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Biomagnification and Bioaccumulation

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Biomagnification/Bioaccumulation Computational Model Using NetLogo

Grade Level: 10
Subject / Content area: Living Environment & Algebra II
Unit of Study: Ecology & Environmental Science
Lesson Title: Biomagnification & Bioaccumulation

Central Focus for the learning segment: Biomagnification and bioaccumulation occur as the result of human pollution, harming species and altering ecosystems. This in turn may harm human beings as people rely on ecosystems for numerous resources.

Content Standard(s):

New York State Common Core, Mathematics Curriculum, Algebra II, Module 3
Topic C (Exponential and Logarithmic Functions and their Graphs)
F-IF.B.4: *For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.*
Engage NY, file:///C:/Users/lthre1/Downloads/algebra-ii-m3-topic-c-overview.pdf

The Living Environment, Core Curriculum, University of the State of New York, The State Education Department, http://www.nysed.gov
Key Idea 7, Performance Indicator 7.1, Major Understanding 7.1c: *Human beings are part of the Earth's ecosystems. Human activities can, deliberately or inadvertently, alter the equilibrium in ecosystems. Humans modify ecosystems as a result of population growth, consumption, and technology. Human destruction of habitats through direct harvesting, pollution, atmospheric changes, and other factors is threatening current global stability, and if not addressed, ecosystems may be irreversibly affected.*

Learning Objectives associated with the content standards:
Students will be able to define and compare the terms biomagnificiation and bioaccumulation.
Students will be able to state the origin of biomagnification and list three examples.
Students will be able to explain the impact of biomagnification on ecosystems and humanity.
Students will be able to recognize and graph an exponential function from gathered data.

Instructional Resources and Materials to engage students in learning**:**

Biomagnification/Bioaccumulation Computation Model
Biomagnification/Bioaccumulation Worksheet
Computer or Tablet with Internet Access and NetLogo
https://www.youtube.com/watch?v=DxqDaTUh08o
https://www.youtube.com/watch?v=85I7oPWUuak
https://www.youtube.com/watch?v=E5P-UoKLxlA
https://student.societyforscience.org/article/uh-oh-baby-fish-prefer-plastic-real-food
https://student.societyforscience.org/article/spidey-sense-eight-legged-pollution-monitors

Instructional Strategies and Learning Tasks that support diverse student needs.

- Students will work in small groups or partners designed by the instructor to assist students' content learning and development
- Students will engage with multimedia: videos, online article reading, computation model manipulation and observation, develop visual representation, graphing
- Instructor will guide student group/partner work to ensure on-task and productive
- Instructor will bring class together for whole discussion and review to ensure all students achieve learning standards before final assessment

Differentiation and planned universal supports:

Group/Partner Work
Extended Time for Worksheet and Quiz
Separate Room for Quiz
Type Worksheet Responses (Excel Graphing)

Language Function students will develop. Additional language demands and language supports:

- Biomagnification/Bioaccumulation, Trophic Levels, Food Chain, Ecology, Ecosystem, Pollution, Micropollution/Micropollutant, Microbeads, DDT, Herbicides, Pesticides
- Graphing (Exponential), Functions, Averages
- Comparison, Justification, Explanation
- Visual Representation (Interpretation and Creation)
- Reading Online Articles (written for students)

Type of Student Assessments and what is being assessed:

- **Informal Assessment:** Teacher Observation
- **Formal Assessment**: Biomagnification/Bioaccumulation Worksheet and Quiz
- **Modifications to the Assessments:** Group/Partner Design, Extended Time to Complete

Evaluation Criteria:

Biomagnification/Bioaccumulation Worksheet
Biomagnification/Bioaccumulation Quiz

Relevant theories and/or research best practices:

Modeling
Group/Partner Work / Peer Teaching

Lesson Timeline: 40 minute class periods.

DAY 1: Biomagnification/Bioaccumulation Worksheet PART I (RESEARCH) & II (NOTES)
DAY 2: Biomagnification/Bioaccumulation Worksheet PART III (COMPUTATIONAL MODEL)
DAY 3: Biomagnification/Bioaccumulation Worksheet PART IV (CONCLUSION), Review Instruction
DAY 4: Biomagnification/Bioaccumulation Quiz