Meden School Curriculum Planning							
Subject	Biology	**Year Group**	11	**Sequence No.**	1	**Topic**	itance, Variation olution

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!'
KS3 Learning **Year 7** Reproduction topic Introduced to the structure of egg and sperm cells. **Year 8** Inheritance topic Introduction to gametes, fertilisation within animals. Understanding of characteristics coming from both genetic and environmental. Selective breeding of animals and cloning of plants. Darwin vs Linnaeus Formation of fossils. Plant structure topic Introduction to pollination and fertilisation in flowering plants. **Year 9**	**L1: Sexual vs Asexual reproduction** **Sexual reproduction** involves the joining (**fusion**) of male and female **gametes**: **sperm** and **egg cells** in animals **pollen** and **egg cells** in flowering plants. In **sexual reproduction** there is mixing of **genetic** information which leads to **variety** in the offspring. The formation of **gametes** involves **meiosis**. **Asexual reproductio**n involves only one parent and no fusion of **gametes**. There is no mixing of **genetic** information. This leads to **genetically identical** offspring (**clones**). Only **mitosis** is involved. **L2: Meiosis** **Meiosis** halves the number of **chromosomes** in **gametes** and **fertilisation** restores the full number of **chromosomes**. Cells in **reproductive organs** divide by **meiosis** to form **gametes**. When a cell divides to form **gametes**: copies of the **genetic** information are made, the **cell divides** twice to form **four gametes**, each with a **single** set of **chromosomes** all gametes are **genetically different** from each other. **Gametes** join at **fertilisation** to restore the normal number of **chromosomes**. The new cell divides by **mitosis**. The number of cells increases. As the **embryo** develops cells **differentiate**. **L3: Sex determination**	L3: Sex determination Students could explore the differences between biological sex and gender to link to LGBTQ+ L4: The human genome Discuss the importance of understanding the human genome. E.g., the search for genes linked to different types of disease understanding and treatment of inherited disorders use in tracing human migration patterns from the past. L7: Genetic disorders Students should make informed judgements about the economic, social and ethical issues concerning embryo screening, given appropriate information.

Cell structure topic The organelles within prokaryotic and eukaryotic cells. Examples of eukaryotic and prokaryotic cells. That prokaryotic cells contain a plasmid.	Ordinary human body cells contain **23 pairs** of **chromosomes**. 22 pairs control **characteristics** only, but one of the pairs carries the **genes** that determine **sex**. In **females** the **sex chromosomes** are the same **(XX)**. In **males** the **chromosomes** are different **(XY).** **L4: DNA** The **genetic** material in the **nucleus** of a cell is composed of a **chemical** called **DNA**. **DNA** is a **polymer** made up of two strands forming a **double helix**. The **DNA** is contained in **structures** called **chromosomes**. A **gene** is a small section of **DNA** on a **chromosome**. Each **gene** codes for a particular **sequence** of **amino acids**, to make a **specific protein**. The **genome** of an **organism** is the **entire genetic material** of that **organism**. The whole human genome has now been studied and this will have great importance for medicine in the future. **L5: Genetic inheritance** Some **characteristics** are controlled by a single **gene**, such as: fur colour in mice; and red-green colour blindness in humans. Each **ge**ne may have different forms called **alleles**. The **allele**s present, or **genotype**, operate at a **molecula**r level to develop **characteristics** that can be **expressed** as a **phenotype**. A **dominant allele** is always expressed, even if only one copy is present. A **recessive allele** is only expressed if two copies are present (therefore no **dominant allele** present). If the two **alleles** present are the same the **organism** is **homozygous** for that trait, but if the **alleles** are different they are **heterozygous**. Most **characteristics** are a result of multiple **genes** interacting, rather than a single gene. **L6: Cross Diagrams – Skills lesson** Students should be able to understand the concept of **probability** in predicting the results of a	L12 & 13 – Antibiotics and Antibiotic resistance Students to explore what can be done to stop drug resistant pathogens emerging. Oracy opportunity of factsheets for 'doctors' or 'public' and then present to the class.

	single gene cross but recall that most **phenotype** features are the result of **multiple genes** rather than single gene **inheritance**. Students should be able to use **direct proportion** and **simple ratios** to express the outcome of a **genetic cross**. Students should be able to complete a **Punnett square** diagram and **extract** and **interpret** information from **genetic crosses** and **family trees**. **<u>L7: Genetic Disorders</u>** **Disorders** are **inherited**. These **disorders** are caused by the **inheritance** of certain **alleles**. **Polydactyly** (having extra fingers or toes) is caused by a **dominant allele**. **Cystic fibrosis** (a disorder of cell membranes) is caused by a **recessive allele**. **Embryo** screening can help to identify if an offspring will have a **genetic disorder**. There are **economic**, **social** and **ethical** issues concerning **embryo** screening to consider with **embryo** screening. **<u>L8: Genetic engineering</u>** **Genetic engineering** is a process which involves **modifying** the **genome** of an **organism** by introducing a **gene** from another **organism** to give a **desired characteristic**. Plant crops have been **genetically engineered** to be **resistant** to **diseases** or to produce bigger, better fruits. **Bacterial cells** have been **genetically engineere**d to produce useful **substances** such as human **insulin** to treat **diabetes**. (HT only) In genetic engineering: • **Enzymes** are used to **isolate** the required **gene;** this gene is inserted into a **vector**, usually a **bacterial plasmid** or a **virus** • The **vector** is used to **insert** the **gene** into the **required** cells • **Genes** are transferred to the cells of animals, plants or microorganisms at an early stage in their development so that they develop with **desired characteristics**. **<u>L9: Pros and Cons of Genetic Engineering.</u>**	

	The **benefits** and **risks** of **genetic engineering** in **agriculture** and in **medicine** and that some people have objections. In **genetic engineering**, **genes** from the **chromosomes** of humans and other **organisms** can be 'cut out' and transferred to cells of other **organisms**. Crops that have had their **genes** modified in this way are called **genetically modified (GM)** crops. **GM crops** include ones that are **resistant** to insect attack or to **herbicides**. **GM crops** generally show **increased yields**. Concerns about **GM crops** include the effect on **populations** of **wild flowers** and **insects**. Some people feel the effects of eating **GM crop**s on human **healt**h have not been fully explored. Modern medical research is exploring the possibility of **genetic modification** to overcome some **inherited disorders**. **<u>L10: Variation</u>** The **genome** and its interaction with the environment influence the development of the **phenotype** of an **organism**. Differences in the **characteristics** of individuals in a population are called **variation** and may be due to differences in: the **genes** they have **inherited** (genetic causes) , the **conditions** in which they have **developed** (environmental causes) or a **combination** of **genes** and the **environment.** There is usually extensive **genetic variation** within a **population** of a **species** recall that all **variants** arise from **mutations** and that: most have no effect on the **phenotype**; some influence **phenotype**; very few determine **phenotype**. **Mutations** occur continuously. Very rarely a **mutation** will lead to a new **phenotype**. If the new **phenotype** is suited to an **environmental change** it can lead to a relatively **rapid change** in the **species e.g., the peppered moth.** **<u>L11: Selective Breeding</u>** **Selective breeding** (artificial selection) is the process by which humans breed plants and animals for **desired genetic characteristics**. Humans have been doing this for thousands of	

	years since they first bred food crops from wild plants and domesticated animals. **Selective breeding** involves choosing **parents** with the **desired characteristic** from a mixed population. They are bred together. From the **offspring** those with the **desired characteristic** are bred together. This continues over many **generations** until all the **offspring** show the **desired characteristic**. The characteristic can be chosen for usefulness or appearance: **Disease resistance** in food crops. Animals which **produce more meat or milk**. Domestic dogs with a gentle nature. Large or unusual flowers. **Selective breeding** can lead to **'inbreeding**' where some breeds are particularly **prone to disease or inherited defects.** **<u>L12 and 13: Antibiotics and antibiotic resistance</u>** **Antibiotics**, such as **penicillin**, are medicines that help to cure **bacterial disease** by killing **infective bacteria** inside the body. It is important that specific **bacteria** should be treated by specific **antibiotics**. **Bacteria** can **evolve** rapidly because they **reproduce** at a fast rate. **Mutations** of **bacterial pathogens** produce new **strains**. Some **strains** might be **resistant** to **antibiotics**, and so are not killed. They **survive** and **reproduce**, so the population of the **resistant strain rises**. The **resistant strain** will then spread because people are not **immune** to it and there is no effective treatment. **MRSA** is resistant to antibiotics. To reduce the rate of development of **antibiotic resistant** strains: Doctors should not prescribe **antibiotics** inappropriately, such as treating non-serious or **viral infections.** Patients should complete their course of **antibiotics** so all **bacteria** are killed and none **survive** to **mutate** and form **resistant strains.** The **agricultural** use of **antibiotics** should be restricted.	

	The **development** of new **antibiotics** is costly and slow. It is unlikely to keep up with the emergence of new **resistant** strains **L14: Evolution and Darwin** The theory of **evolution** by **natural selection** states that all **species** of living things have **evolved** from simple life forms that first developed more than three billion years ago. **Evolution** occurs through **natural selection** of **variants** that give rise to **phenotypes** best suited to their **environment**. If two **populations** of one **species** become so different in **phenotype** that they can no longer **interbreed** to produce **fertile offspring** they have formed two **new species.** The **theory of evolution by natural selection** is now widely accepted. Evidence for **Darwin's theory** is now available as it has been shown that **characteristics** are passed on to **offspring** in **genes**. There is further evidence in the **fossil** record and the knowledge of how **resistance** to **antibiotics evolves** in **bacteria**. **L15: Fossils** **Fossils** are the '**remains**' of **organisms** from millions of years ago, which are found in rocks. Many early forms of life were **soft-bodied**, which means that they have left few traces behind. What traces there were have been mainly destroyed by **geological activity**. Therefore, scientists cannot be certain about how life began on Earth. **Phylogenic trees** can be used to show how different **species** have **evolved** over time and who their closest/most distant **ancestor species** were. **Fossils** may be formed: • from parts of **organisms** that have not **decayed** because one or more of the conditions needed for **decay** are absent. • when parts of the **organism** are replaced by **minerals** as they **decay.** • as **preserved** traces of **organisms**, such as **footprints, burrows** and **rootlet** traces. **L16: Extinction** **Extinctions** occur when there are no remaining individuals of a **species** still **alive**. Students should be able to **describe factors** which may contribute to the **extinction** of a **species**.	

	L17 & 18: Revision and EOTT	