

Exploring the KU Natural History Museum

Selection in Finches and Flies

Target Audience: Middle school and above

Differentiated Instruction Summary

Strategy	Levels*	Content/Process/Product	Grouping(s)**
RAFT	Readiness Interests Learning modalities	Content Process Product	Small groups Peer partners Homogeneous Heterogeneous

** Readiness: Different tasks rely to a greater or lesser extent on information provided explicitly in museum exhibit labels; Interests: Students have choices in the organisms or variable they can assume for their role and target audience to communicate with; Learning preferences: Students have choices in their product/deliverable.

** Varied grouping options can be used for this activity, depending on student needs and chaperone ability, but individuals or pairs are probably best.

Objective: To explore the principle of natural selection from different perspectives.

- Know: Key factors in natural selection are variation in traits/characters among individuals, differential survival, and differential reproductive success.¹
- Do: (1) Describe and explain how variation among individuals relates to differential survival and reproductive success; (2) explain how these factors impact the overall population; and (3) be able to extend their reasoning to speciation.
- Understand: (1) individuals within a species vary in their traits/characters; (2) variations can be heritable; (3) some variations result in differential survival and subsequent reproduction of individuals with this variation; (3) this differential survival and reproduction can change population demographics; and (4) over time this can result in speciation.

¹ Be aware that 'need' and 'desire' based reasoning are common misconceptions about evolution, and anthropomorphic representations are likely to emerge. A discussion that specifically addresses these misconceptions is recommended (e.g. as a post-activity follow up discussion in the classroom).

Pre-assessment/Prior Knowledge: Prior to their visit, students should be familiar with the VIST evolutionary principles (variation, inheritance, selection and time).

Activity Description: Students explore the evolutionary principle of natural selection as outlined above through the examples of the Hawaiian fruit flies and medium ground finches featured in the *Explore Evolution* museum exhibit. Students choose one option from each column—role, audience, format and topic—and are asked to explain how the principle of natural selection in this context. Role options include organisms and traits, possible audiences reflect a wide range of ages and experience, a diversity of learning modalities are represented in the format choices, and a suite of topics related to natural selection are outlined.

Materials Needed:

- Students
 - Copies of RAFT handout (see attached)

Exploring the KU Natural History Museum

- Materials needed for select format (e.g. various paper, tape, colored pencils, markers – it is recommended that student selections be made in advance).

- Teacher
 - Content Outline

Content: Natural Selection²

Natural Selection is one of the basic mechanisms of evolution. The core ideas of natural selection are that there is variation in traits, many traits are heritable (passed to subsequent generations), there is differential survival and reproduction (individuals with a particular trait are more likely to survive and successfully reproduce), this advantageous trait becomes more common the population, and over time can result in an entire population with the same trait.

² *A pre or post-visit discussion of genetic drift, differential survival and reproduction that results from chance (i.e. a random process), might be worthwhile to contrast with natural selection.*

Medium Ground Finches

Large beaked medium ground finches have selective advantage in dry years resulting from an abundance of large, hard seeds; small beaked medium ground finches have a selective advantage in wet years resulting from an abundance of small, soft seeds.

Beak size is a heritable character and so this trait is passed on to the surviving offspring. The differential survival and reproduction of finches with a particular trait would result in changes in the ground finch population, which over a long period of time and sustained selective pressure could change the entire finch population, and potentially result in a separate or different species.

Hawaiian Fruit Flies

Male fruit flies have a variety of fancy features to attract females (e.g. wing patterns, songs and dances). Female fruit flies choose the males they reproduce with; some are more choosy than others. All these traits are heritable, and so individual male and female flies that are more likely to survive are more likely to reproduce, and therefore pass these traits onto their offspring.

Population change and potential speciation events that could result would vary depending on the distribution of male and female traits, For example, if males 'without fancy features' are selected by 'not very choosy' females as often as males 'with fancy features' are selected, then male 'without fancy features' and 'not very choosy females' would remain common in the population. However, if 'very choosy females' were more common in the population and preferred males 'with fancy features', then males 'with fancy features' would become more common in the population and 'very choose females' would remain common—and if this trend continued for several generations, the entire population might be composed of males 'with fancy features' and 'very choosy' females.

Exploring the KU Natural History Museum

RAFT Activity: Natural Selection

Choose one option from each column—role, audience, format and topic—to explain how the principle of natural selection relates to the evolution of medium ground finches or Hawaiian fruit flies as featured in the *Explore Evolution* exhibit.

Role	Audience	Format	Topic
Very choosy female fly	Other individual of the same species	Create a flow chart	Mate choice
Not very choosy female fly	Scientist/Researcher	Compose a poem	Speciation
Small beaked medium ground finch	Elementary school class	Perform a skit	Trait variation
Large beaked medium ground finch	Classmate	Write a story	Change in population
Small, soft seeds	Non-native English speaker	Draw a Venn diagram	Reproduction
Fancy fly features	Visually/hearing disadvantaged student	Build a prop	Survivability
Very elaborate singing & dancing male	KU student	Sing a song	Heritability
Not very elaborate singing & dancing male fly	Other museum visitor	Draw a cartoon	Time

Exploring the KU Natural History Museum

Rubric: Natural Selection in Finches and Flies

RAFT	Needs further support	Meets Expectations	Exceeds Expectations
Role	Provides basic description of organism or trait (e.g. they are small, soft seeds)	Provides full explanatory description of organism or trait (e.g. they are small, seeds that are more common in wet years)	Provides rich and/or contextualized description of organism or trait (e.g. they are small, soft seeds that are more common in wet years and can be eaten by finches with small beaks)
Audience	Does not identify audience; does not appropriately target audience (e.g. does not explain terms, uses examples that are not meaningful)	Identifies audience and is appropriately targeted (e.g. language, explanation, examples)	Identifies and appropriately targeted, and demonstrates thoughtful reflection on specific audience
Format	Information conveyed is not correct; minimal effort made towards product	Information conveyed is accurate and a strong product is created	Accurately conveys information, and creates a product that is well thought out and that reflects their skills and creativity
Topic	Does not identify topic; superficially identifies topic	Clearly identifies and defines topic	Clearly identifies and defines topic, and provides broader context for how the particular aspect they explored relates to natural selection