



Games as models: Engaging students in NGSS



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What is Project NEURON?

- At the University of Illinois
- Educators, scientists, and graduate students
- Curriculum development
 - Inquiry-based
 - Connect to standards
- Professional development
 - Summer institutes
 - Conferences



Project NEURON Curriculum Units

- **Do you see what I see?**
 - *Light, sight, and natural selection*
- **What can I learn from worms?**
 - *Regeneration, stem cells, and models*
- **What makes me tick...tock?**
 - *Circadian rhythms, genetics, and health*
- **What changes our minds?**
 - *Toxicants, exposure, and the environment*
 - *Foods, drugs, and the brain*
- **Why dread a bump on the head?**
 - *The neuroscience of traumatic brain injury (TBI)*
- **Food for thought: What fuels us?**
 - *Glucose, the endocrine system, and health*
- **What makes honey bees work together?**
 - *How genes and environment affect behavior*
- **How do small things make a big difference?**
 - *Microbes, ecology, and the tree of life*

Available at:
neuron.illinois.edu



Using games in the classroom

1. What is a **game**?
2. What was the last game you used in the classroom?
3. How did your students use it?
4. What were the learning outcomes or goals?



Using models in the classroom

1. What is a **model**?
2. What was the last model you used in the classroom?
3. How did your students use it?
4. What were the learning outcomes or goals?



Do you see what I see?

- Lesson 1: What do I see?
- Lesson 2: How does biology affect perception?
- Lesson 3: How does the environment affect perception?
- Lesson 4: What are light and color?
- Lesson 5: Do fish have a favorite color?
- Lesson 6: Why do guppies have a favorite color?
- Lesson 7: What do you see?



The Guppy Game!

- Groups of 4
- Play for 15 minutes
- Each person needs
 - Guppy card
 - Scorecard
 - Quickrules
- Play with habitats
 - Practice Pond
 - Amazon
 - Fish Tank
- Record Scores



Class Data

	Fancy Female	Fancy Male	Wild Female	Wild Male
Practice Pond				
Amazon				
Fish Tank				
Murky Pond				
Clear Stream				
Quiet Brook				



Guppy Game Discussion

- When was being bright an advantage or disadvantage? (males)
- When was being biased an advantage or disadvantage? (females)
- Which guppies are best adapted for which habitats?



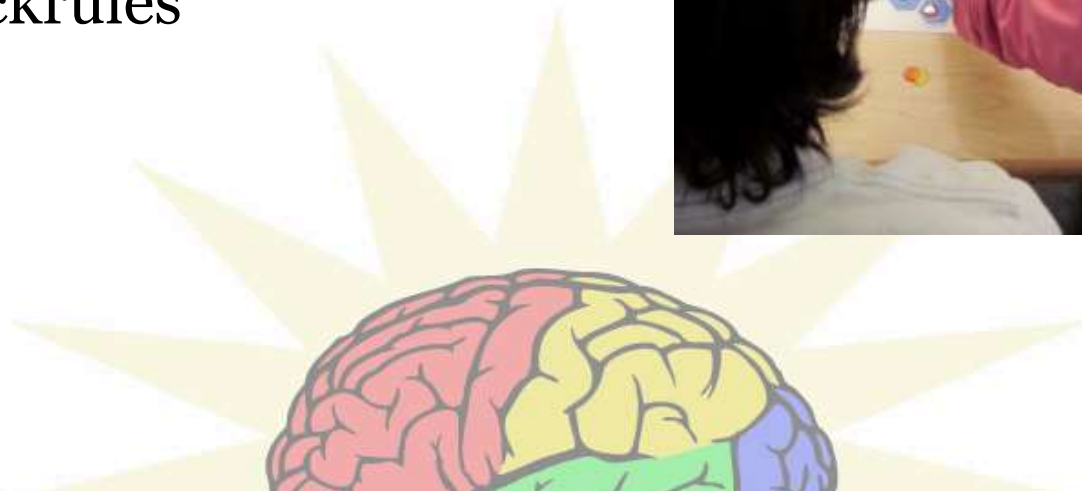
What changes our minds?

- Lesson 1: What changes our minds?
- Lesson 2: How do we define what changes our minds?
- Lesson 3: How does the environment magnify our exposure to toxicants?
- Lesson 4: How does harmful algae affect Daphnia?
- Lesson 5: Where are toxicants and how much are we exposed?
- Lesson 6: Toxicant in action: What changes the cell?
- Lesson 7: If it's harmful, why do we use it?



The Biomagnification Game!

- Play for 15 minutes
- Groups of 5-7
 - 2 Tuna
 - 3-5 Anchovies
- Each player needs
 - Cup with fish graphic
 - Quickrules



Biomagnification Game Discussion

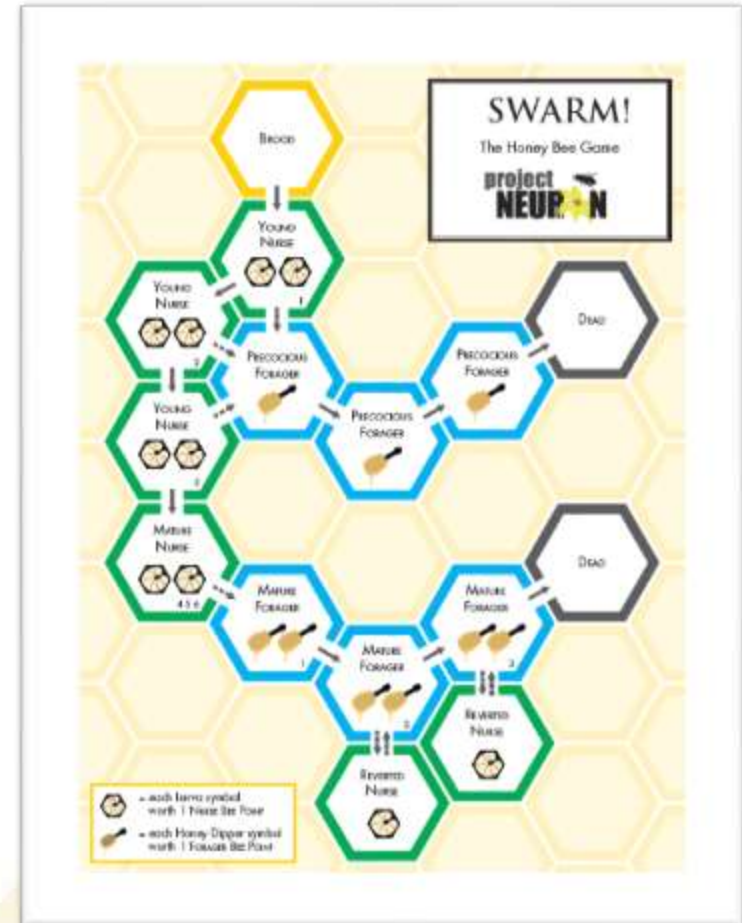
- How does the first graph show bioaccumulation?
- Why is the relationship between biomass and trophic levels?
- How does the third graph show biomagnification?



- Models include diagrams, physical replicas, mathematical representations, analogies, and computer simulations.
- Bring certain features into focus while obscuring others.
- Contain approximations and assumptions that limit the range of validity and predictive power.
- Used to
 - represent a system (or parts of a system) under study
 - aid in the development of questions and explanations
 - generate data that can be used to make predictions
 - communicate ideas to others
- Students can evaluate and refine models in iterative cycle.
 - Comparing their predictions with the real world.
 - Adjust models to gain insights into the phenomenon being modeled.
- Models are based upon evidence.
 - When new evidence is uncovered that the models can't explain, models are modified.

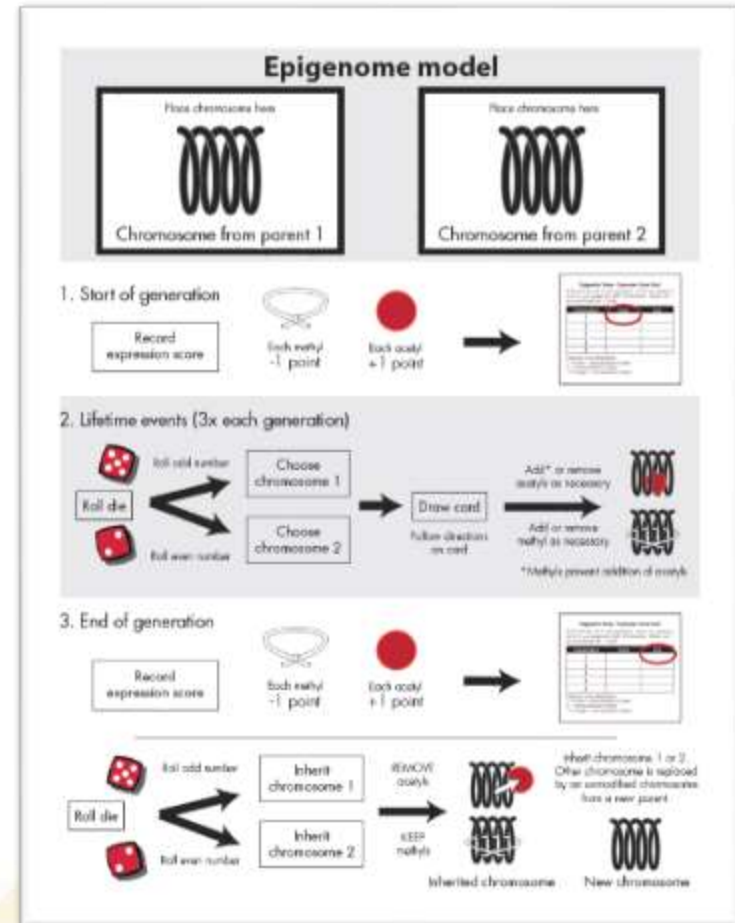
Swarm! Honey Bee Game

- Students role-play as many bees in a hive
- Goals: Make honey and take care of larvae
- Models balance of honey bee roles in colony, environmental challenges to colony



Epigenetics Game

- Students role-play as “themselves”
- Goals: Play through several generations
- Models modifications of environmental factors on genes



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Thanks!

For additional information visit:
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The screenshot shows the Project NEURON website interface. At the top left is the University of Illinois logo. In the center is a colorful brain graphic with the text "project NEURON". To the right is a search bar with the text "log in/Create account". Below the header is a navigation menu with links: "Curriculum Units", "Professional Development", "Games and Media", "Additional Projects", and "About". The main content area features the title "Project NEURON" and the subtitle "Novel Education for Understanding Research on Neuroscience". There are three paragraphs of text providing information about the project's goals and resources. A "News and Events" section lists several activities with dates: "Color Sorting Activity in The Science Teacher" (March 25, 2012), "Color Sorting Game is Back Online" (February 20, 2013), "Project NEURON at 2013 Public Engagement Symposium" (February 8, 2013), and "Keep an eye out for a poster at the 2013 Public Engagement Symposium that describes FTD2-Dyke". On the right side, there is a red-bordered box titled "Neuroscience Day" containing two event listings: "March 19-20 at Science Inn S. SIOUX CITY, NE" and "March 21 @ Sioux Clinker MISSION, SD", both with a small brain icon.