Engaging Students in Authentic Scientific Investigations using Digitized Museum Specimens

EPIC Bioscience

THE UNIVERSITY OF UTAH®

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Goals & Context

Digitized museum collections are an enormous source of untapped potential to engage young learners in science investigations using real specimens to address pressing global questions.

EPIC Bioscience are interactive, online science investigations aligned to NGSS for middle school learners. Students gather data directly from museum specimens, analyzing their data to develop evidence-based arguments related to global issues of biodiversity loss and climate change.

Development Activities

Scientist Consultations

- How are practicing scientists using collections in their research?
- What key questions can be answered by investigation of museum specimens?

Collections Review

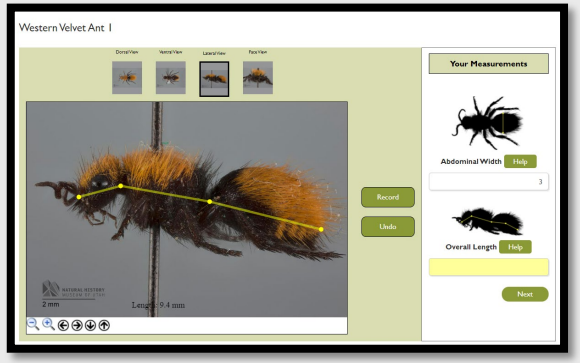
- Which collections provide compelling, digitized specimens from which student can collect data directly?
- Are there sufficient specimens for analysis considering quality, quantity, and associated metadata?

Teacher Design Review Workshops

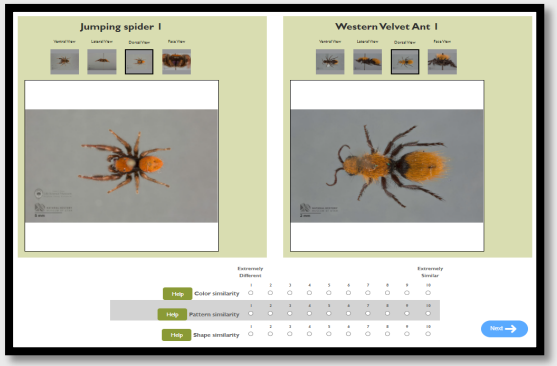
- Difficulty? Engagement? Flow? Support?

Entomology: Identify key mimic features driving predator behaviors

NGSS MSLS2-2



Measuring features of museum specimens.



Comparing observable characteristics of specimens.

Question: What physical features drive predator behaviors when encountering harmful prey and their mimics?

Investigation: Students collect and analyze data on measurable features and observable characteristics of museum specimens to determine which features influence predator behavior over time.

Vertebrate Zoology: Predict ability to adapt diet based on physical features

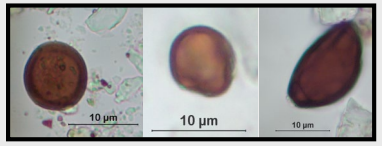
NGSS MSLS2-1

Question: As insect populations undergo an unprecedented, rapid decline, how will bat species be affected by sudden changes in their dietary resources? Can they adjust?

Investigation: Students gather bat size & jaw metrics (to calculate bite force), analyzing how the physical features of different bats predict their likely ability to adjust diets as resources rapidly change.

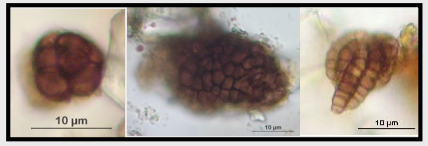
Mycology: Analyze number & diversity of fungal spores in mesic & xeric environments

NGSS MSLS2-3



Single, spherical morphology

Long, filamentous morphology



Aggregate, colonial morphology

Students explain rates of energy cycling in mesic and xeric environments via number & diversity of fungal spores in soil samples.

Evaluation & Findings

Teacher Testing

- Students collecting and analyzing own data is compelling and meaningful
- Shorten activities & increase scaffolds

"[They are] **collecting data the way that actual scientists would** collect data! The tools were super easy and effective!"

"I love that the **specimens** are **real images of insects** - most students will think that is **cool**.."

Usability and Learning Interactions

- Strong need for visual instruction
- Working with specimens is compelling

"OK, so that **insect has a really cute face** up close."

"You know, **measuring** these is actually pretty **fun**"

"Wait, look at the map! **These live near me?! That's crazy**.

Upcoming Activities

- Classroom testing in middle schools.
- Beta development of Investigation #4.

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