

Natural Selection Overview

This 3-minute touch-screen activity demonstrates that natural selection is observable. Kids will re-enact a portion of the Grants' study on Daphne Island in three virtual visits:

1. Wet Season (pop. 1200)
2. Drought: To show differential survival (or natural selection). (pop. -85%)
3. Deluge: To show differential reproduction (or prediction of evolution). (pop. +400%)

Kids will learn that a major factor influencing the survival of the medium ground finch is the weather, and thus the availability of food. During the drought, medium ground finches with larger beaks could take advantage of alternate food sources because they could crack open larger (tribulus) seeds. The smaller-beaked birds couldn't do this, so they died of starvation.

Finally, kids will see that most babies (born in the post-drought generation) had large beaks, the predominant trait of surviving finches.

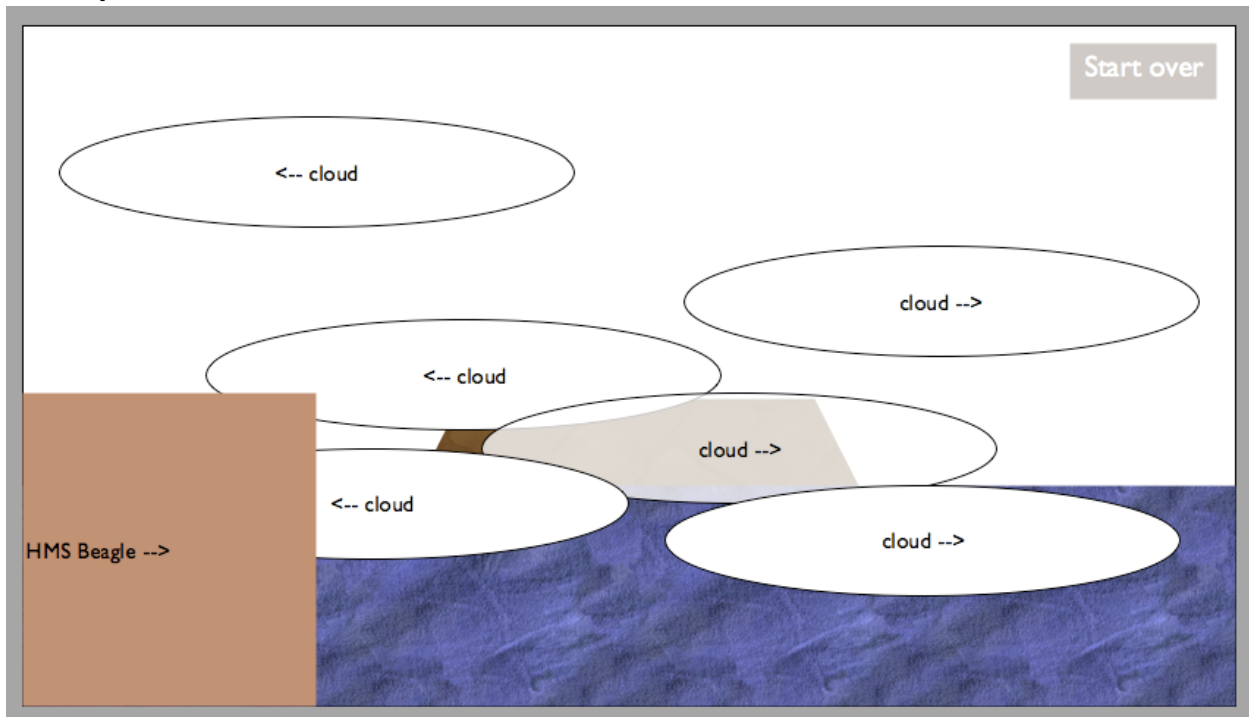
Birds

There are eight variations: black and brown-feathered, large and small-beaked, big body (100%) and smaller body (+/-90%).

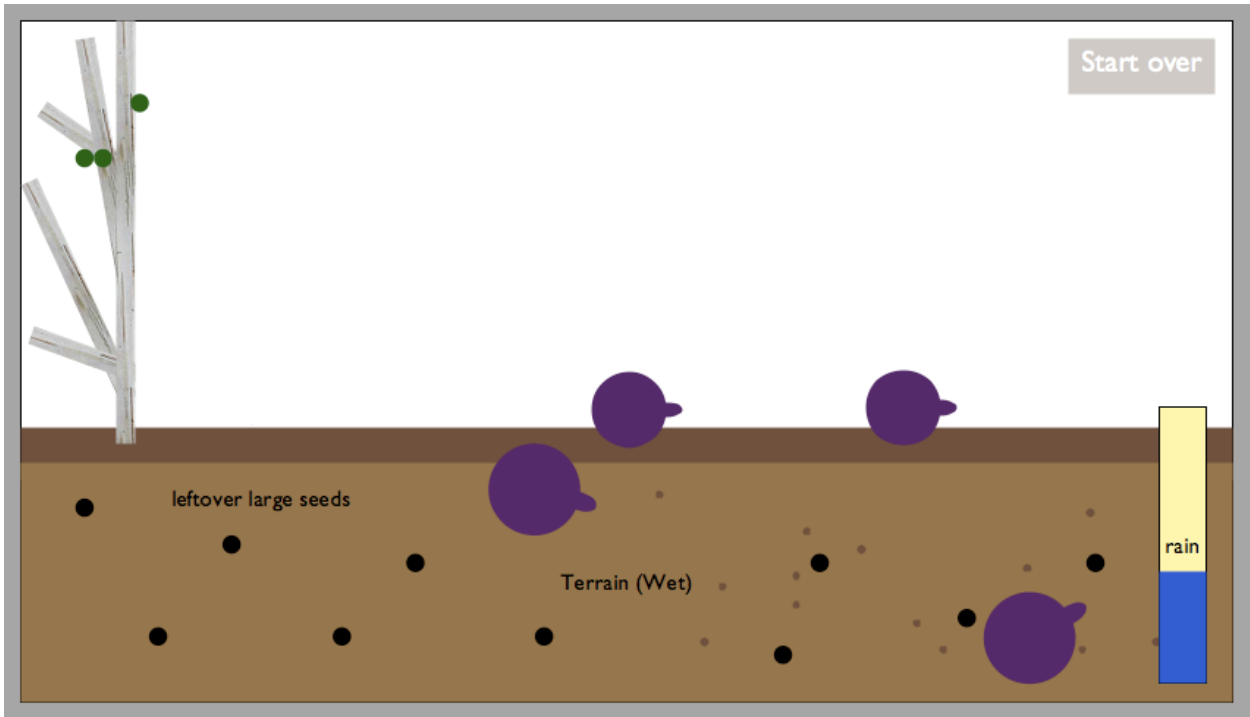
"Touch" Cues

Touch-screen cues are either generic [Button] or highlighted screen element.

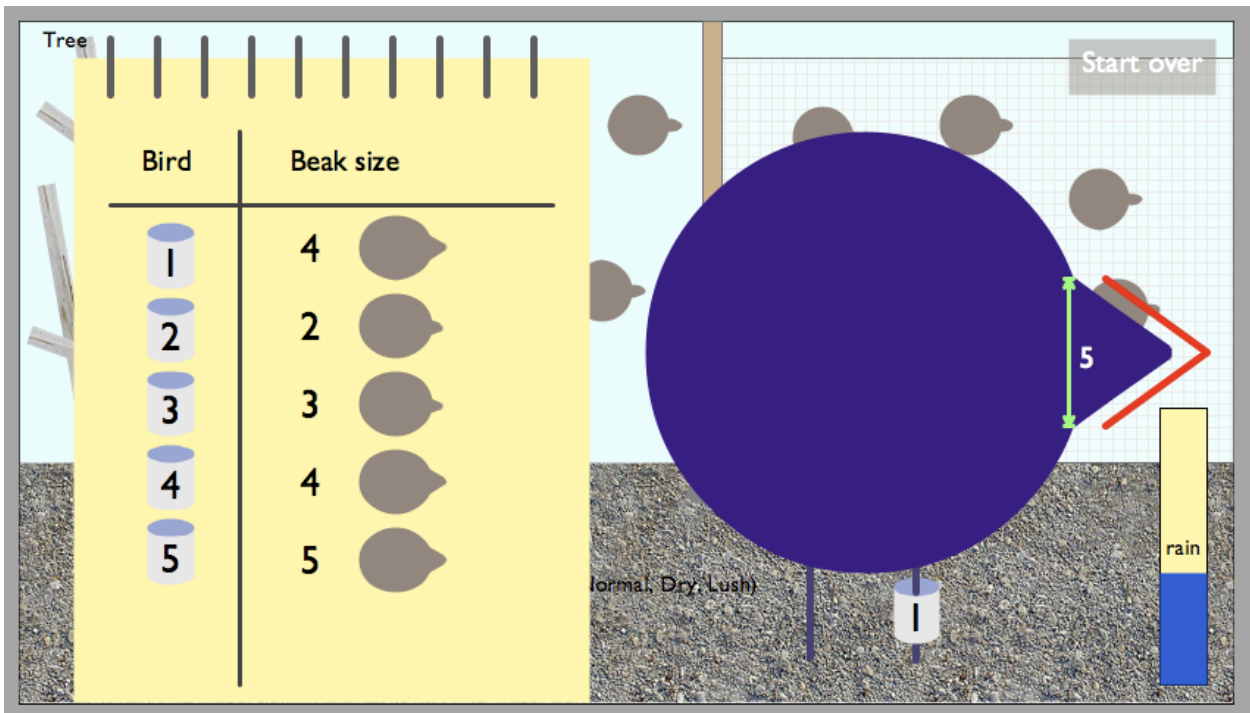
Mockups



Click Begin. HMS Beagle sails across the screen.



Daphne Major, wet season. Finches eat soft seeds, ignoring large seeds.



Five birds are captured in mist net (3 big beak : 2 small beak). Touch a bird to remove it so it can be measured and recorded. A numbered band is automatically attached to its leg. Touch caliper to adjust it.

Script

Narration & SFX	Image	Action
	Start Over button.	Start over if: <ul style="list-style-type: none"> - Click Start Over button - screen idle 30 seconds Show Start Over button if screen idle X seconds.
SFX: Birds, Ocean	Show [Begin] and [Comienzo] buttons. Animated loop. Distant shot of Daphne Major (Wet season). Low-hanging clouds obscure island. Frigate (or unidentifiable) birds flutter to and fro in the distance. Turtles swim in foreground.	Touch a to continue. [Begin] = English [Comienzo] = Spanish
<p>(anim01) In 1835, Charles Darwin visited the Galápagos Islands. He collected thirty one finches, including the stubby-beaked <i>Geospiza fortis</i> – the medium ground finch. (Source: Weiner)</p> <p>(anim02) At the time, he didn't think the bird was special. He assumed that one Galápagos finch was like the next. (Source: Weiner)</p> <p>(anim03) Over one hundred years later, scientists returned to the Galápagos to study the medium ground finch. And they saw something <i>amazing!</i></p> <p>(anim04) What did Darwin miss the first time? (Source: Weiner, p. 22)</p>	<p>(anim01) HMS Beagle sails across foreground (left to right), far from Daphne Major (as it never docked there). Ship bobs (so it is never fully visible – but mast is viewed close up). At the same time, clouds part (drifting right and left – offscreen). See mockup.</p> <p>(anim02) A single bird perches on ship mast.</p> <p>(anim03) 3 more birds perch – arranged like birds on a telephone wire.</p> <p>(anim04) HMS Beagle exits screen. Now island is fully visible.</p>	Auto-advance.
SFX: Birds, Remote Ocean Daphne Major sits in the center of the Galápagos Islands. You arrive during the wet season.	Zoom in on island, then fade to black. Fade in next screen (background=wet).	Auto-advance.
(anim01) You see a number of medium ground finches eating small, soft seeds. They ignore the larger, tough seeds.	(anim01) Approx. 10 birds hop and peck at seeds on the ground. There is a tree in the foreground (in which nest will	Touch [Net] to continue.

Narration & SFX	Image	Action
<p>(anim02) You hang a mist net to take a closer look.</p>	<p>later appear). A rolled up net appears off to side. Show that larger seeds are untouched. See mockup. (anim02) Show [Net] highlight. (Fade in glow around closed mist net.)</p>	
<p>SFX: Wing flapping (struggle), Remote Ocean</p>	<p>Net rolls out. Five birds get trapped in the net. Show [Bird01] highlight. (Fade in glow around bird.)</p>	<p>Touch [Bird01] to continue.</p>
<p>You gently remove each bird from the net. You band it's leg so you can recognize it later. Then you use a caliper to measure the size of its beak.</p>	<p>Notepad appears (big enough to show five vertical bird profiles). On Touch [Bird01-05]: Bird appears in foreground (in front of net). Brightly-colored band pops onto leg. SFX: Pop). Band # (1-5) auto-added to first column in notepad. Show open caliper – framing beak. (Fade in glow around caliper to show that it can be touched.) Caliper has 5 open states. 175 (default) 150 = 5 (big beak) 120 = 4 (big beak) 90 = 3 (small beak) 60 = 2 (small beak) Touch [Caliper] to close it one notch. As caliper adjusts, vertical measurement appears over beak (with number 2-5). Once Caliper is adjusted correctly, show [Record] button in notepad. On Touch [Record]: Beak size recorded in notepad. Bird flies away (making net visible again). If all birds (Bird01-05) removed from net, show [Button]. See mockup.</p>	<p>Touch [Bird02-05] to continue. Touch [Caliper] to adjust. Touch [Record]. (Adds bird to notepad. Bird flies away.) Highlight next bird (fade in glow around next bird). Repeat until all birds removed from net. Note, captured bird variations (3 big beak : 2 small beak) include: 3 big beaked: - 3 black, OR - 3 brown, OR - 2 black + 1 brown, OR - 2 brown + 1 black AND 2 small beaked: - 2 black, OR - 2 brown, OR - 1 black + 1 brown IMPORTANT: Same banded big-beaked birds will appear on next visit.</p>
<p>The birds have varying beak sizes. Some big (anim01), some small (anim02). But</p>	<p>(anim01) Highlight/unhighlight big-beaked birds.</p>	<p>Touch [Button] to continue.</p>

Narration & SFX	Image	Action
<p>they all eat the same small, soft seeds. That's strange. If they eat the same thing, why are their beaks different sizes?</p>	<p>(anim02) Highlight/unhighlight small-beaked birds. Show [Button].</p>	
<p>SFX: Ocean You return to Daphne Major the following year to continue your study. <i>Can this be the same island?</i> It's hot and dry! The earth scalds your bare feet!</p>	<ol style="list-style-type: none"> 1. Fade out, fade in distant island view (dry). 2. Play VO. 3. Zoom in on island, then fade to black. Fade in next screen (background=dry). 	Auto-advance.
<p>(anim01) Last year a team of scientists counted over 1,000 medium ground finches. But this year, there are less than two hundred. <i>So many have died!</i> (anim02) You look for your banded birds. How many are left?</p>	<p>(anim01) Approx. 5 birds rake ground for seeds. Tribulus shells are scattered on the ground. (anim02) Auto-open notepad. As banded birds touched, they are circled with pen line in notepad.</p>	Touch [Bird] (total = 3). After 3 birds located, auto-advance to next screen. Leave notepad open.
<p>Only 3 of your birds survived. (anim01) <i>But why?</i> You notice that the surviving birds have large beaks. The dead birds have small beaks. You look again at the island floor. You only see the shells of large seeds. <i>The tough ones!</i> (anim02)</p>	<p>(anim01) Fade out small-beaked birds to imply that they have died. (anim02) Show [Tribulus] highlight. (Fade in glow around shell.)</p>	Touch [Tribulus] to continue.
<p>Perhaps the <i>small beak</i> was too weak to crack the tougher seeds. Only the <i>big-beaked</i> birds were able to pry them open! (anim01)</p>	<p>Animation (flashback): Show birds <i>side-by-side</i> (big and small) struggling to crack tribulus. Only large beak cracks seed. (anim01) Show [Button].</p>	Touch [Button] to continue.
<p>SFX: Birdsong, insects, rain Some years later, you return to Daphne Major. The island is deluged with rain. The air is thick with insects and birdsong. It's like a jungle!</p>	<ol style="list-style-type: none"> 1. Fade out, fade in distant island view (deluge). 2. Play VO. 3. Zoom in on island, then fade to black. Fade in next screen (background=jungle) 	Auto-advance.
<p>(anim01) Not only did your remaining</p>	<p>(anim01) There's a nest in a tree.</p>	Touch [Nest] to continue.

Narration & SFX	Image	Action
birds survive, there is a new generation of medium ground finches. You take a closer look.	Show [Nest] highlight. (Fade in glow around nest.)	
Most of the nestlings have big beaks, just like their parents. They've inherited the same feature that helped their parents survive the drought!	Nest close up. Parent with banded leg perched aside nest (to imply that parents are big beaked).	
You can't wait to report what you've observed. Mostly big-beaked birds survived the drought. And now, their offspring have this feature. This kind of change is called natural selection, the way evolution happens! (anim01)	(anim01) Show [Parent] highlight. (Fade in glow around bird.) On touch, bird drops seed in nestling's mouth (to show off baby's beak size).	After 3 "feedings," auto-advance to final screen.
Charles Darwin did not believe that we could observe this kind of change in a lifetime. <i>But you have!</i> (anim01)	(anim01) Clouds roll in. Reset.	