

Summary

Unit 4 - Ecology

Subject	Year	Start date	Duration
Biology	IB1	Week 1, May	3 weeks 12 hours

Course Part

Core

Curriculum

Aims

Appreciate scientific study and creativity within a global context through stimulating and challenging opportunities

Acquire a body of knowledge, methods and techniques that characterize science and technology

Apply and use a body of knowledge, methods and techniques that characterize science and technology

Develop an ability to analyse, evaluate and synthesize scientific information

Develop a critical awareness of the need for, and the value of, effective collaboration and communication during scientific activities

Develop experimental and investigative scientific skills including the use of current technologies

Develop and apply 21st century communication skills in the study of science

Become critically aware, as global citizens, of the ethical implications of using science and technology

Develop an appreciation of the possibilities and limitations of science and technology

Develop an understanding of the relationships between scientific disciplines and their influence on other areas of knowledge

Objectives

Demonstrate knowledge and understanding of

facts, concepts, and terminology

methodologies and techniques

communicating scientific information

Apply

facts, concepts, and terminology

methodologies and techniques

methods of communicating scientific information

Syllabus Content

Core

4. Ecology

4.1 Species, communities and ecosystems

Nature of science:

Looking for patterns, trends and discrepancies - plants and algae are mostly autotrophic but some are not.

Understandings:

Species are groups of organisms that can potentially interbreed to produce fertile offspring.

Members of a species may be reproductively isolated in separate populations.

Species have either an autotrophic or heterotrophic method of nutrition (a few species have both methods).

Consumers are heterotrophs that feed on living organisms by ingestion.

Detritivores are heterotrophs that obtain organic nutrients from detritus by internal digestion.

Saprotrophs are heterotrophs that obtain organic nutrients from dead organisms by external digestion.

A community is formed by populations of different species living together and interacting with each other.

A community forms an ecosystem by its interactions with the abiotic environment.

Autotrophs obtain inorganic nutrients from the abiotic environment.

The supply of inorganic nutrients is maintained by nutrient cycling.

Ecosystems have the potential to be sustainable over long periods of time.

Applications and skills:

Skill: Classifying species as autotrophs, consumers, detritivores or saprotrophs from a knowledge of their mode of nutrition.

Skill: Setting up sealed mesocosms to try to establish sustainability. (Practical 5)

Skill: Testing for association between two species using the chi-squared test with data obtained by quadrat sampling.

Skill: Recognizing and interpreting statistical significance.

4.2 Energy flow

Nature of science:

Use theories to explain natural phenomena - the concept of energy flow explains the limited length of food chains.

Understandings:

Most ecosystems rely on a supply of energy from sunlight.

Light energy is converted to chemical energy in carbon compounds by photosynthesis.

Chemical energy in carbon compounds flows through food chains by means of feeding.

Energy released from carbon compounds by respiration is used in living organisms and converted to heat.

Living organisms cannot convert heat to other forms of energy.

Heat is lost from ecosystems.

Energy losses between trophic levels restrict the length of food chains and the biomass of higher trophic levels.

Applications and skills:

Skill: Quantitative representations of energy flow using pyramids of energy.

4.3 Carbon cycling

Nature of science:

Making accurate, quantitative measurements - it is important to obtain reliable data on the concentration of carbon dioxide and methane in the atmosphere.

Understandings:

Autotrophs convert carbon dioxide into carbohydrates and other carbon compounds.

In aquatic ecosystems carbon is present as dissolved carbon dioxide and hydrogencarbonate ions.

Carbon dioxide diffuses from the atmosphere or water into autotrophs.

Carbon dioxide is produced by respiration and diffuses out of organisms into water or the atmosphere.

Methane is produced from organic matter in anaerobic conditions by methanogenic archaeans and some diffuses into the atmosphere or accumulates in the ground.

Methane is oxidized to carbon dioxide and water in the atmosphere.

Peat forms when organic matter is not fully decomposed because of acidic and/or anaerobic conditions in waterlogged soils.

Partially decomposed organic matter from past geological eras was converted either into coal or into oil and gas that accumulate in porous rocks.

Carbon dioxide is produced by the combustion of biomass and fossilized organic matter.

Animals such as reef-building corals and mollusca have hard parts that are composed of calcium carbonate and can become fossilized in limestone.

Applications and skills:

Application: Estimation of carbon fluxes due to processes in the carbon cycle.

Application: Analysis of data from air monitoring stations to explain annual fluctuations.

Skill: Construct a diagram of the carbon cycle.

4.4 Climate change

Nature of science:

Assessing claims - assessment of the claims that human activities are producing climate change.

Understandings:

Carbon dioxide and water vapour are the most significant greenhouse gases.

Other gases including methane and nitrogen oxides have less impact.

The impact of a gas depends on its ability to absorb long wave radiation as well as on its concentration in the atmosphere.

The warmed Earth emits longer wavelength radiation (heat).

Longer wave radiation is absorbed by greenhouse gases that retain the heat in the atmosphere.

Global temperatures and climate patterns are influenced by concentrations of greenhouse gases.

There is a correlation between rising atmospheric concentrations of carbon dioxide since the start of the industrial revolution 200 years ago and average global temperatures.

Recent increases in atmospheric carbon dioxide are largely due to increases in the combustion of fossilized organic matter.

Applications and skills:

Application: Threats to coral reefs from increasing concentrations of dissolved carbon dioxide.

Application: Correlations between global temperatures and carbon dioxide concentrations on Earth.

Application: Evaluating claims that human activities are not causing climate change.

ATL Skills

Approaches to Learning

Thinking

- In this unit, we will

ask students to formulate a reasoned argument to support their opinion or conclusion

give students time to think through their answers before asking them for a response

reward a new personal understanding, solution or approach to an issue

ask open questions

set students a task which required higher-order thinking skills (such as analysis or evaluation)

build on a specific prior task

help students to make their thinking more visible (for example, by using a strategy such as a thinking routine)

require students to take an unfamiliar viewpoint into account when formulating arguments

ask questions that required the use of knowledge from a different subject from the one you are teaching

include a reflection activity

make a link to TOK



Social

- In this unit, we will

have students work in small groups

allocate, or ask students to allocate among themselves, different roles in a classroom discussion or activity

have students peer assess their group performance or process

support students in resolving a conflict in a team

give a group assessment task

give students feedback on how they worked as a group

have students discuss their understanding of a text or idea among themselves and come up with a shared understanding

provide an opportunity for students to analyse the impact of their behaviour on the class or on a group performance

encourage students to consider alternative points of view or to take the perspective of others

provide opportunities for students to make decisions



Developing IB Learners

☆ Learner Profile



Inquirers



Knowledgeable



Thinkers



Reflective