

Ecosystems, Probability, & Graph Theory

University of Colorado Denver, GK-12: Transforming Experiences

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Background information:

The students will have studied ecosystems in their science classes and basic theoretical probability in their mathematics classes. Students work in groups to develop a food web using a directed graph as a visualization tool. Then, using previously determined probabilities the groups try to determine the effects of various changes to their ecosystems.

Goals:

- Reinforce the lessons students have learned in their mathematics and science classes
- Provide exposure to graph modeling (and the benefits)
- In predicting outcomes of environmental changes they will become more aware of their impact on their own environment.

Standards:

- Use algebraic methods to explore, model, and describe patterns and functions involving numbers, shapes, data, and graphs in problem-solving situations and communicate the reasoning used in solving these problems.
- Use data collection and analysis, statistics, and probability in problem-solving situations and communicate the reasoning used in solving these problems.
- Link concepts and procedures as they develop and use computational techniques, including estimation, mental arithmetic, paper-and-pencil, calculators, and computers, in problem-solving situations and communicate the reasoning used in solving these problems.

Procedure:

Using the 5 E Instructional Model: A Framework for Inquiry-Based Instruction

Engage: Students will be asked for possible environment-changing events and try to determine, as a class, their relative probabilities. USE: episode of *The Simpsons* that parodies the effects of introducing a new species to an environment.

Explore: Each group will choose or be assigned an ecosystem. They will choose 10-15 animals and plants in that ecosystem to model using a directed graph. Each group will answer several pre-determined questions about their systems, e.g. "Which species seems most/least resistant to change, and why?", and "Are there any 'loops' in your graph? What does that mean?"

Explain: Groups will talk about their environments and how they answered the questions.

Elaborate: The groups roll dice to determine which environment-changing event(s) should be included in their model, modify their food web accordingly, and explain why they made the decisions they did.

Evaluate: Groups are asked how their environments fared after the fictional events, and self assessment for if they adequately answered their questions.