

Expert and Novice Conceptions of the Biotic Impacts of Climate Change

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GOAL 1: Identify expert and novice conceptions of the biotic impacts of climate change
GOAL 2: Develop a concept inventory of the biotic impacts of climate change

STEP 1: Develop Domain Framework



1. Consulted 5 common Ecology textbooks
2. Reviewed 33 recent articles in climate change education about misconceptions
3. Conducted preliminary qualitative study ($n_{\text{novice}} = 39$, $n_{\text{expert}} = 17$)
 - a) What topics are taught/learned related to climate change
 - b) What biotic impacts from climate change are taught/learned

Preliminary Domains

STEP 2: Evaluate Importance of Domains by Experts



1. Solicited feedback from our Advisory Board
2. Administered survey ($n_{\text{expert}} = 13$) about the importance of each Domain (see framework below) to:
 - a) Science related to climate change
 - b) Student understanding of climate change

Finalized Domains

STEP 3: Develop Interview Protocol Using Domains



1. Explored different question types
 - a) Concept map
 - b) Semi-structured open response
2. Employed professional illustrator to prepare 3 scenes for interviews
3. Piloted protocol ($n = 18$)
4. Solicited feedback from Advisory Board

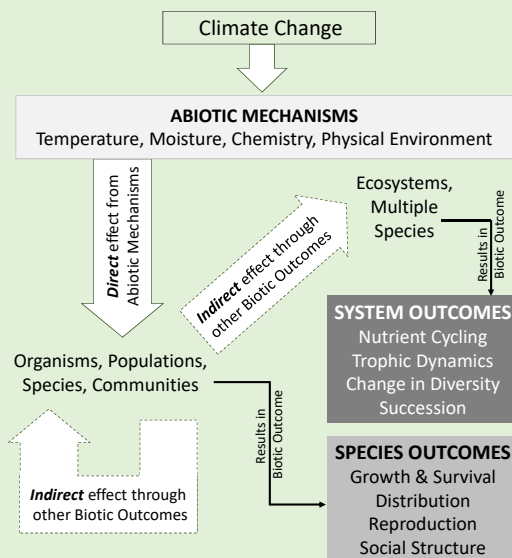
Interview Protocol

STEP 4: CURRENT STEP Conduct Qualitative Study



1. Conducted Phase 1 of conceptions interviews ($n_{\text{novice}} = 13$)
2. Coded Phase 1 interview data using Domain framework ($n = 11$)
3. Analyzed data to revise protocol for Phase 2 conceptions interviews
4. Will conduct (Fall 2019) Phase 2 conceptions interviews using revised protocol

DOMAIN FRAMEWORK

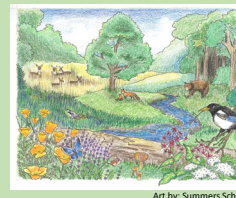


PRELIMINARY FINDINGS

Analysis of Step 4, Phase 1 interview data – forest scene only:

Findings

- **Direct Outcome:** Change in survival most frequently reported outcome (Student 6).
- **Indirect Mechanism:** Change in trophic dynamics most frequently reported indirect cause to biotic outcomes (Student 6).
- **Magnitude and Timescale of Outcomes:** Biotic outcomes are reported as drastic and immediate (Students 12 and 2).



Art by: Summers Scholl

Interview Examples (modified for clarity)

- **Student 6:** "Climate change affects the whole food chain. When a smaller organism is gone; it's less food for the bigger organisms, which is less food for other organisms."
- **Student 12:** "In 10 years, this environment would probably look a lot less green and vibrant, and it would probably be more barren and not as full of color or species."
- **Student 2:** "It probably would look less green, like there would probably be a lot drier grasses, not as nearly as many creatures in general and it would probably look a little barren."

NEXT STEPS

Immediate-term:

- Conduct Phase 2 of conceptions interviews with novices and experts
- Complete qualitative study of novice and expert conceptions of the biotic impacts of climate change
- Develop preliminary items for the concept inventory

Long-term:

- Review of preliminary instrument by experts
- Conduct think-aloud interviews by novices
- Administer field test of the instrument to begin quantitative data collection (for psychometric analysis)

WE NEED YOUR HELP!

If you or other members of your department teach Introductory Biology or 200/300-level Ecology, we could use your help! In the next two years we will be seeking experts (faculty) and students (from Intro Bio and Ecology) to collect data. Please contact: Emily Holt, Emily.holt@unco.edu