Meden School Curriculum Planning							
Subject	Biology	**Year Group**	10	**Sequence No.**	1	**Topic**	B7 – Ecology

Retrieval	Core Knowledge	Student Thinking
What do teachers need **retrieve** from students before they start teaching **new content**?	What **specific ambitious knowledge** do teachers need teach students in this sequence of learning?	What real life examples can be applied to this sequence of learning to **development of our students thinking, encouraging them to see the inequalities around them** and 'do something about them!'
Year 8 Ecosystems, feeding relationships and adaptations L1: Understanding that food chains begin with a producer, which is a green plant or alga and they produce their own food through photosynthesis which provides biomass for the rest of the food chain which is passed on when one organism eats another. Explaining the organisation of a food chain, producer → primary consumer → secondary consumer → tertiary consumer. Defining the term predator, prey, herbivore, carnivore and omnivore. **Year 8 Ecosystems, feeding relationships and adaptations L2:** Interpreting numerous food chains that are connected within a food web. Defining the terms ecosystem, interdependence and stable community. **Year 8 Ecosystems, feeding relationships and adaptations L3:** Interpreting predator prey cycle graphs and understanding that	**L1: Organization of an Ecosystem** Students should be able to describe: • Different levels of **organisation** in an **ecosystem** from individual organisms to the whole ecosystem • The importance of **interdependence** and **competition** in a **community**. Students should be able to, when provided with appropriate information: • Suggest the factors for which **organisms are competing** in a given habitat • Suggest how organisms are **adapted to the conditions** in which they live. An **ecosystem** is the **interaction of a community of living organisms (biotic) with the non-living (abiotic) parts of their environment**. To **survive and reproduce,** organisms require a supply of materials from their surroundings and from the other living organisms there. Students should understand that **photosynthetic organisms** are the **producers of biomass** for life on Earth. **Feeding relationships** within a **community** can be represented by **food chains**. All **food chains begin** with a **producer** which **synthesises molecules**. This is usually a **green plant** or **alga** which makes **glucose by photosynthesis**. **Producers** are eaten by **primary consumers**, which in turn may be eaten by **secondary consumers** and then **tertiary consumers**. **Consumers** that kill and eat other animals are **predators**, and those eaten are **prey.** **L2: Competition** **Plants** in a **community or habitat** often **compete** with each other for **light** and **space**, and for **water** and **mineral ions** from the **soil**. **Animals** often **compete** with each other for **food, mates** and **territory**. Within a **community** each **species** depends on **other species for food**, **shelter, pollination**, **seed dispersal** etc. If one **species is removed** it can affect the **whole community**. This is called **interdependence**. A **stable community** is one where all the **species and environmental factors** are in **balance** so that **population sizes** remain fairly **constant**. Students should be able to	

one affects the other and the cycles continuously rise and fall. **Year 8 Ecosystems, feeding relationships and adaptations L4:** Understanding how pyramids of numbers can be used to represent food chains. **Year 8 Ecosystems, feeding relationships and adaptations L5:** Investigating further into how biomass is passed along a food chain and as it moves up a food chain there is less biomass and energy. Explaining the different amounts of biomass in different organisms and how pyramids of biomass can be drawn to represent this. **Year 8 Ecosystems, feeding relationships and adaptations L6:** Researching how humans use different chemicals in industry such as herbicides, fungicides and pesticides and then investigating how these chemicals can accumulate within a food chain resulting in negative impacts on ecosystems and biodiversity. **Year 8 Ecosystems, feeding relationships and adaptations L7:** Explaining where biomass originates from, how it passes on and how it is lost. Also calculating efficiency of biomass transfer. **Year 8 Ecosystems, feeding relationships and adaptations L8:** Defining the term biodiversity and researching the human	extract and **interpret** information from **charts, graphs and tables** relating to the **interaction of organisms** within a **community**. **L3: Abiotic & Biotic Factors** Students should be able to explain how a change in an **abiotic factor** would affect a given **community** given appropriate data or context. **Abiotic (non-living) factors** which can affect a **community** are: • **light intensity** • **temperature** • **moisture levels** • **soil pH and mineral content** • **wind intensity and direction** • **carbon dioxide levels for plants oxygen levels for aquatic animals.** Students should be able to extract and **interpret information** from **charts, graphs and tables** relating to the **effect of abiotic factors** on **organisms** within a **community**. Students should be able to explain how a change in a **biotic factor** might affect a given **community** given appropriate data or context. **Biotic (living) factors** which can affect a **community** are: • **availability of food** • **new predators arriving** • **new pathogens** • one **species outcompeting** another, so the numbers are **no longer sufficient to breed**. Students should be able to extract and **interpret information** from **charts, graphs and tables** relating to the **effect of biotic factors** on organisms within a **community**. **L4 & L5: Adaptations.** Students should be able to explain how **organisms** are **adapted** to live in their **natural environment**, given appropriate information. **Organisms** have **features (adaptations**) that enable them to **survive** in the conditions in which they normally live. These **adaptations** may be **structural, behavioural or functional**. Some **organisms** live in **environments** that are very **extreme**, such as at **high temperature**, **pressure**, or **salt concentration**. These **organisms** are called **extremophiles**. **Bacteria** living in deep sea vents are **extremophiles**. **L6: Predator-Prey Cycles** In a **stable community** the numbers of **predators and prey** rise and fall in **cycles**. Students should	**L3:** Understanding how animals are adapted, so should animals be kept in zoos considering they are specialised for certain environments?

impact upon it and what the consequences of this are. **Year 8 Ecosystems, feeding relationships and adaptations L9:** Understanding why deforestation is occurring and the impact of this upon biodiversity and global warming **and also discovering peat bogs and the issues surrounding their disappearance.** **Year 8 Ecosystems, feeding relationships and adaptations L10:** Discovering how biodiversity is being maintained through breeding programmes, field margins and hedgerows, reducing waste and recycling and protecting and regenerating habitats. Discussing why some countries and governments cannot commit to maintaining biodiversity due to food security, cost of the programmes, development of society and the affect on the local economies. **Year 8 Ecosystems, feeding relationships and adaptations L11:** Researching adaptations in animals and plants to help them survive and be successful in their environments. **Year 8 Ecosystems, feeding relationships and adaptations L12:** Discovering what animals compete for and why.	be able to **interpret graphs** used to model these **cycles**. **L7 & L8: Required Practical Transects and Quadrats** A range of experimental methods using **transects** and **quadrats** are used by **ecologists** to determine the **distribution** and abundance of **species** in an **ecosystem**. **Required practical activity 7: Measure the population size** of a common **species** in a **habitat.** Use **sampling techniques** to investigate the effect of a factor on the **distribution** of this **species**. **L9: Water Cycle and Environmental Change.** Students should: • recall that many different **materials cycle** through the **abiotic and biotic** components of an **ecosystem** • explain the importance of the **carbon and water cycles** to living **organisms**. All **materials** in the living world are **recycled** to provide the building blocks for **future organisms**. The **water cycle** provides **fresh water** for **plants and animals** on land before draining into the seas. Water is continuously **evaporated and precipitated**. Students are **not expected** to study the **nitrogen cycle.** Students should be able to explain the **role of microorganisms** in **cycling materials** through an **ecosystem** by returning **carbon** to the **atmosphere** as **carbon dioxide** and **mineral ions** to the soil. Environmental change can cause the **distribution** of organisms to change (where they live). **Availability of water, temperature** and **atmospheric gases** can influence this. **Seasonal, geographic factors** and **human interaction** can also contribute. **L10: Carbon Cycle** The **carbon cycle** returns **carbon** from **organisms** to the **atmosphere** as **carbon dioxide** to be used by **plants in photosynthesis.** **L9: Decay** **Compost** is decomposed organic matter that is used as **natural fertiliser** for crops and garden plants. Microorganisms such as **bacteria, fungi** and **detritus** feeders are responsible for decomposition. Conditions must be right for them: **temperature, oxygen availability, water availability** and **number of organisms. Biogas** is mainly **methane** which can be burnt as **fuel.** microorganisms decay **anaerobically** which produced methane gas, **sludge** waste can also be used to make biogas on a large scale. Biogas is made in a simple fermenter called a **digester or generator.** They need to be kept at a **constant temperature**. Biogas cannot be stored as a liquid and has to be used straight away. There are **batch generators** and **continuous generators.**	**L4:** Should hunting of animals for sport be legal in the UK? **L5:** Discovering how ecologists carry out their work and gaining a further understanding of a career within ecology.

Year 8 Ecosystems, feeding relationships and adaptations L13: Discovering what plants compete for and why.	**L10 & L11: Required Practical Decay** **L12: Biodiversity & Waste Management** **Biodiversity** is the **variety of all the different species of organisms on earth, or within an ecosystem**. A great **biodiversity** ensures the **stability of ecosystems** by **reducing** the **dependence** of **one species on another** for **food, shelter** and the maintenance of the physical **environment**. The future of the **human species** on Earth relies on us **maintaining a good level of biodiversity**. Many **human activities** are **reducing biodiversity** and only recently have **measures** been taken to try to **stop this reduction**. Rapid growth in the **human population** and an increase in the **standard of living** mean that increasingly **more resources** are used and **more waste** is produced. Unless **waste and chemical materials** are properly handled, **more pollution** will be caused. **Pollution** can occur: • in **water, from sewage, fertiliser or toxic chemicals** • in **air, from smoke and acidic gases** • on **land, from landfil**l and from **toxic chemicals**. **Pollution kills** plants and animals which can **reduce biodiversity.** **L13: Global Warming** Students should be able to describe some of the **biological consequences** of **global warming**. Levels of **carbon dioxide** and **methane** in the **atmosphere** are increasing, and contribute to '**global warming'**. **L14: Deforestation & Peat Bogs.** Large-scale **deforestation** in tropical areas has occurred to: • provide **land for cattle** and **rice fields** • **grow crops for biofuels** **Humans reduce** the amount of **land** available for other **animals and plants** by **building, quarrying, farming** and **dumping waste**. The **destruction of peat bogs,** and other areas of **peat** to produce garden **compost, reduces** the area of this **habitat** and thus the variety of different **plant, animal** and **microorganism species** that live there (**biodiversity**). The **decay** or **burning** of the **peat** releases **carbon dioxide** into the **atmosphere**. **L15: Maintaining Biodiversity.** Students should be able to describe both **positive and negative human interactions** in an	**L11:** Does biodiversity affect our lives? Should every country in the world put in measures to reduce the loss of biodiversity? **L12:** Is global warming an issue for everyone? **L13:** How does the destruction of the Amazon rainforest affect the development of new drugs? What are the impacts on countries if they stop deforestation?

	ecosystem and explain their **impact on biodiversity**. Scientists and concerned citizens have put in place programmes to **reduce the negative** effects of humans on **ecosystems and biodiversity**. These include: • **breeding programmes for endangered species** • **protection and regeneration of rare habitats** • reintroduction of **field margins** and **hedgerows** in **agricultural areas** where farmers grow only one type of crop • **reduction of deforestation** and **carbon dioxide emissions** by some governments • **recycling resources** rather than dumping waste in **landfill.** **L16: Trophic Levels & Biomass** **Trophic levels** are the different stages of a food chain. They are named after their location in the food chain with numbers. Trophic Level 1 is **producers,** Trophic Level 2 is **primary consumers,** Trophic Level 3 is **secondary consumers** and Trophic Level 4 is **tertiary consumers.** Decomposers secrete **enzymes** that break down dead organisms and waste into **small soluble food molecules** that diffuse into the microorganisms. There is **less energy, less biomass** and **usually less organisms** every time you move up a trophic lebel. Each bar on a pyramid of biomass shows the **relative mass of living material.** The bar at the bottom is always a producer and Trophic Level 1. Each bar must be labelled. Energy from the Sun is the source of energy for nearly all life on Earth. Only 1% of energy from the Sun is transferred for photosynthesis by producers. Glucose is used to make biological molecules that make up the producer's biomass which gets transferred to each trophic level when it is eaten. Biomass is lost when organisms **don't eat the whole organism**, **don't absorb all of the food or convert biomass into other substances.** Efficiency of biomass transfer can be calculated by **(biomass transferred to the next level / biomass available at the previous level) x100.** **L17: Food Security and Farming** **Food security** is having enough food to feed a population. Things can affect this: **increasing population, demands for certain foods, new pests and pathogens, high input costs of farming and availability of water.** Overfishing is causing the fish stocks to decline. Fish stocks can be maintained by **fishing quotas** and **net size.** Food production can be made more productive by **limiting the movement of livestock, keeping them in temperature-controlled environments, factory farming in small pens, fish in cages and fed a high-protein diet.** However, **disease** can spread easily and there are **ethical objections.**	**L14:** Should zoos be used to maintain animal populations? Should the Government pay Farmers for introducing field margins? Should we dictate to other countries whether they should or should not cut down rainforests? Should recycling be made mandatory in UK law? **L18:** Should animals be intensively farmed? **L20:** Should we use GM crops?

	L18: Biotechnology 1 Microorganisms can be cultured industrially under **controlled conditions** in large vats for use as a food source. **Mycoprotei**n is used to make **high-protein meat substitutes,** it is made from a fungus called ***Fusarium*** which is grown in **aerobic conditions** on **glucose syrup**. The **biomass** is **harvested** and **purified**. Genetic engineering is transferring a useful gene from one organism to another. Bacteria can be genetically engineered to make human insulin. A **plasmid** is removed from a bacterium. Insulin gene is cut (with **restriction enzymes**) from the human chromosome with **sticky ends.** The plasmid is cut open with the same restriction enzyme leaving the same sticky ends. The plasmid and human insulin gene are mixed together. **Ligase** is added to join the sticky ends to produce **recombinant DNA.** It is then inserted into a bacterium. The bacterium is then grown in a vat under controlled conditions which is harvested and purified. **L19: Biotechnology 2** Biotechnology can help with **food shortages** and with people who **do not have a varied diet. Genetically modified (GM)** crops can be produced to be **resistant to pests** to **improve crop yield.** They can be genetically modified to grow better in **drought conditions** (improve yield too) or provide **more nutritional value.** Many people argue that people go hungry as they cannot afford food, so **poverty** needs to be tackled first. There are fears that countries may become **dependent** on companies who sell **GM seeds**. Sometimes **poor soil** is the main reason why crops fail and even GM crops won't survive. **L20: Revision** **L21: EoTT** **L22: GPA**	