

# Natural Selection Classroom Simulation: Dinosaurs

## Teacher Directions

\*If you want, you may allow students to pay out points to change their adaptations (mutation).

### RULES:

1. Everyone here gets points based on your adaptations. Some of you will get more or less points based on what you chose.
2. Your points represent how many dinosaurs there are of your species. Your goal is to end up with as many offspring in your population as possible.
3. Every round is a generation. The teacher will read some cards that describe changes in the environment. Some changes will favor your adaptations, others will make your adaptations less advantageous, and you'll lose points. The order is random, except the last 3 cards.
4. If you lose all your organisms, you are extinct and you're out of the game.
5. If you have any organisms remaining by the end of the game, you win!

You are a dinosaur species living in the Mesozoic! Choose one trait from each category and Circle it in pencil. It may change throughout the activity

Size	Color	Blood Type	Defense	Speed	Eating Habits	Walking	Special 1	Special 2	Special 3
Large	Brown	Warm	Spike tail	Slow	Scavenger	2 legs	Feathers	Webbed toes	Moves in a pack
Medium	Green	Cold	Whip tail	Medium	Herbivore	4 legs	Back Plates	Nostrils on forehead	Climber
Small	Yellow		Sharp Claws	Fast	Omnivore		Longest Neck	Back "sail"	Swimmer
	Blue		Club tail		Predator		Head Crest	Fused tail bones	Makes vocal calls
			Neck frills and spikes				Long Neck	Hard Skull	Cares for young
			Armored Skin						

Everyone gets 100 points for body size!

Everyone starts out with 100 points for your color!

The Mesozoic is HOT! Warm-blooded isn't a great thing. Cold-blooded gives you 100 points! None for warm.

DEFENSE! All Tail defenses receive 200 points because you can defend yourself from a distance. Sharp Claws, neck frills, and armored skin give you 100 points because you need to be close range to use them.

Fast organisms get 100 points because you can hunt or evade predators well!

Herbivores and omnivores get 200 points for having more food available! Scavengers and Predators get none.

Dinosaurs with 2 legs use less energy! 200 points. Four-legged dinosaurs get 100 points for stability.

If you have Nostrils on your forehead AND a long/longest neck, you get 100 points! You can evade predators better by hiding in water.

If you move in a pack, you get superior protection, 100 points.

Caring for your young makes your kids more likely to survive to adulthood, 100 points.

**"You were able to choose your adaptations. Do organisms usually get to do this? NO. They are dealt the hand that they are dealt, and they deal with it. You will now get to play your hand as the environment changes."**

<p>Last 1!</p> <p>The dust cloud from an asteroid has blocked sunlight and causes most plants to die. Herbivores and omnivores lose 800 points. Predators lose 1200 points because they have no food either. Scavengers lose only 500 points.</p> <p>Fused tail bones, feathers, and warm-blooded helps you survive in the cold environment. NO POINTS LOST.</p> <p>Large body size requires too much food, lose 500 points.</p>	<p>2nd to last</p> <p>Major volcanic eruptions are causing the climate to warm, but also creating toxic conditions for organisms. If you have the fused tail bone AND feathers, you can fly to better areas. Gain 300 points.</p> <p>Cold blooded is better in the warm, gain 200 points. Warm-blooded lose 100 points.</p>	<p>3<sup>rd</sup> to last</p> <p>The environment has changed significantly. Climate change is making things colder as the continents separate and ocean circulations alter. Warm-blooded dinosaurs gain 100, but cold-blooded dinosaurs lose 600. Feathered dinosaurs gain 100 for insulation.</p> <p>If you have a fused tail bone AND feathers, you can fly!!!! You earn 1000 points for being able avoid predators, catch prey better, and move easily to better climates.</p>
<p>Packs of small, fast predators are increasing in number. Gain 100 if you care for your young.</p> <p>Lose 200 if you are a slow dinosaur, gain 100 for medium speed and 200 for fast.</p> <p>Gain 100 for any tail defense.</p>	<p>The division of tectonic plates allows currents of water to flow around the world and evens out the temperature. It also makes a wetter environment. Gain 400 points for being a swimmer, 100 points for webbed toes, 200 for nostrils on the head because you can stay in the water.</p> <p>The greener world around you gives 200 points to green dinosaurs, 100 to blue. Brown loses 100, yellow loses 400.</p>	<p>The climate dries out due to convergent plate boundaries. The land is farther from the ocean in some places because the smashed plates make a larger land mass. The land dries out.</p> <p>Brown and yellow gain 100 points for camouflage. Blue loses 100 and Green loses 200.</p> <p>Swimmers lose 300.</p> <p>Packs require more food, lose 200.</p>
<p>Great amounts of plant life evolve, making more food for herbivores and omnivores. Gain 400 points.</p> <p>Predators have more food too, gain 200 points.</p> <p>Scavengers lose 100 for having less dead/starving animals around.</p> <p>Green camouflage gains 300 points.</p>	<p>Plant life grows higher due to a mutation caused by abundant sunlight and rainfall. Longest necks herbivore/omnivore gain 300, long necks and herbivore/omnivore gain 100, all other herbivore/omnivores lose 500.</p> <p>Herbivore/omnivore Climbers gain 200.</p>	<p>The environment dries a bit and the forests become large grasslands. This favors large herds of grazing animals.</p> <p>Pack dinosaurs get 400 points. Herbivores gain 300. Animals making vocal calls gain 200 because they can communicate with their packs.</p>

<p>The females of your species decide they will select male partners who can protect them. Males must now fight over mates. Gain 200 for being larger, 100 for being medium size, and lose 100 for small.</p> <p>Gain 300 for having a hard skull.</p>	<p>Climate continues to be warm, and organisms struggle to maintain a healthy body temperature.</p> <p>Feathered dinosaurs overheat, lose 400 points. Dinosaurs with back plates and back sails can cool themselves easier. Gain 400 points.</p> <p>Cold blooded dinosaurs gain 200, warm-blooded loses 200.</p>	<p>A new disease spreads across the world.</p> <p>Swimmers are less susceptible, lose 400.</p> <p>Pack Animals spread the disease quicker, lose 800.</p> <p>All Others lose 600.</p> <p>Scavengers lose an additional 400 because they can eat infected meat.</p>
<p>A new species of dinosaur that steals eggs from nests to eat evolves.</p> <p>Dinosaurs who care for their young lose only 100, all other dinosaurs lose 600.</p> <p>Animals with a head crest develop a scarier presence to other dinosaurs, gain 300 points.</p>	<p>As continents move due to plate tectonics, more swamps, marshes, and bogs are created. Creatures that walk on 4 legs are less likely to sink into the muddy, wet environment.</p> <p>4 Legged dinosaurs gain 200, 2 legged dinosaurs lose 200.</p>	<p>Fish species grow in number. Predators with webbed feet gain 400 points. Predators with webbed feet and blue coloring gain 600.</p> <p>All others are unaffected.</p>
<p>Plants evolve new toxins to prevent being eaten.</p> <p>Herbivores lose 500 points. Omnivores lose 100.</p>	<p>Predator bite strength increases. Dinosaurs that have back plates or a back sail are at risk of bleeding more when bitten because their plates and sails have many blood vessels in them.</p> <p>Lose 200 points.</p>	<p>A giant land mass is created due to plate tectonics. The land mass's center is far from the ocean and dries up. Many trees die, leaving a major oxygen contributor gone.</p> <p>Large dinosaurs struggle with less oxygen and lose 600 points. Medium dinosaurs lose 300 points.</p>

<p>Predators learn to focus on long and longest necks to take down their prey. Both lose 300 points</p> <p>Predators gain 300 points, and lose no points if they have a long or longest neck.</p>	<p>Predators like T-rex cannot see without their prey moving.</p> <p>Slow-moving dinosaurs gain 200 points.</p> <p>Fast-moving dinosaurs lose 200.</p>	<p>Volcanic eruptions cause widespread acid rain to form. This acid rain causes plant life to yellow.</p> <p>Yellow dinosaurs gain 300 points, all other colors lose 200.</p>
<p>Predators and scavengers with sharp claws gain 100 points for being able to better defend their kills or food.</p> <p>Predators without sharp claws find it difficult to defend their food, and lose 100 points.</p>	<p>All predators are evolving stronger and faster tactics to hunt prey.</p> <p>Any dinosaurs without a whip tail or fast speed lose 300 points.</p>	<p>The number of dinosaurs that eat plants increases. Competition for food makes it more difficult for herbivores to survive.</p> <p>Herbivores lose 300 points.</p> <p>Predators and scavengers gain 100 points.</p>
<p>Omnivores develop the ability to eat more types of food as new things evolve. Gain 200 points.</p> <p>.</p>	<p>Drier conditions lead to fewer trees and more grasses. Predators that are tall are spotted easier by prey items, and shorter herbivores and omnivores are able to hide better.</p> <p>2-legged dinosaurs lose 300 points, 4 legged dinosaurs gain 300.</p> <p>Longest and long neck dinosaurs lose 300 points.</p>	<p>Dinosaurs with a head crest that make calls are able to create fancy displays for mating that lead to greater populations.</p> <p>Gain 300 points for head crests, 200 for making calls.</p>

<p>Dinosaurs with back plates appear larger to predators, so they are less likely to attack them. Gain 200 points for back plates.</p> <p>Lose 100 points for back plates if you are a predator (even if you have back plates).</p>	<p>Widespread cooling due to Milankovitch cycles causes large amounts of the world's water to freeze at the poles. Sea levels decrease.</p> <p>Dinosaurs that are swimmers lose 500 points. Dinosaurs with webbed feet lose 200 points. Cold-blooded dinosaurs lose 200 points.</p> <p>Warm-blooded and feathered dinosaurs gain 300 points for each trait.</p>	<p>The release of large amounts of toxic gasses from volcanoes causes oceans to acidify. Sea creatures cannot make shells, and die, disrupting the food chain.</p> <p>Swimming dinosaurs lose 500 points, all others lose 200</p> <p>EXCEPT: Scavengers gain 100 points.</p>
<p>A genetic mutation in predator species causes them to not be able to see blue.</p> <p>Medium and large Blue Dinosaurs gain 400 points. Small Blue dinosaurs gain 600 points</p>	<p>Cooling from Milankovitch cycles causes glaciers to form on many mountain ranges.</p> <p>Warm-blooded dinosaurs can still survive in the cooler areas of the mountains, gain 200 points.</p>	<p>Forests begin to dominate many areas of the earth due to a wetter climate. Dinosaurs have more habitats to explore.</p> <p>Climbers gain 200 points.</p> <p>Large dinosaurs lose 100 because they find it difficult to navigate the wooded areas.</p>
<p>Plants begin to evolve large seeds that need dispersed by animals, and so they evolve fruits! Enticed by the fruits, herbivores and omnivores eat them and poop out the seeds.</p> <p>Omnivores and herbivores gain 400 points.</p>	<p>Spike-tailed dinosaurs develop a symbiotic relationship with bacteria. The bacteria grow on the tail spikes of the dinosaurs and produce toxins. When the spike-tailed dinosaurs use their defense against predators, the toxin disables the attackers and can lead to death.</p> <p>Spike-tailed dinosaurs gain 200 points, Predators lose 200.</p>	<p>Dinosaurs develop sensory organs that detect heat from other creatures. Dinosaurs with back sails are able to regulate their heat output but increasing or decreasing blood flow into their sail. This can be used as communication.</p> <p>Dinosaurs with a back sail gain 200 points.</p>

<p>Billions of years ago, a supernova exploded, sending cosmic radiation at the speed of light towards the earth. It reaches earth now, lighting up the night sky! The exposure to cosmic radiation causes many mutations in the DNA of all dinosaurs, causing them to lose 700 points.</p> <p>Surviving dinosaurs have the option to change up to 2 of their traits due to the mutations.</p>	<p>Plate tectonics causes continents to join, and many organisms that have never evolved to deal with each other must now figure out how to interact with each other.</p> <p>Large and medium sized dinosaurs gain 100 points, small dinosaurs lose 500 points.</p> <p>Dinosaurs that move in a pack are better protected, gain 300 points.</p>	<p>Neck Frills evolved for protection from predators, but a mutation causes them to be covered in new patterns that make females take note.</p> <p>Sexual selection creates bigger neck frills, gain 300 points if you have a neck frill.</p>
<p>Plate Tectonics stalls. There is no building up of landforms. Widespread weathering and erosion cause an overall flattening of the landscape. Slow dinosaurs have a disadvantage as other dinosaurs evolve to run faster in the flat landscape.</p> <p>Gain 300 points if you're fast, lose 600 if you're slow.</p>	<p>Carbon dioxide is released in large quantities as supervolcanoes erupt in what is now India and Siberia. Carbon dioxide is more dense and sinks towards the ground.</p> <p>Dinosaurs with Nostrils on their head have a slight advantage because they can breathe more oxygen in.</p> <p>Gain 200 points. All others lose 100.</p>	<p>Many calcium-rich plants evolve, allowing dinosaurs with armored skin to develop stronger plating. Gain 200 points.</p>
<p>Different biting insects that carry disease evolve. The only way to reduce how much they can bite you safely is with a whip tail. The whip tail is long enough to reach insects and flexible enough to be used.</p> <p>Whip tailed dinosaurs gain 200 points, all others lose 400 points.</p>	<p>A fused tail bone makes it more difficult to walk, making you more susceptible to predators. Lose 300 points.</p>	<p>Dinosaurs that make vocal calls evolve a low-pitch frequency call that cannot be heard by most predators. Gain 500 points.</p> <p>All predators lose 200 points, because your prey can communicate about you and prevent other dinosaurs from being eaten by you.</p>

# Dinosaur Natural Selection Traits card

Size	Color	Blood Type	Defense	Speed	Eating Habits	Walking	Special 1	Special 2	Special 3
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Circle one trait from each column that you'd like to have starting out.  
You may pay 1000 points to change one trait at a time.

Keep your running score on your notebook pages. After each change in points, write a short note to the side saying why you gained or lost points.

If you lose all your points, you're extinct. If you survive, you win!