PhET Tips for Teachers

Natural Selection

The ***Natural Selection*** simulation allows students to engage in scientific thinking about genes, traits, mutations, and selection agents. Students can compare the distribution of bunnies over time and hypothesize about which traits may be favored in different conditions.

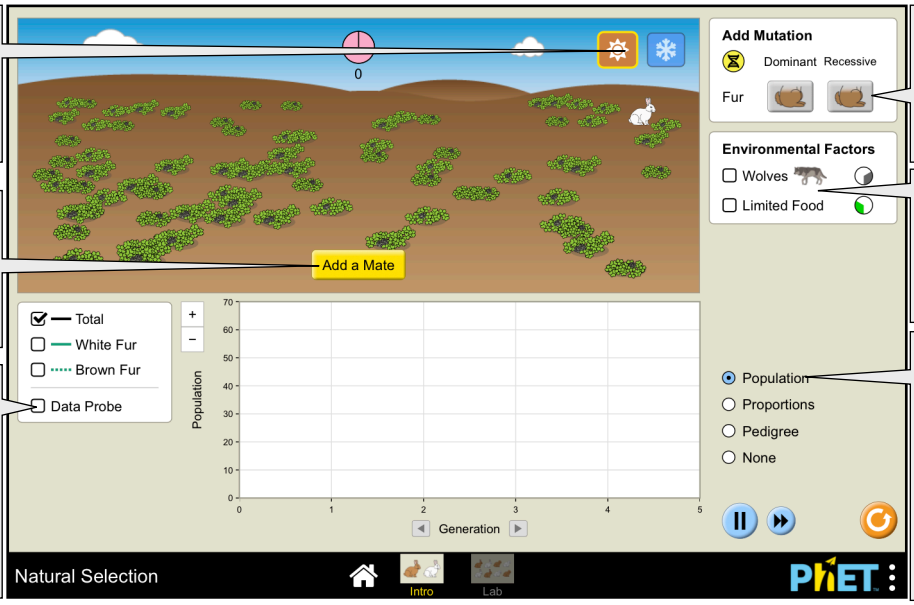
Intro Screen

In the Intro screen, students can be introduced to natural selection by focusing on just one mutation.

SELECT equator or arctic environment

ADD A MATE to watch the population grow

PROBE the population chart to get exact numbers of bunnies



ADD a dominant or recessive mutation

ADD wolves and/ or limited food to the environment

VIEW population graph over time, relative proportions of traits, or pedigree chart

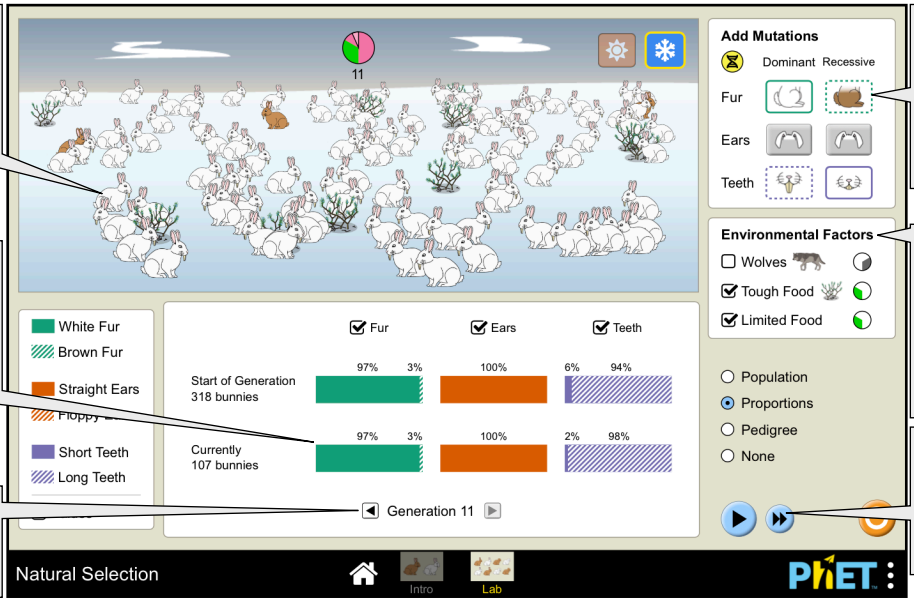
Lab Screen

In the Lab screen, students can explore the relationship between additional mutations and environmental factors.

WATCH the bunnies in their environment

COMPARE the presence of different traits

VIEW past or current data



RECALL if a mutation is dominant or recessive

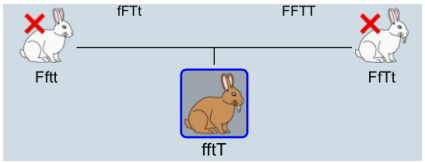
ADD wolves, tough food, and/ or limited food to the environment

SPEED up time by pressing and holding

McGarry, September 2020

Model Notes

- Floppy ears have no selective advantage and are representative of mutations that can occur but are not advantageous.
- Limited food does not select for any particular phenotype, but rather functions as a carrying capacity.
- The pedigree displays the alleles for each bunny. The left allele represents the “father” and the allele that was inherited from the parent on the left. The right allele represents the “mother” and the allele that was inherited from the parent on the right.



- For a full model description and simplifications, see the model description.

Customization Options

The following query parameters allow for customization of the simulation, and can added by appending a '`?`' to the sim URL, and separating each query parameter with a '`&`'.

Query Parameter and Description	Examples
`allelesVisible` - when set to false, allows you to hide alleles from appearing in the Pedigree.	`allelesVisible=false`
`introPopulation` - specifies the initial population of bunnies for the Intro screen (up to 750 bunnies).	`introPopulation=2`

`introMutations` - specifies the mutations that appear in the initial population of bunnies for the Intro screen. Must be used with `introPopulation`.	`introMutations=F&introPopulation=1ff`
	
	`introMutations=f&introPopulation=5Ff`

`labPopulation` - specifies the initial population of bunnies for the Lab screen (up to 750 bunnies).	`labPopulation=10`

`labMutations` - specifies the mutations that appear in the initial population of bunnies for the Lab screen. Must be used with `labPopulation`.	`labMutations=Ft&labPopulation=1ffTt`
	
	`labMutations=fEt&labPopulation=5FfEeTT,10ffeeTt`

`screens` - launches the screens listed after the '`=`'. Each screen should be separated by a comma. For more information, visit the Help Center.	`screens=2`

Suggestions for Use

- Explore different mutations and environmental factors to determine which mutations are advantageous with each selection factor.
- What conditions lead to bunnies taking over the world?
- What conditions lead to the bunny population stabilizing?
- What conditions lead to all of the bunnies dying?

McGarry, September 2020

See all published activities for Natural Selection here.
For more tips on using PhET sims with your students, see Tips for Using PhET.