

Unit 7 - SL Option C - Ecology and Conservation

Content Area: **Science**
Course(s): **IB Biology, SL**
Time Period: **Fourth Marking Period**
Length: **4**
Status: **Published**

Unit Overview

C.1 Use models as representations of the real world—zones of stress and limits of tolerance graphs are models of the real world that have predictive power and explain community structure.

C.2 Use models as representations of the real world—pyramids of energy model the energy flow through ecosystems.

C.3 Assessing risks and benefits associated with scientific research—the use of biological control has associated risk and requires verification by tightly controlled experiments before it is approved.

C.4 Scientists collaborate with other agencies—the preservation of species involves international cooperation through intergovernmental and non-governmental organizations.

STAGE 1- DESIRED RESULTS

Standards

2020 New Jersey Student Learning Standards- Science

Science and Engineering Practices

- Constructing Explanations and Designing Solutions
- Developing and Using Models
- Engaging in Argument from Evidence
- Obtaining, Evaluating, and Communicating Information
- Using Mathematics and Computational Thinking

Cross Cutting Concepts

- Cause and Effect
- Energy and Matter
- Influence of Engineering, Technology, and Science on Society and the Natural World
- Stability and Change
- Structure and Functions

Disciplinary Core Ideas

Life Sciences

- LS1C: Organization for Matter and Energy Flow in Organisms
- LS2A: Interdependent Relationships in Ecosystems
- LS2B: Cycles of Matter and Energy Transfer in Ecosystems
- LS2C: Ecosystems Dynamics, Functioning, and Resilience
- LS2D: Social Interactions and Group Behavior

Earth and Space Sciences

- ESS3C: Human Impacts on Earth Systems
- ESS3D: Global Climate Change

Engineering. Technology. and Applications of Science

- ETS1A: Defining and Delimiting an Engineering Problem
- ETS1B: Developing Possible Solutions
- ETS1C: Optimizing the Design Solution

Essential Questions

C.1 How is community structure an emergent property of an ecosystem?

C.2 How do changes in community structure affect and are affected by organisms?

C.3 How do human activities impact on ecosystem function?

C.4 What do communities need to conserve in order to preserve biodiversity?

Enduring Understanding

Students will have a lasting understanding about how human activities have impacted the planet and biodiversity. Students will also have a deeper understanding about how biodiversity is important to the planet.

Students will know...

C.1

- The distribution of species is affected by limiting factors.
- Community structure can be strongly affected by keystone species.
- Each species plays a unique role within a community because of the unique combination of its spatial habitat and interactions with other species.
- Interactions between species in a community can be classified according to their effect.
- Two species cannot survive indefinitely in the same habitat if their niches are identical.

C.2

- Most species occupy different trophic levels in multiple food chains.
- A food web shows all the possible food chains in a community.
- The percentage of ingested energy converted to biomass is dependent on the respiration rate.
- The type of stable ecosystem that will emerge in an area is predictable based on climate.
- In closed ecosystems energy, but not matter is exchanged with the surroundings.
- Disturbance influences the structure and rate of change within ecosystems.

C.3

- Introduced alien species can escape into local ecosystems and become invasive.
- Competitive exclusion and the absence of predators can lead to reduction in the numbers of endemic species when alien species become invasive.
- Pollutants become concentrated in the tissues of organisms at higher trophic levels by biomagnification.
- Macroplastic and microplastic debris has accumulated in marine environments.

C.4

- An indicator species is an organism used to assess a specific environmental condition.
- Relative numbers of indicator species can be used to calculate the value of a biotic index.
- *In situ* conservation may require active management of nature reserves or national parks.
- *Ex situ* conservation is the preservation of species outside their natural habitats.
- Biogeographic factors affect species diversity.
- Richness and evenness are components of biodiversity.

Students will be able to...

C.1

- Analyze the distribution of one animal and one plant species to illustrate limits of tolerance and zones of stress.
- Critique local examples to illustrate the range of ways in which species can interact within a community.
- Explain the symbiotic relationship between *Zooxanthellae* and reef-building coral reef species.

C.2

- Explain the conversion ratio in sustainable food production practices.
- Critique consideration of one example of how humans interfere with nutrient cycling.

C.3

- Connect the study of the introduction of cane toads in Australia and one other local example of the introduction of an alien species.
- Compare the discussion of the trade-off between control of the malarial parasite and DDT pollution.
- Explain a case study of the impact of marine plastic debris on Laysan albatrosses and one other named species.

C.4

- Explain a case study of the captive breeding and reintroduction of an endangered animal species.
- Analyze the impact of biogeographic factors on diversity limited to island size and edge effects.

STAGE 2- EVIDENCE OF LEARNING

Formative Assessment

- Debriefing
- Exit Card / Ticket
- Index Card Summaries
- Inside-Outside Circle Discussion (Fishbowl)
- Journal Entry
- Observation

- Questions & Answers
- Quiz

Authentic Assessments

C.1

- Skill: Analysis of a data set that illustrates the distinction between fundamental and realized niche.
- Skill: Use of a transect to correlate the distribution of plant or animal species with an abiotic variable.

C.2

- Skill: Comparison of pyramids of energy from different ecosystems.
- Skill: Analysis of a climograph showing the relationship between temperature, rainfall and the type of ecosystem.
- Skill: Construction of Gersmehl diagrams to show the inter-relationships between nutrient stores and flows between taiga, desert and tropical rainforest.
- Skill: Analysis of data showing primary succession.
- Skill: Investigation into the effect of an environmental disturbance on an ecosystem.

C.3

- Skill: Analysis of data illustrating the causes and consequences of biomagnification.
- Skill: Evaluation of eradication programmes and biological control as measures to reduce the impact of alien species.

C.4

- Skill: Analysis of the biodiversity of two local communities using Simpson's reciprocal index of diversity.

Laboratories will be used for assessment

Quizzes will be given.

Benchmark Assessments

Chapter tests will be given.

STAGE 3- LEARNING PLAN

Instructional Map

Helpful guidance for implementing the IB curriculum

C.2

- Examples of aspects to investigate in the ecosystem could be species diversity, nutrient cycling, water movement, erosion, leaf area index, among others.

C.4

- The formula for Simpson's reciprocal index of diversity is:

$$D = \frac{N(N-1)}{\sum n(n-1)}$$

D = diversity index, N = total number of organisms of all species found and n = number of individuals of a particular species.

Modification/Differentiation of Instruction

Differentiation Strategies for Special Education Students

- Remove unnecessary material, words, etc., that can distract from the content
- Use of off-grade level materials
- Provide appropriate scaffolding
- Limit the number of steps required for completion
- Time allowed
- Level of independence required
- Tiered centers, assignments, lessons, or products
- Provide appropriate leveled reading materials
- Deliver the content in "chunks"
- Varied texts and supplementary materials
- Use technology, if available and appropriate
- Varied homework and products
- Varied questioning strategies
- Provide background knowledge
- Define key vocabulary, multiple-meaning words, and figurative language.
- Use audio and visual supports, if available and appropriate
- Provide multiple learning opportunities to reinforce key concepts and vocabulary
- Meet with small groups to reteach idea/skill
- Provide cross-content application of concepts
- Ability to work at their own pace
- Present ideas using auditory, visual, kinesthetic, & tactile means
- Provide graphic organizers and/or highlighted materials
- Strategy and flexible groups based on formative assessment

- Differentiated checklists and rubrics, if available and appropriate

Differentiation Strategies for Gifted and Talented Students

- Increase the level of complexity
- Decrease scaffolding
- Variety of finished products
- Allow for greater independence
- Learning stations, interest groups
- Varied texts and supplementary materials
- Use of technology
- Flexibility in assignments
- Varied questioning strategies
- Encourage research
- Strategy and flexible groups based on formative assessment or student choice
- Acceleration within a unit of study
- Exposure to more advanced or complex concepts, abstractions, and materials
- Encourage students to move through content areas at their own pace
- After mastery of a unit, provide students with more advanced learning activities, not more of the same activity
- Present information using a thematic, broad-based, and integrative content, rather than just single-subject areas

Differentiated Strategies for ELL Students

- Remove unnecessary materials, words, etc., that can distract from the content
- Provide appropriate scaffolding
- Limit the number of steps required for completion
- Gradually increase the level of independence required
- Tiered centers, assignments, lessons, or products
- Provide appropriate leveled reading materials
- Deliver the content in “chunks”
- Varied texts and supplementary materials, including visuals
- Use technology, if available and appropriate
- Differentiate homework and products
- Varied questioning strategies
- Provide background knowledge
- Define key vocabulary, multiple-meaning words, and figurative language.
- Use audio and visual supports, if available and appropriate
- Provide multiple learning opportunities to reinforce key concepts and vocabulary
- Meet with small groups to reteach idea/skill

- Provide cross-content application of concepts
- Allow students to work at their own pace
- Presenting ideas through auditory, visual, kinesthetic, & tactile means
- Role play
- Provide graphic organizers, highlighted materials
- Strategy and flexible groups based on formative assessment

Differentiation Strategies for At Risk Students

- Remove unnecessary materials, words, etc., that can distract from the content
- Provide appropriate scaffolding
- Limit the number of steps required for completion
- Gradually increase the level of independence required
- Tiered centers, assignments, lessons, or products
- Provide appropriate leveled reading materials
- Deliver the content in “chunks”
- Varied texts and supplementary materials
- Use technology, if available and appropriate
- Differentiate homework and products
- Varied questioning strategies
- Provide background knowledge
- Define key vocabulary, multiple-meaning words, and figurative language
- Use audio and visual supports, if available and appropriate
- Provide multiple learning opportunities to reinforce key concepts and vocabulary
- Meet with small groups to reteach idea/skill
- Provide cross-content application of concepts
- Presenting ideas through auditory, visual, kinesthetic, & tactile means
- Provide graphic organizers and/or highlighted materials
- Strategy and flexible groups based on formative assessment

504 Plans

Students can qualify for 504 plans if they have physical or mental impairments that affect or limit any of their abilities to:

- walk, breathe, eat, or sleep
- communicate, see, hear, or speak
- read, concentrate, think, or learn
- stand, bend, lift, or work

Examples of accommodations in 504 plans include:

- preferential seating
- extended time on tests and assignments
- reduced homework or classwork
- verbal, visual, or technology aids
- modified textbooks or audio-video materials
- behavior management support
- adjusted class schedules or grading
- verbal testing
- excused lateness, absence, or missed classwork
- pre-approved nurse's office visits and accompaniment to visits
- occupational or physical therapy

Modification Strategies

- Cooperative Grouping
- Oral Directions
- Preferential Seating
- Repeated Drill and Practice
- Teacher Notes

Differentiation Strategies

High Preparation

- Group Investigations
- Independent Research / Project

Low Preparation

- Flexible Grouping
- Jigsaw

- Use of Collaboration
- Varied Journal Prompts
- Work Alone / Together

Horizontal Integration- Interdisciplinary Connections

See Appendix

Vertical Integration- Discipline Mapping

Previous courses

6th grade – Diversity of life

7th grade – Populations and Ecosystems

8th grade – Human Systems Interactions and Heredity and Adaptations

9th grade – Honors Biology

10th grade – Honors Chemistry

Possible next courses

Honors Physics

Anatomy & Physiology

IB Physics

Zoology

Forensics

Additional Materials

Videos used through McGraw Hill, Crash Course and Howard Hughes Medical Institute.

Current Research articles supplied through Newsela.