HASPI Medical Biology Lab 14
Biodiversity and Health
NGSS HS-LS2-6
Teacher Information

Description

a. Biodiversity and Health

Students will set up a collection area to examine biodiversity found in ecosystems surrounding the school. Students will also examine how changing conditions in a small ecosystem can impact biodiversity and individual populations. Following the activity, students will have the opportunity to research how pesticides can change conditions in an ecosystem, and impact human health.

Next Generation Science/Common Core Standards

Students who demonstrate understanding can:

HS-LS2-6. **Evaluate the claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem.**

Medical Application: Complex interactions in ecosystems maintain relatively consistent numbers in stable conditions, but changing conditions, such as the introduction of pesticides, can result in a new ecosystem. The health and stability of ecosystems can have an impact on human health.

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Engaging in Argument from Evidence • Evaluate the claims, evidence, and reasoning behind currently accepted explanations or solutions to determine the merits of arguments. **Scientific Knowledge is Open to Revision in Light of New Evidence** • Scientific argumentation is a mode of logical discourse used to clarify the strength of relationships between ideas and evidence that may result in revision of an explanation.	**LS2.C: Ecosystem Dynamics, Functioning, and Resilience** A complex set of interactions within an ecosystem can keep its numbers and types of organisms relatively constant over long periods of time under stable conditions. If a modest biological or physical disturbance to an ecosystem occurs, it may return to its more or less original status (i.e. the ecosystem is resilient), as opposed to becoming a very different ecosystem. Extreme fluctuations in conditions or the size of any population, however, can challenge the functioning of ecosystems in terms of resources and habitat availability. **LS4.D: Biodiversity and Humans** • Humans depend on the living world for the resources and other benefits provided by biodiversity, but human activity is also having adverse impacts on biodiversity through overpopulation, overexploitation, habitat destruction, pollution, introduction of invasive species, and climate change. Thus sustaining biodiversity so that ecosystem functioning and productivity are maintained is essential to supporting and enhancing life on Earth. Sustaining biodiversity also aids humanity by preserving landscapes of recreational or inspirational value.	**Stability and Change** • Much of science deals with constructing explanations of how things change and how they remain stable.

Connections to other DCIs in this grade-band: **HS.ESS2.E**

Articulation to DCIs across grade-levels: **MS.LS2.A, MS.LS2.C, MS.ESS2.E, MS.ESS3.C**

Common Core State Standards Connections:
ELA/Literacy -

RST.9-10.8	Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem.
RST.11-12.1	Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.

RST.11-12.7	Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.
RST.11-12.8	Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.
Mathematics –	
MP.2	Reason abstractly and quantitatively.
HSS-ID.A.1	Represent data with plots on the real number line.
HSS-IC.A.1	Understand statistics as a process for making inferences about population parameters based on a random sample from that population.
HSS-IC.B.6	Evaluate reports based on data.

Essential Question

By the end of this activity students will be able to:

- Evaluate the claims, evidence, and reasoning that complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem.
- Describe ecological interactions between organisms, and how these interactions can impact biodiversity.
- Demonstrate how a change or disturbance in an ecosystem can impact biodiversity.
- Explain how the health and stability of ecosystems and biodiversity can have an impact on human health.

Time

Estimated Time	**Actual Time** (please make note below)
Lab 14: 75 - 100 minutes class time (over 1 week period)	

Note: Share the actual time on the forum (www.haspi.org) or at HASPI curriculum conference

Materials

HASPI is a grant-funded project and on occasion we are able to provide supplies to participating sites. If we are unable to provide supplies, the company, item number, and approximate cost have been included.

Supply	Provided (P) or Needed (N)	Quantity	Company/ Item #	Approximate Cost
Petri plates	P	10	Carolina/741252	$10.85
Wood sticks (stirrers)	P	80	Grocery	$5.00
String	P	1 roll	Grocery	$5.00
Plastic forceps	P	10	Carolina/623990	$1.15 each
Tape measures	P	10	Grocery	$10.00
Masking tape	N	1 roll	-	-
Attractant or deterrent	N	As needed	-	-
Cameras	N	10	-	-
Index cards	N	10	-	-
Paper towels	N	As needed	-	-

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Common Student Misconceptions

The following is a list of possible misconceptions that students experience. Please feel free to add any additional misconceptions students experienced during this activity to be better prepared for the future use of this lab/activity.

- The concept of a diversity index can be hard to grasp. Each index has its own parameters for "measuring" biodiversity, and it may be useful to provide examples of some of the other indices (Simpson index, Gini-Simpson index, Berger-Parker index).

Additional Misconception Notes:

Guiding Questions

These questions are meant to support discussion of the concept/standard.

- What is biodiversity?
- Examine the biodiversity in the community surrounding your school or home.
- How do the organisms in this community interact with one another?
- How can biodiversity be measured?
- Why should humans strive to maintain biodiversity? How can we do that?

The Task/Response System

Through multiple discussions and suggestions, HASPI has decided to use the task/response system for lab procedures and directions. The response column can be utilized to:

- Provide space for answers to questions provided in the task column.
- Provide space for data/observation records.
- Provide images to help relay a step.
- Support reinforcement of the standards/concepts immediately during the lab investigations.
- Any other way you see fit to use it!

Additional Information

Information	Page #	Location
Lab 14: Biodiversity and Health		
Choose an area around the school with relatively little human influence, and that will not have a lot of human traffic. If this is hard to do at your site, it may be possible to send students home with the materials to set up the lab.	Pages 384-385	Part A
It will be necessary to provide attractants/deterrents, or have students bring them in the day of the lab.	Pages 384-385	Part A
Students will need a camera, and this should not be difficult to arrange with a camera phone.	Page 386	Part B
Once the number of species has been collected, the remaining calculations can be done as homework.	Pages 389-390	Part C
The lab asks students to make a hard copy and tape/paste the pictures into Tables 1 & 2, or they can download a copy of the tables from www.haspi.org and copy/paste the pictures into the tables before printing them out.	Pages 387-388	Tables 1 & 2
Students will need a hard copy, or computer and printer access to print out "Fields of Change – Student" to complete Part D.	Page 391	Part D

Resources and References

- Hunter, P. 2007. The human impact on biological diversity. How species adapt to urban challenges sheds light on evolution and provides clues about conservation. EMBO, Science and Society, 8(4): 316-318.

- Khan Academy, 2014. Biodiversity and Ecosystem Function. Ecological Interactions, Khan Academy, https://www.khanacademy.org.

- NOAA. 2014. Biofilms and Biodiversity. Maryland Sea Grant, http://ww2.mdsg.umd.edu/interactive_lessons/biofilm/.

Images (in order of appearance)
- http://team71.wikispaces.com/Predator
- http://vetmed.illinois.edu/wildlifeencounters/images/bighorn_sheep.jpg
- http://o.quizlet.com/IaOifzNfEwWuGv4f-01O-Q_m.png
- http://cache2.artprintimages.com/LRG/38/3815/8YQIF00Z.jpg
- http://www.nature.org/ourinitiatives/regions/africa/from-africa-with-love.xml
- http://dermnetnz.org/arthropods/img/s/tick5-s.jpg
- http://moblog.net/media/r/i/c/richcolour/poisoning-pigeons-in-the-park.jpg