# EcoGEM

## Testing and Refining Thinking with GEM

Simulations afford the opportunity to make student thinking visible and allows them to manipulate variables that might be otherwise inaccessible. This is especially important in ecosystems, where static diagrams often hide the complexity of interactions and reinforce surface-level reasoning (Preston, 2018). Research on food web modelling suggests that interactive and computational representations can help students recognize indirect effects, population-level changes, and relationships that are not obvious in static visualizations (Lui & Moher, 2017; Rachmatullah & Wiebe, 2021). In addition, when students' ideas are made visible and revisable, they are better able to compare their thinking against evidence and alternative explanations (Linn et al., 2003; White & Frederiksen, 1998).

The following experience is designed to help you move through a Generate-Evaluate-Modify cycle using a dynamic ecological simulation.

The Annenberg Ecology Lab allows users to add or remove species, adjust feeding relationships, and observe population changes over time through both a field animation and a population-time graph. These linked representations make system behaviour more visible by allowing users to connect what they see in the ecosystem with what they see in the data. Research on dynamic modelling also suggests that direct manipulation and real-time feedback help learners notice patterns, construct causal explanations, and test ideas more efficiently than static representations alone (Jackson et al., 1995).

## EcoGEM Activity

EcoGEM (Morris, 2026) is an interactive experience built around the use of the Annenberg Ecology Lab. As you work through the simulation, think about how the tool supports each stage of the GEM cycle. Start by opening the app and navigating through the "Student Lab". After completing the interactions, you may also explore the Teacher Portal. For your reference, here is the written **EcoGEM suggested lesson (https://docs.google.com/document/d/1LKbypTmA9ESM4Uf2Q16S19LlfNQXvDYAZ51DEAxkCRs/edit?usp=sharing)** progression.

# EcoGEM

A high-fidelity companion for the Ecology Lab simulation, powered by the Generate-Evaluate-Modify cycle.

View as a standalone app:

💎 **Launch EcoGem Companion** (https://ecogem-simulation-companion-645234714648.us-west1.run.app/)

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## References

Annenberg Learner. (n.d.). Annenberg Learner. (n.d.). *Ecology labs: The producers* [Interactive simulation]. **https://www.learner.org/wp-content/interactive/envsci/ecology/producers.html (https://www.learner.org/wp-content/interactive/envsci/ecology/producers.html)**

Linn, M., Clark, D., & Slotta, J. (2003). Wise design for knowledge integration. *Science Education*, 87(4), 517–538.

Lui, M., & Moher, T. (2017). Learning to Model Ecosystems With Interaction Food Webs in Middle School Classrooms. *Isls.org.* https://doi.org/dx.doi.org/10.22318/cscl2017.66

Jackson, S.L., Stratford, S.J., Krajcik, J., & Soloway, E. (1995). *Making system dynamics modeling accessible to pre-college science students*. Center for Highly Interactive Computing in Education Web. https://www.hi-ce.org/papers/1995/making_systems_dynamic_modeling/index.html

Morris, A. (2026). EcoGem Simulation Companion (Version 1.0) [Web application]. https://ecogem-simulation-companion-645234714648.us-west1.run.app/

Preston, C. (2018). Food webs: Implications for instruction. *The American Biology Teacher*, 80(5), 331–338. https://doi.org/10.1525/abt.2018.80.5.331

Rachmatullah, A., & Wiebe, E. N. (2021). Building a computational model of food webs: Impacts on middle school students' computational and systems thinking skills. *Journal of Research in Science Teaching*, 59(4), 585–618. https://doi.org/10.1002/tea.21738