. The alligator's jaw is shown in an open position, and curved arrows indicate its movement. The software interface includes a toolbar at the bottom with various colored icons.

Build the model following step-by-step instructions or create your own alligator. If you create your own, you may need to change the example program.

To operate the alligator best, make sure the jaw opens and closes easily. To do that, loosen the pulleys and bushings to reduce friction. If the belts have been used a lot, wipe them clean to improve performance.

The energy transfers from the computer powering the motor, to the crown gear at a 90° angle to the next gear. That gear turns a small pulley and a belt that are on the same axle as the gear. The belt connects the small pulley to the large pulley. Moving the large pulley opens and closes the alligator's jaw.

The energy changes from electrical (the computer and motor) to mechanical (physical movement of the gears, belts and the jaw mechanism).



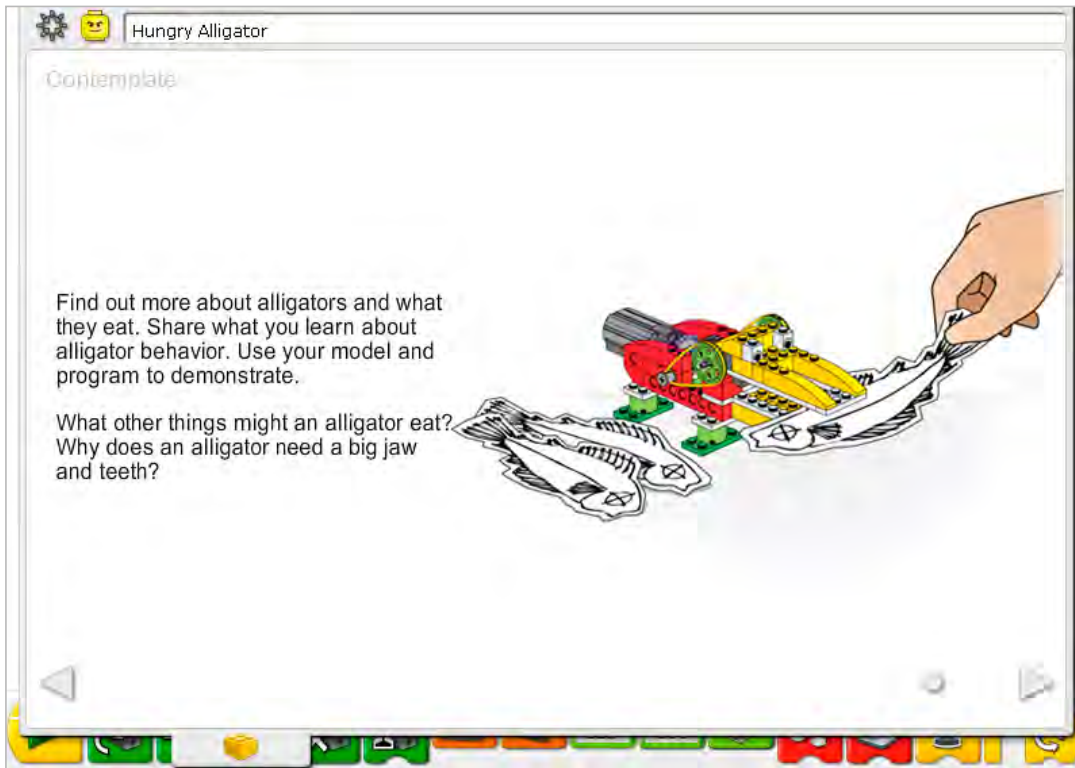
The Hungry Alligator program uses the keyboard controls to start the movement. The Start On Key Press Block waits for you to press the **A** key on the keyboard. Then it turns on the Motor That Way (counterclockwise) to close the jaw. Next, the program runs Play Sound 17, the Crunch sound. Then it turns on the Motor This Way to open the jaw. The motor runs for seven-tenths of one second and turns off.

To change the Start On Key Press letter, place the mouse over the Block and type a different letter key. You can also type a number key or one of the four arrow direction keys.

See the LEGO® Education WeDo™ Software section for the Sound List referencing the Play Sound Block numbers with descriptive names.

See Getting Started for more examples with Motor On For, Motor This Way, Motor That Way, Play Sound and Start On Key Press.

Contemplate



Set up enough space for books, paper, scissors and other materials and for demonstrating your model.

Gather some books or search internet sources for information about other sources of food for alligators. Choose a type of food. Then draw it and cut it out or make it. Prepare an information sheet, digital slides, or notes for your demonstration.

You are demonstrating alligator behavior: the motion sensor feedback allows the alligator model to react to the food. You may wish to adjust the input numbers to the Play Sound and to the Motor On For timing to suit your demonstration better.

Practice presenting your information about alligators and timing the demonstration.

After the alligator presentations, discuss these ideas.

How is the alligator program like a real alligator's brain?

The program is like a brain because it makes decisions and causes movement to respond to the environment.

How is the alligator program different from a real alligator brain?

A real alligator brain is capable of more sophisticated and varied responses. It is 'programmed' to respond to much more than a simple showing of food.

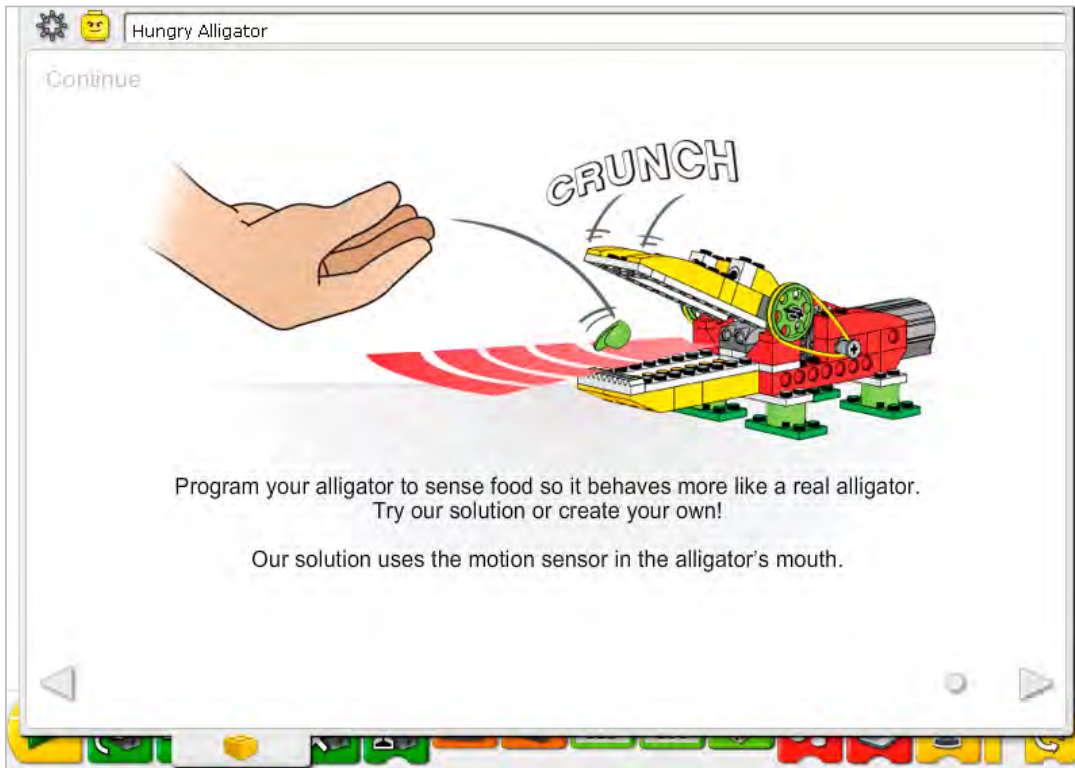
Is this an alligator or crocodile?

It is more like an alligator because they have U-shaped jaws. Crocodiles have more pointed and narrow jaws.

Alternative ideas...

Describe a day in the life of your alligator by drawing a series of pictures. When is the alligator awake? When is it eating?

Continue



In the Continue phase of this activity, you are adding more intelligence to the alligator behavior.

Use the sensor that is already built into the model. The motion sensor and motor can work in either LEGO® Hub port.

The motion sensor must be positioned as shown in the building instructions or it will not work according to the example program. The mouth must open wide when it is waiting to be “fed” so the motion sensor can see the food, not its own jaw. The motion sensor can see large and small objects within a range of about 15 cm.



The Hungry Alligator program is modified to change the Start On Key Press to a Start Block and to add the motion sensor input. After you click the Start Block, the program waits for the motion sensor to see something. Then it turns on the Motor That Way to close the jaw and plays Sound 17, the Crunch sound. Then the motor turns on this way to open the jaw. The motor runs for seven-tenths of one second and turns off. The program repeats.

To repeat the program a specific number of times, add a number and text input to the Repeat Block.

See Getting Started for more examples with the Motion Sensor, Motor On For, Motor This Way, Motor That Way, Play Sound, Repeat, and Wait For.

Extension

Join with all of the other groups in your class to create a Wild Animal Park. Use construction paper, cardboard, grass, rocks and other materials to create an appropriate habitat for each animal. Design a tour of the Park and allow each group to present their animal. Invite other students to tour the Wild Animal Park.

