



Integrating Biology and Physics: Lessons in Light and Sight



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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



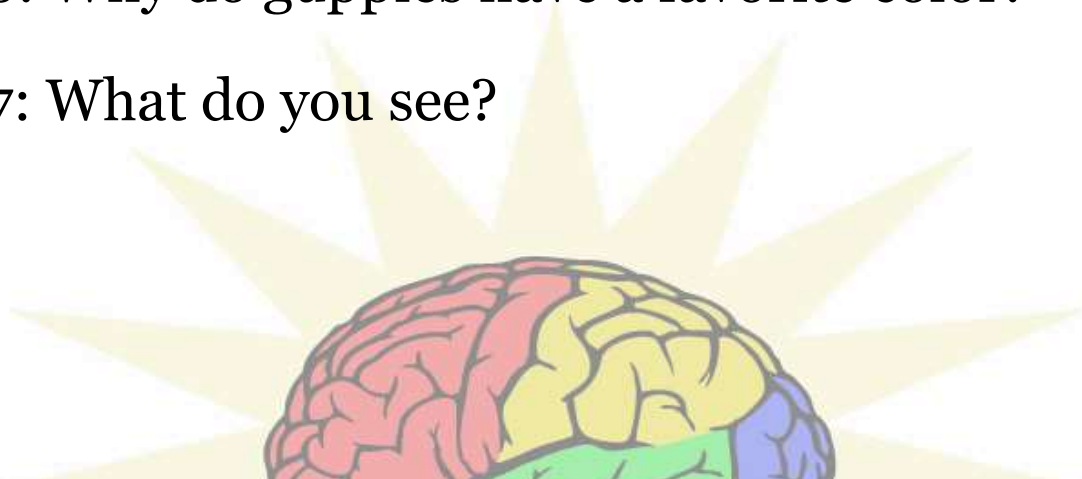
Project NEURON Curriculum Units

- **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*

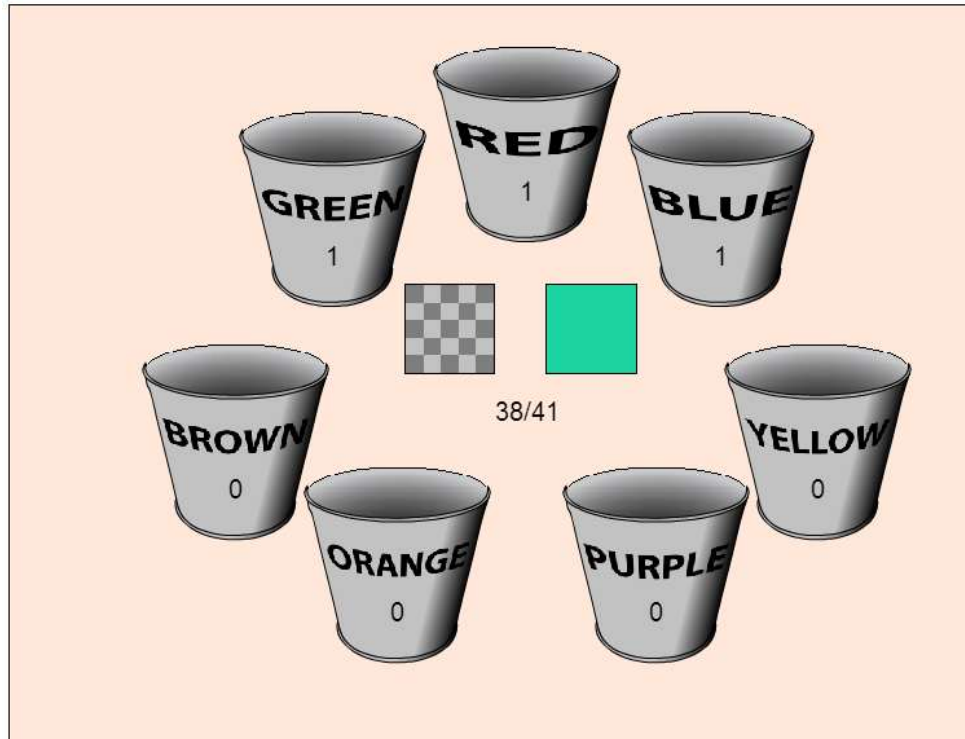
Available at:
neuron.illinois.edu

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?



Paint Chip activity!

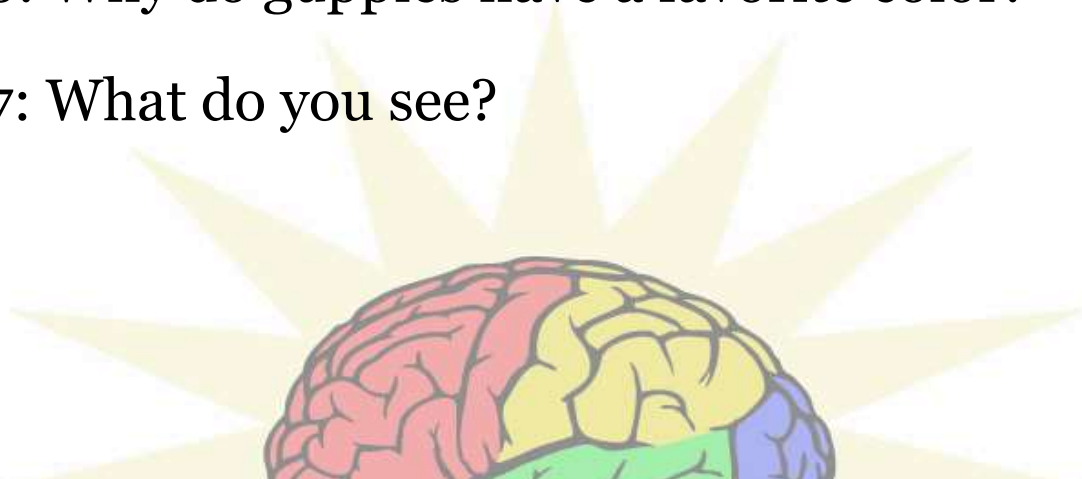


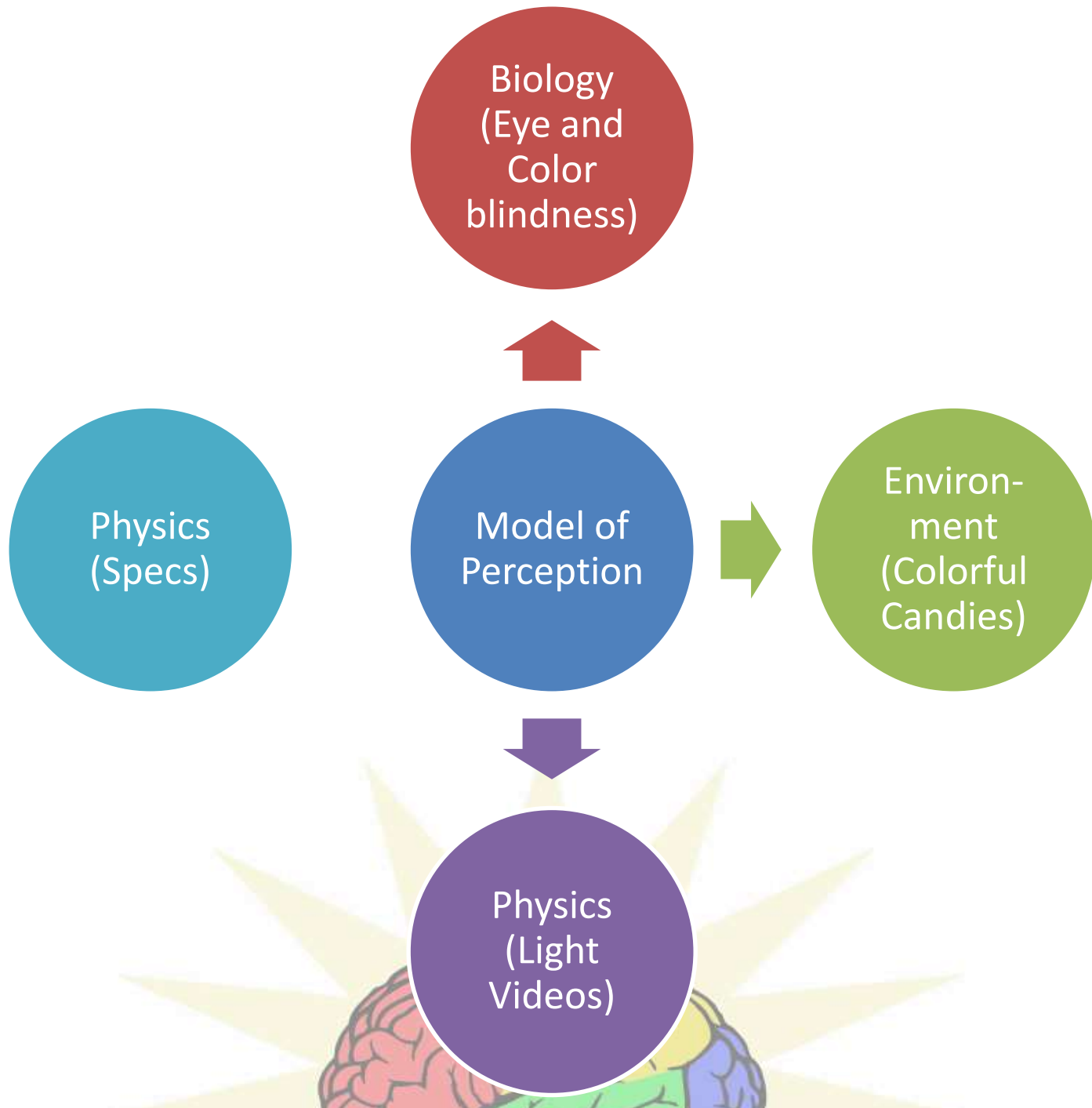
<http://neuron.illinois.edu/games/paintchip>

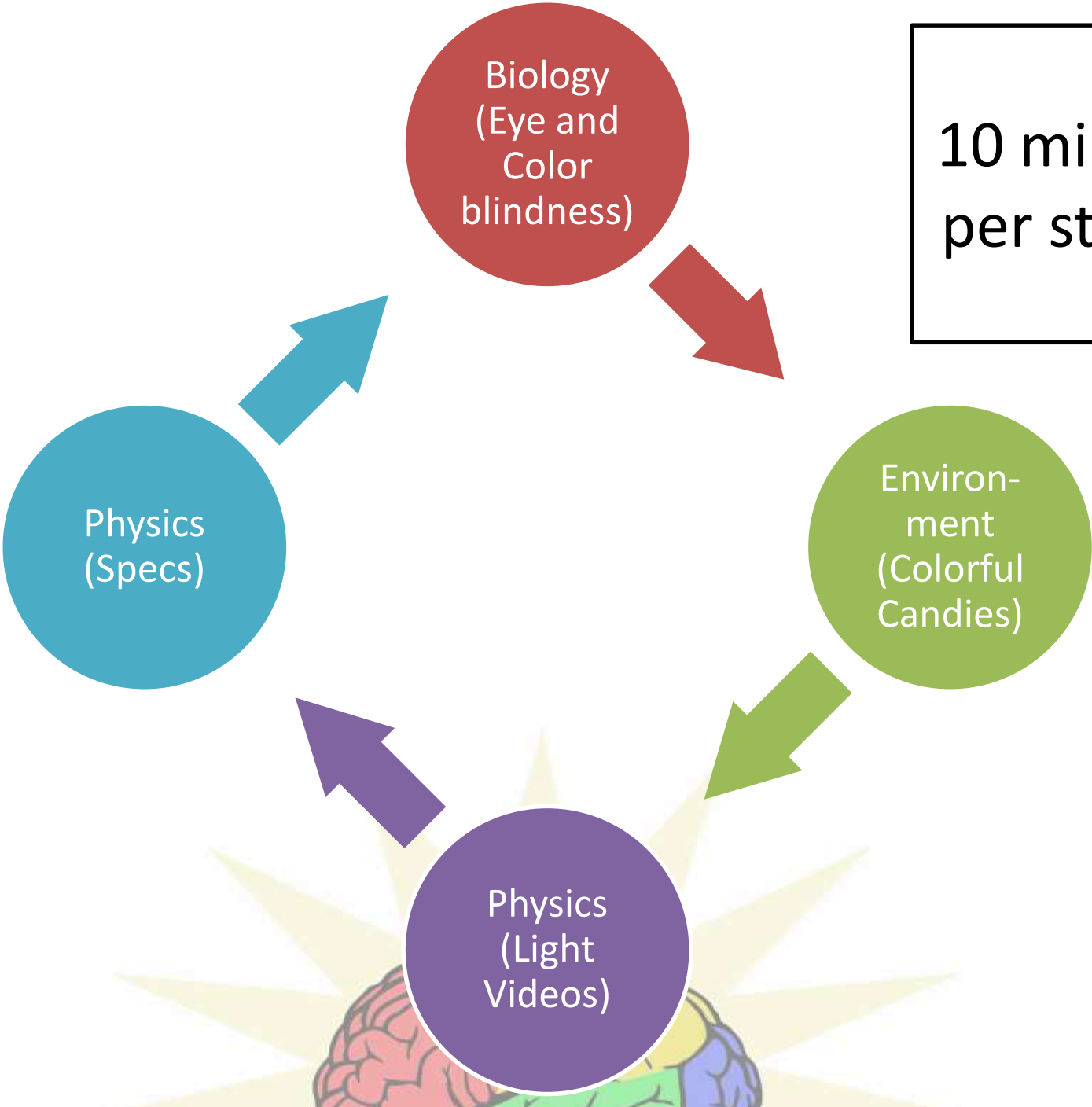


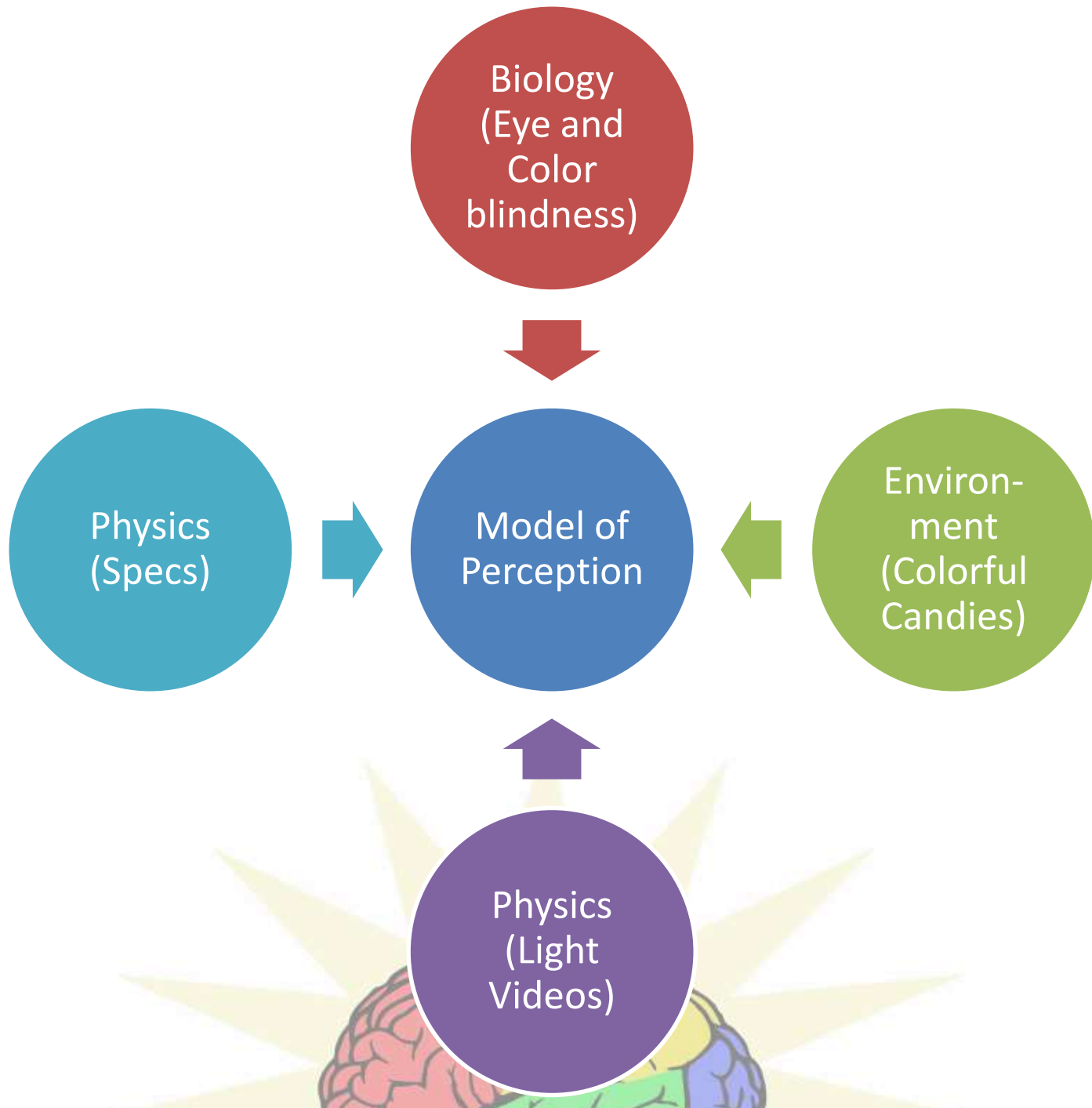
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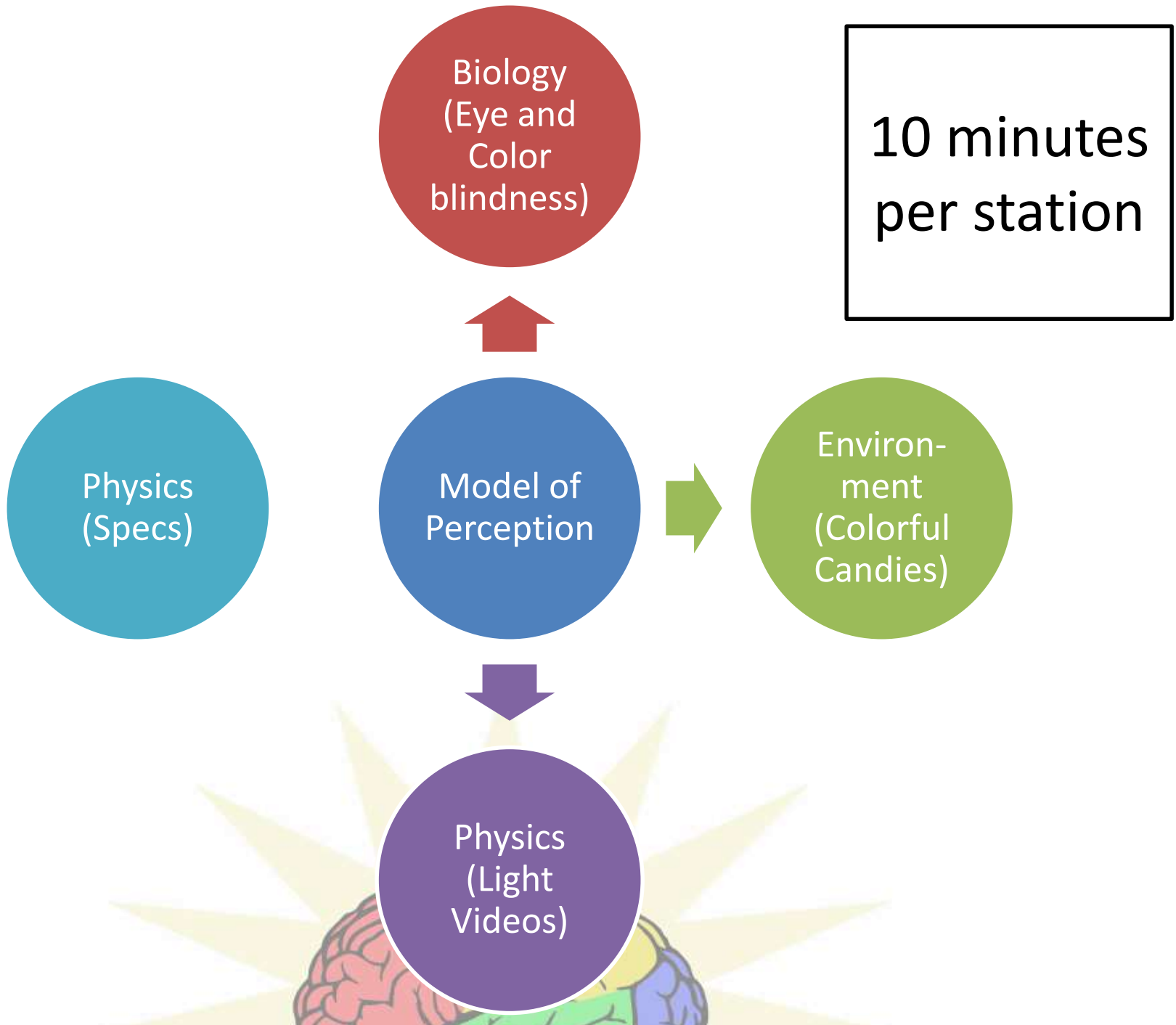


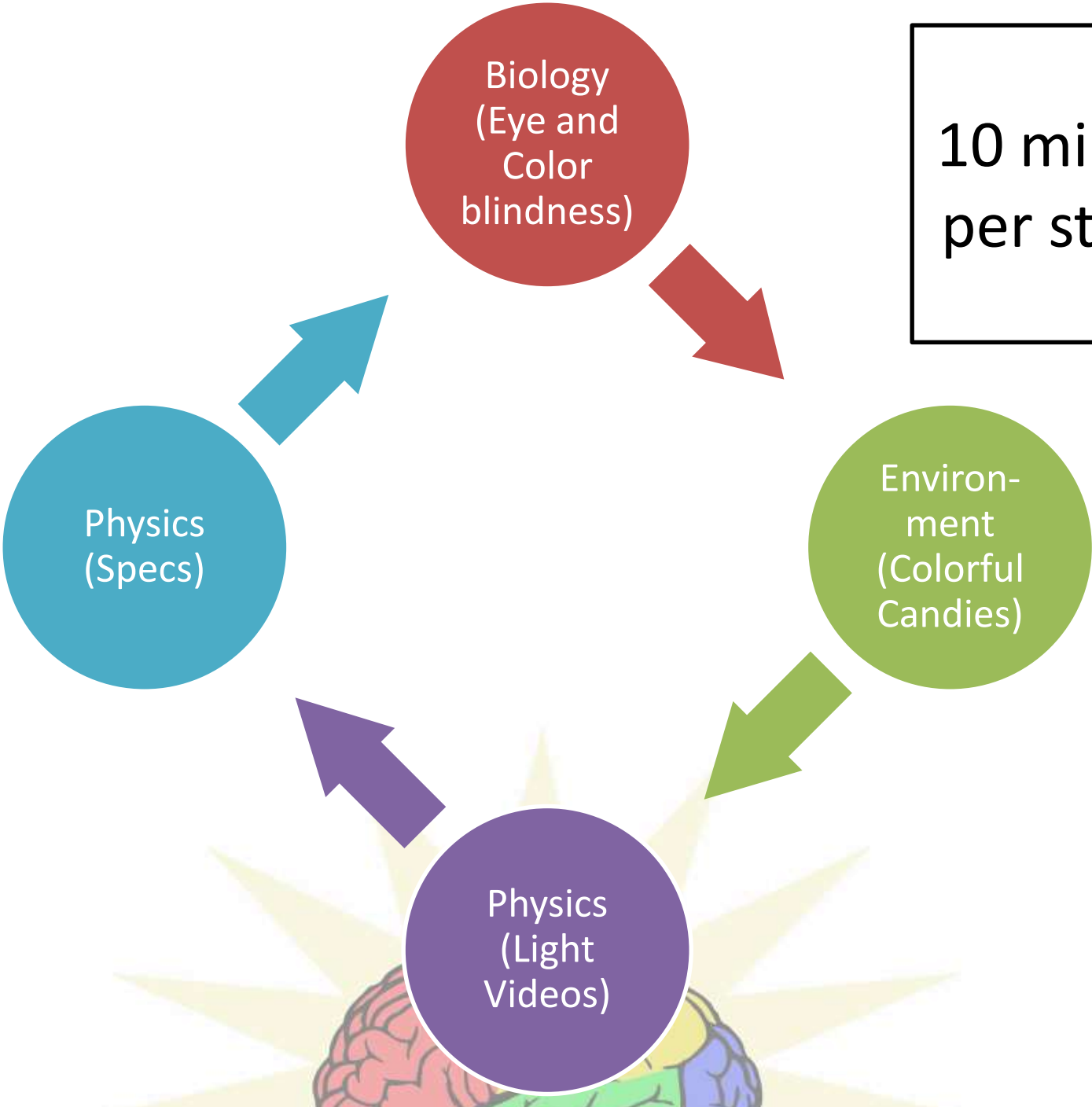
Build a model

- Groups of 4
- Diagram, flow chart, bullets, etc.
- **Visual representation of the factors that affect color perception**
- 5 minutes

Model of Perception







10 minutes
per station

Revise your model

- Add or modify original model to incorporate new knowledge
- **Visual representation of the factors that affect color perception**
- 5 minutes
- Discussion

Model of Perception



Discussion

1. What kinds of revisions did you make to your model?
2. Which activities stood out to you?
3. How would you use these activities in your classroom?



Discussion

1. How would you use these activities to integrate biology and physics?
2. What are the advantages/disadvantages to integrating the disciplines to teach based on concept?



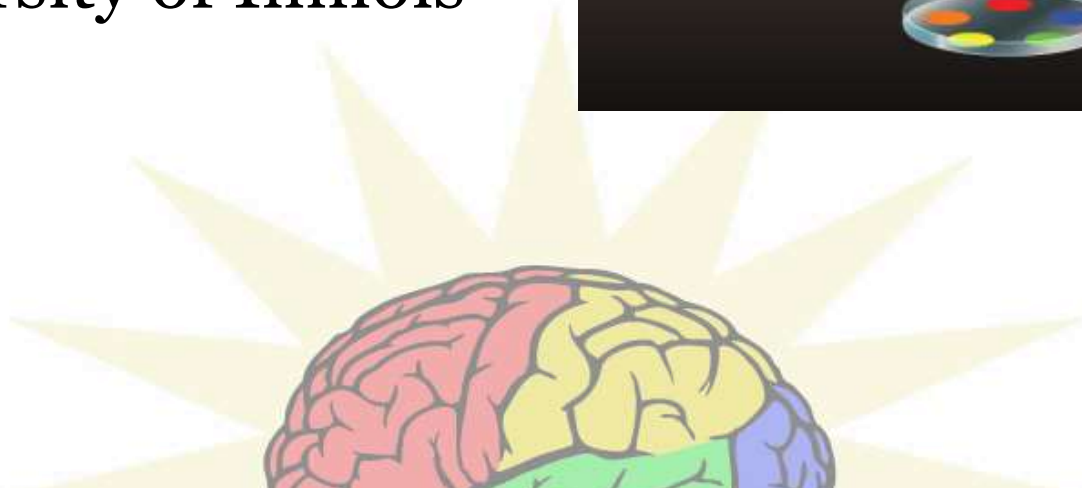
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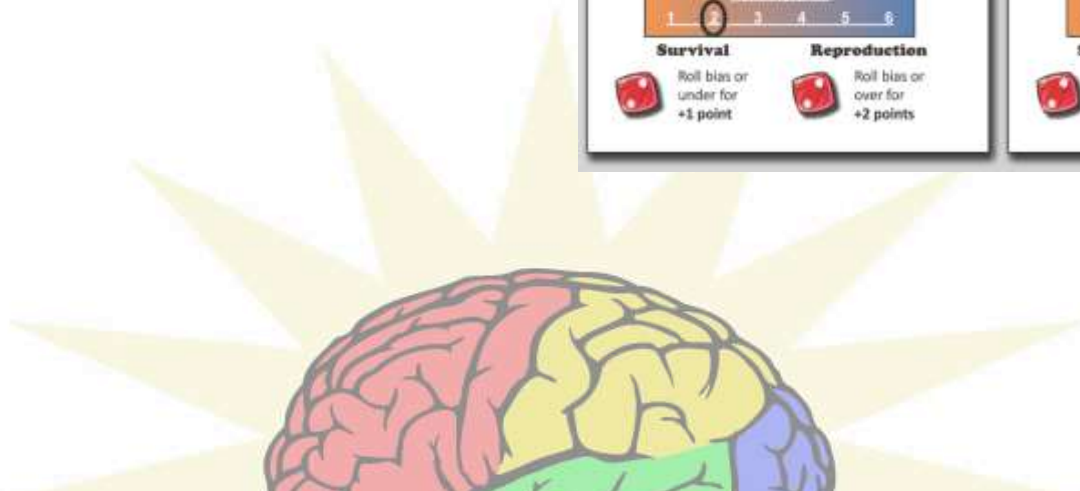
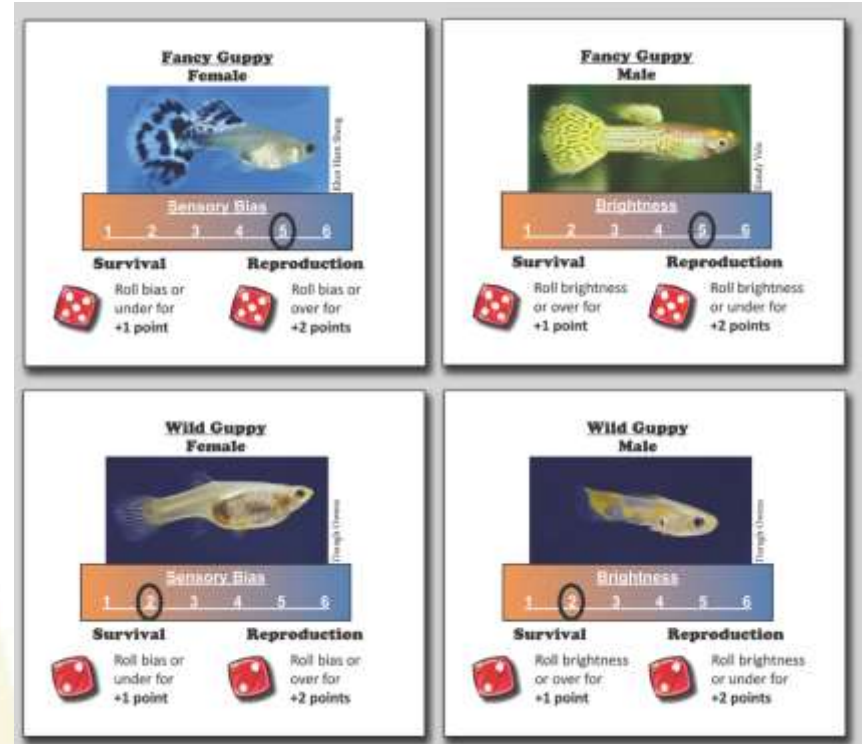
Lesson 5

- Revise model of perception
- Guppy experiment simulation
- Based on research by Dr. Becky Fuller at University of Illinois



Lesson 6

- “Why do guppies have favorite colors?”
- The Guppy Game
- Natural and sexual selection



Lesson 7

- “What do you see?”
- Evolution
- Biodiversity of sight

<p><i>Odontodactylus scyllarus</i> Peacock mantis shrimp <small>Native to Pacific Ocean from Guam to East Africa</small></p>  <ul style="list-style-type: none">• Colorful and large, from 3 to 18 cm• Fluoresce while molting• Often prey on species which are transparent or semi-transparent• Many predators are invertebrates, which have soft, reflective bodies	<p>Animal Bio Card #3</p> <ul style="list-style-type: none">• Credited with the most complex eyes of the animal kingdom• Possess 16 types of photoreceptor cells—12 for color vision and 4 for color filtering• Can see different planes of polarized light <p>SEPA <small>Southwest Environmental Policy Act</small></p> <p>PROJECT NEURON</p>
<p><i>Aotus zonalis</i> Panamanian night monkey <small>Native to Panama and Colombia, Central America</small></p>  <ul style="list-style-type: none">• Belong to family of the only nocturnal monkeys• Grab flying insects out of the air• Notably wide variety of vocal sounds• Feed on flowers, leaves, insects, beetles, and spiders that are all active at night	<p>Animal Bio Card #4</p> <ul style="list-style-type: none">• Have large eyes for their head size• Do not have color vision• Have monochromatic vision, only seeing white, black, and intermediate greys• Eyes are sensitive to movement and changes in the spatial region <p>SEPA <small>Southwest Environmental Policy Act</small></p> <p>PROJECT NEURON</p>



Acknowledgements

- NIH, SEPA
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 - Project NEURON

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Thanks!

For additional information visit:
<http://neuron.illinois.edu>

E-mail:
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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 and a "Log in/Create account" link. Below the header is a navigation menu with links for "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, including a "Color Sorting Activity in The Science Teacher" and a "Color Sorting Game is Back Online". A red-bordered box on the right highlights "Neuroscience Day" events, including a "March 19-20 Workshop in S. SIOUX CITY, NE" and a "March 21 @ Sioux Clinker MISSION, SD".