

ADVANCED BIOLOGICAL SYSTEMS
Unit #1: Evolution
Instructional resource #7: Speciation Jigsaw

Instructors' notes

This is a lesson intended to be complementary to the selection simulation. Whereas the simulation was used to develop a conceptual understanding of selection, the readings done here are used to allow students to see the application of their conceptualized understanding to researched examples of selection and speciation.

As to the mechanics of organizing the reading groups, we have tended to apply a random process of bringing students together. There may be great success in appointing student groups before the reading period begins. Not all of the readings are of equal complexity. The first article on the list, *Evolution caught in the act*, is more of a summary piece with little reliance on data. On the other hand, the articles *The secondary contact phase of allopatric speciation in Darwin's finches* or *Genome evolution, structural rearrangements and speciation* tend to be much more abstract in the ideas introduced in them and more data-driven. Assigning students to articles based on their readiness might yield a better result in understanding than a purely random process.

NGSS addressed in this lesson:

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| HS-LS4-2 | Construct an explanation based on evidence that the process of evolution primarily results from four factors: (1) the potential for a species to increase in number, (2) the heritable genetic variation of individuals in a species due to mutation and sexual reproduction, (3) competition for limited resources, and (4) the proliferation of those organisms that are better able to survive and reproduce in the environment. |
| HS-LS4-4 | Construct an explanation based on evidence for how natural selection leads to adaptation of populations. |

Speciation Jigsaw

This lesson introduces a strong focus on primary literature into our unit on evolution. You will be assigned to read one or two of the following articles. Following the reading, a small group of your classmates who have read different articles will gather together to discuss the knowledge that you gained and synthesize a statement regarding speciation. Please be ready to present your article to your classmates during our next class period.

While reading your paper, focus on:

- thorough background of the topic
- major concepts discussed
- processes (experimentation, data collection, evaluations, etc)
- major conclusions
- context of conclusions

We encourage you to make use of additional resources to gain a better understanding of concepts from your paper.

Titles and links to articles:

Evolution caught in the act.

<https://www.nature.com/news/2006/060710/full/news060710-11.html>

The secondary contact phase of allopatric speciation in Darwin's finches.

<https://www.pnas.org/content/106/48/20141.full>

Genome evolution, structural rearrangements and speciation.

<https://onlinelibrary.wiley.com/doi/full/10.1111/jeb.13101>

support for above article

https://en.wikipedia.org/wiki/Genome_evolution#Speciation

Speciation and Bursts of Evolution.

<https://link.springer.com/content/pdf/10.1007%2Fs12052-008-0049-4.pdf>

A positive association between population genetic differentiation and speciation rates in New World birds.

<https://www.biorxiv.org/content/biorxiv/early/2016/11/02/085134.full.pdf>