Lessons learned from Pennsylvania's rare chickadee 'hybrid zone' can now be accessed by students worldwide

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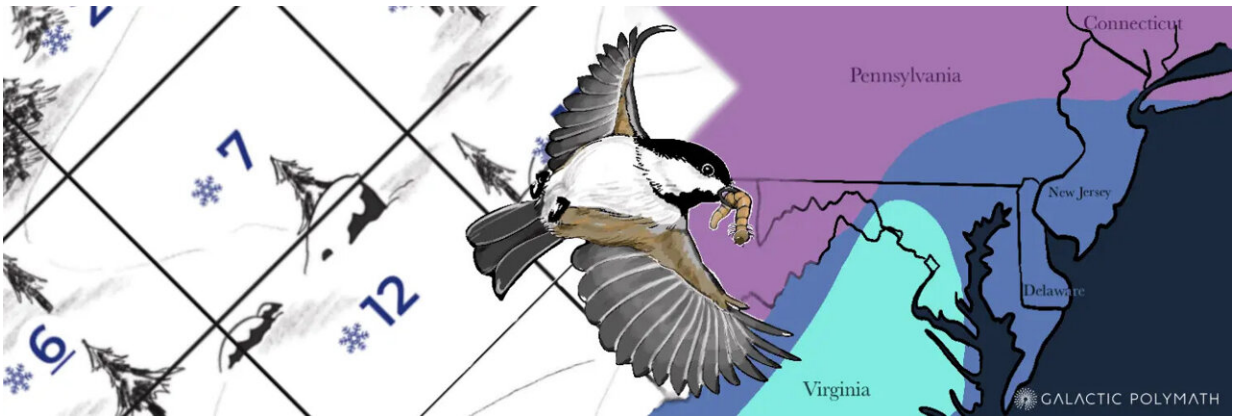

An illustration from the learning module. Credit: Galactic Polymath

In the hybrid zone that encompasses the Lehigh Valley in Pennsylvania, the habitats of the Carolina Chickadee and the Black-capped Chickadee converge, creating an opportunity for the different species to cross-breed and produce hybrid offspring.

In a new online module, it's the too-often disparate worlds of current research and secondary education that converge to create an opportunity for young learners to engage with high-level evolutionary biology concepts.

The module stems from a research collaboration among Amber Rice, associate professor of biological sciences at Lehigh University; Scott Taylor, associate professor of ecology and evolutionary biology at the University of Colorado; and Tim Roth, associate professor of psychology at Franklin & Marshall College. It integrates learning standards with interactive lessons and games to help students around the world learn about hybridization.

"Hybridization in chickadees is relevant to everyone in ways that people may not realize, from the food we eat to the ways climate change is affecting our ecosystems. We wanted to bring those ideas to younger students outside of our own academic zones," said Rice.

The module is geared towards students in grades 8-12 and designed to align directly with Common Core ELA, NGSS and SEL CASEL-based standards. Created in partnership with education studio Galactic Polymath, the module will be available beginning August 28, 2024, for free.

While the module is designed for classroom use, it is freely accessible to anyone interested in learning about hybridization.

A topic not for the birds

The team's research, focused on hybridization between two species occurring in a relatively small geographic area, may seem esoteric. But their findings have implications for other areas of life science, including ecology, genomics and neuroscience.

The team's most recent projects, which form the basis for the learning module, focus on how hybridization can impact learning and memory, which can be important for overall fitness, or survival.

Hybrid zones—the areas where two different species that may interbreed come into contact—are often shaped by geography and climate. As global temperatures continue to rise, these zones in North America are shifting further north. The survival of species, and their potential hybrid offspring, will depend on how well they can adapt to these new environments.

"Hybridization can lead to all kinds of interesting outcomes," Rice explained in an article on the research. "One is that you can actually get genetic variation from other species that can be adaptive [and beneficial to the species]. ... [But] what we've understood for a fair bit of time is that you can have hybridization and the hybrids have low fitness. And this is probably the more common outcome."

Incubating interest in evolution

While timely, the topic of hybridization is nested in complex concepts. Translating these high-level ideas into activities and lessons that resonate with younger learners is a challenge.

That's why the team turned to Galactic Polymath, a Minnesota-based education studio founded by Matt Wilkins. Wilkins is a former middle school biology teacher and postdoctoral biology researcher who earned a Ph.D. in ecology and evolutionary biology from the University of Colorado in 2014.

As an educator whose career bridged the worlds of secondary schools and university research, he recognized the gap that exists between current research and the majority of the world's population. He founded Galactic Polymath in 2021 to help academic professionals transform their high-level research into lessons suitable for classrooms at the secondary education level.

"When students learn about natural selection and evolution, they're often given examples like Darwin's finches on the Galapagos," Wilkins said. "This unit is about how a majority of food crops we eat are hybrids and how species hybridize and exchange genes all the time in the wild to a degree that most people don't know about. Hybridization is truly the testing grounds for evolution and I'm excited for students to connect these concepts to their daily lives—whether they're at the grocery store, out for a walk, or in a national park."

Creating the module was a "highly collaborative" process, Rice said, with a project team including the researchers, artists, video editors and other experts.

The module includes three lessons:

- an introduction to hybrids featuring videos of the researchers and interactive slides
- a natural selection-inspired memory game, "Foraging Frenzy," highlighting cognitive differences between chickadee species and hybrids, and
- A concluding activity in which students can analyze their own gameplay data to help synthesize their learning about the effects of and influences on hybridization.

"The Foraging Frenzy game is such a fun way to help students understand this topic in relation to daily life and our changing climate," Rice said. "I can't wait to see this being put to use in the classroom."

More information: The module can be accessed at https://www.galacticpolymath.com/lessons/en-US/12.