

Change Thinking for Global Science: Fostering and Evaluating Inquiry Thinking About the Ecological Impacts of Climate Change



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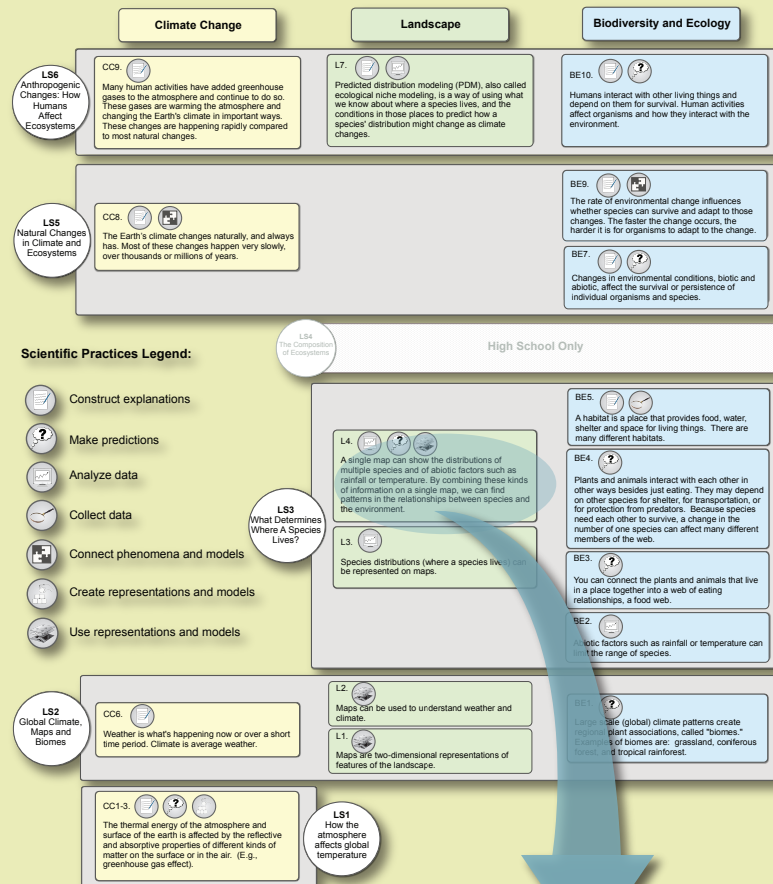


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LEARNING PROGRESSION



L4.

A single map can show the distributions of multiple species and of abiotic factors such as rainfall or temperature. By combining these kinds of information on a single map, we can find patterns in the relationships between species and the environment.

LEARNING GOALS

- Students **use representations (food webs) to make predictions** about a species' ability to survive if feeding relationships are changed
- Students **analyze data from maps to predict patterns** in conditions that influence where a focal species live

PROJECT SUMMARY

During the lifetimes of our current middle and high school students, it is likely that our planet will undergo more anthropogenic change than it has during all of human history to date. The project is utilizing a learning progression approach for the systematic design of coordinated curriculum, tool, and assessment products focused on climate change biology. This work will provide an empirical and theoretical basis for critical concept development about the impacts of climate change on living systems.

RESEARCH QUESTIONS

- Which scientific content and reasoning skills are essential for 7-10th graders' complex reasoning and modeling of the ecological impacts of climate change? How are these manifested in content and inquiry reasoning progressions?
- What dynamic visualization and modeling resources support the development of deep thinking about the ecological impacts of climate change?
- What scaffolding and instructional activities support the development of deep thinking about the ecological impacts of climate change, including both content (ecological impacts) and complex reasoning components (science practices) of this knowledge, within cohorts of 7-10th graders?

CURRICULUM DEVELOPMENT

ChangeThinking

Home | Learning Set | Critter Catalog | My Account

Learning set 1 | Learning set 2 | Learning set 3 | Learning set 5 | Learning set 6 |

Learning Set 1

- Learning Set 2
- Learning Set 3
- How do abiotic factors influence species?
- How do food webs influence where a species is found?
- How do interactions influence where a species is found?
- Habitats are places where a species' needs are met.
- How are maps used to show where species are found?
- Learning Set 5
- Learning Set 6

My Notes

Abiotic factors could be divided into:
1. Chemical & geological factor: Rocks & Minerals
2. Physical factor: Temperature & Weather

Level of Understanding

1 2 3 4 5

Ask Friends | Ask Teacher

Driving Question : What conditions are present in the places where animals live?

- The design of curricular activities are driven by the learning progression developed specifically for middle school-aged students.
- The learning goals for each activity fuse essential disciplinary content with established scientific practice.

Look at the map below. Circle the places on the map where you think the organism you found could live based on moisture

Soil Moisture (mm)

0 15 30 45

My Prediction is . . .

Scientific Question 3.1 :
In what states could the organism you found live based on soil moisture?

CLAIM
I predict _____ can live in places where the average soil moisture is _____.

EVIDENCE

Hint: what was your moisture for the place where you found this organism?

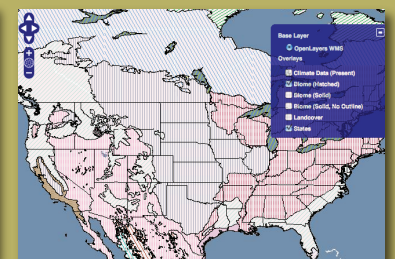
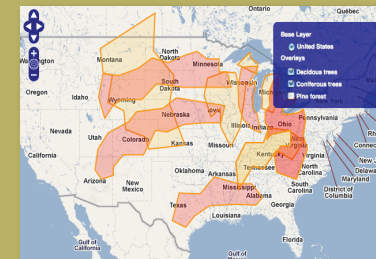
FORMATIVE USABILITY TESTING

Purpose

Formative usability testing to identify potential problems with activity structure and interface design.

Research Questions

- What difficulties do students face when using interactive map and participating in a collaborative writing task?
- How can knowledge of these difficulties inform scaffolding design for subsequent activity development?



STUDY METHODS

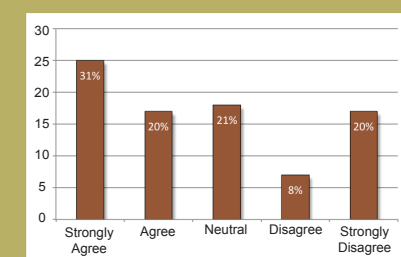
Participants : 84 middle school students from the United States and Canada (age: $M = 11.57$, $SD = 13.77$).

Materials : Drupal-based technology environment with embedded Google map and YouTube video.

Procedure : Students completed an online layered map activity and a collaborative writing activity.

RESULTS

- Approximately half of students (51%) found it easy to find the necessary information to complete the map activity.
- Many students (64%) found it challenging to use the map Pan and Zoom features.
- Students (72%) reported that they enjoyed editing a peer's paragraph, although they were uncertain about what they could or should change.



"It was easy to find the information I needed for the map activity."