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|  **Subject Science - Year 9 Medium Term Plan/SOW** | **The Academy of St Francis of Assisi** |
| **Unit: B15** | **Title: B15 Adaptations, interdependence, competition** | **Number of lessons in sequence** | **10 lessons**  |
| **Overarching Curricular Goals (Aims)**  | **By the end of this unit students will:** There are a number of ecological terms including community, population, habitat, ecosystem, abiotic factor, and biotic factor, and students should recall the precise meaning of each. Students should understand the importance of communities including the interdependence of all the species present, and be able to give real examples to illustrate interdependence. In studying organisms in their environments, students should recall the effects of abiotic and biotic factors on populations. Students should have measured the distribution of organisms with quadrats and transects, and carried out a practical to investigate the population size of a common species in a habitat. Students have studied competition in animals and plants and should recall what factors they compete for and how they compete, and how they become successful in their environments. Students should understand how organisms are adapted to survive in many different conditions. They should be able to give examples of the ways in which animals and plants are adapted to their environments.  | **Links to National Curriculum****Links to & building upon prior learningIncluding KS2 if Yr7** | **Students at KS3 build on their knowledge and skills from KS2 by learning about:**The interdependence of organisms in an ecosystem, including food webs and insect pollinated crops; the importance of plant reproduction through insect pollination in human food security and how organisms affect, and are affected by, their environment, including the accumulation of toxic materials.**Keywords** food chain, producer, consumer, prey, predator, food web, decomposer, interdependence, population, bioaccumulation, ecosystem, community, habitat, environment, niche, competition. **Students at KS4 build on their knowledge and skills from KS3 by learning about:**The levels of organisation within an ecosystem. Some abiotic and biotic factors which affect communities. The importance of interactions between organisms in a community. How materials cycle through abiotic and biotic components of ecosystems. The role of microorganisms (decomposers) in the cycling of materials through an ecosystem. Organisms are interdependent and are adapted to their environment. The importance of biodiversity. Methods of identifying species and measuring distribution, frequency and abundance of species within a habitat. Positive and negative human interactions with ecosystems.**Students at KS5 build on their knowledge and skills from KS4 by learning about:** Populations of different species form a community. A community and the non-living components of its environment together form an ecosystem. Ecosystems can range in size from the very small to the very large. Within a habitat, a species occupies a niche governed by adaptation to both abiotic and biotic conditions. An ecosystem supports a certain size of population of a species, called the carrying capacity. This population size can vary as a result of the effect of abiotic factors, interactions between organisms, interspecific and intraspecific competition and predation. The size of a population can be estimated using randomly placed quadrats, or quadrats along a belt transect, for slow-moving or non-motile organisms, the mark-release-recapture method for motile organisms. The assumptions made when using the mark-release-recapture method. Ecosystems are dynamic systems. Primary succession, from colonisation by pioneer species to climax community. At each stage in succession, certain species may be recognised which change the environment so that it becomes more suitable for other species with different adaptations. The new species may change the environment in such a way that it becomes less suitable for the previous species. Changes that organisms produce in their abiotic environment can result in a less hostile environment and change biodiversity. Conservation of habitats frequently involves management of succession. |
| **Outcomes/****Success Criteria** | **Knowledge** **Communities** 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. 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.**Abiotic factors**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 and Oxygen levels for aquatic animals.**Biotic factors**Biotic (living) factors which can affect a community are the availability of food, new predators arriving, new pathogens, one species outcompeting another so the numbers are no longer sufficient to breed.**Adaptations**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.**Skills** **Communities** Describe different levels of organisation in an ecosystem from individual organisms to the whole ecosystemDescribe 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 habitatSuggest how organisms are adapted to the conditions in which they live.Students should be able to extract and interpret information from charts, graphs and tables relating to the interaction of organisms within a community. **Abiotic factors**Students should be able to record first-hand observations of organisms.Students should be able to explain how a change in an abiotic factor would affect a given community given appropriate data or context.**Biotic factors**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.**Adaptations**Students should be able to explain how organisms are adapted to live in their natural environment, given appropriate information. |
| **2/3 tier vocabulary.** | **Differentiation/Scaffolding/Support.** | **Stretch and challenge opportunities in class, enrichment and home learning.** | **Opportunities for wider reading/Listening/watching.** |
| **KS3 keyword links**food chain, producer, consumer, prey, predator, food web, decomposer, interdependence, population, bioaccumulation, ecosystem, community, habitat, environment, niche, competition.**abundance** a measure of how common or rare a particular type of organism is in a given environment**adaptations** special features that make an organism particularly well suited to the environment where it lives**community** group of interdependent living organisms in an ecosystem**competition** the process by which living organisms compete with each other for limited resources such as food, light, or reproductive partners**distribution** where particular types of organisms are found within an environment**extremophile** an organism that can survive and reproduce in extreme conditions**interdependence** the network of relationships between different organisms within a community, for example eachspecies depends on other species for food, shelter, pollination, seed dispersal, etc.**mean** the arithmetical average of a series of numbers**median** the middle value in a list of numbers **mode** the number which occurs most often in a set of data**quadrat** a sample area used for measuring the abundance and distribution of organisms in the field**quantitative sampling** records the numbers of organisms rather than just the type**range** the maximum and minimum values for the independent or dependent variables – important in ensuring that any patterns are detected**sample size** the size of a sample in an investigation**transect** a measured line or area along which ecological measurements are made**Oracy:** ACE questioning Targeted Q and ADiscussion activities  | **Knowledge Support:** * Key facts.
* Knowledge organisers.

**Reading support**:* Explicit vocabulary delivery
* Glossary of terms
* Visualizer to support whole class reading.
* Keyword discussion and annotation.

**Skills support:** * Support sheets
* Practical guidance sheets.
* Practical scaffolding.
* Demonstrations and discussions.
* Writing frames.
 | Stretch and challenge embedded into every lesson (see PowerPoints)**Home learning / enrichment** **Scholarship:** |  |

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| **Unit Title** | **Sequence of learning Lesson title, theme, big question.** |  **Key concepts/outcomes/knowledge and skills.**  | **Assessment/ including specific content/ knowledge/skills tested.** **Green=assess/Blue=improve**  | **HWK. Add** **Hyperlink****To be in books clearly marked** | **Furthering Cultural Capital.****&****Opportunities for reading** | **Recall of prior or future topics –**  | **Lesson resources including or hyperlink to supporting websites/resources/books/texts & individual lessons.** **5xT+L essentials to be included in individual lessons,** |
|  **B15 Adaptations, interdependence, competition** | B15.1 The importance of communities**Community** group of interdependent living organisms in an ecosystem**interdependence** the network of relationships between different organisms within a community, for example each species depends on other species for food, shelter, pollination, seed dispersal, etc. | **Aiming for Grade 4** * Describe what is meant by ecosystem, population, and community.
* List some resources that living things need.
* Use a given example to describe why one species relies on another.

**Aiming for Grade 6** * Define the terms community, population, habitat, ecosystem, abiotic factor, biotic factor.
* Describe what a stable community is and give an example.Suggest how one species relies on another.

**Aiming for Grade 8** * Explain why a community is stable and important.
* Use evidence to write hypotheses about why populations have changed in a community.
* Explain why interdependence is important in maintaining a stable community.
* What is meant by a stable community
* The relationship between communities and ecosystems.

An ecosystem is the interaction of a community of living organisms with the non-living (abiotic) parts of their environment. Organisms require materials from their surroundings and other living organisms to survive and reproduce. 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. |  | B15.1 The importance of communities HWB15.1: HW answers B15. | To be added by:GS, JD or AC | KS2 NC Living things and their habitatsKS3 NC Relationships in an ecosystem. | **Knowledge organisers**Ecology **B15 retrieval questions****Practical**: N/A**PowerPoint:** B15.1 The importance of communities**Printed resources:**B15.1 A country gardenB15.1 Ecological words |
| **B15 Adaptations, interdependence, competition** | B15.2 Organisms in their environment**Biotic** Living factors that affect living organisms. **Abiotic** Non-living factors that affect living organisms.  | Abiotic factors that may affect communities of organisms include:* light intensity
* temperature
* moisture levels
* soil pH and mineral content
* wind intensity and direction
* the carbon dioxide levels for plants
* the availability of oxygen for aquatic animals.

Biotic factors that may affect communities of organisms include:* availability of food
* new predators arriving
* new pathogens
* new competitors.
 | **Aiming for Grade 4 LOs:*** Identify factors as biotic or abiotic
* Recall an instrument to measure an abiotic factor.

**Aiming for Grade 6 LOs:*** Describe how a factor influences the distribution of organisms.
* Describe how to record the measurements of abiotic factors.

**Aiming for Grade 8 LOs:*** Describe in detail how to measure the pH and water content of soil.
* Analyse data in detail and draw appropriate conclusions.
 | B15.2 Organisms in their environment HWB15.2 HW answers |  |  | **Knowledge organisers**Ecology **Retrieval questions** B15 knowledge questions**Practical**: B15.2 Measuring abiotic factors**PowerPoint:** B15.2 Organisms in their environment**Printed resources:**B15.2 Measuring abiotic factorsB15.2 Sorting factorsB15.2 Evaluating fieldwork methodsB15.2 Understanding biotic and abiotic factors**B15.2 Extension** B15.2 Robin territoriesB15.2 Producing frequency tables |
| **B15 Adaptations, interdependence, competition** | B15.3 Distribution and abundance**abundance** a measure of how common or rare a particular type of organism is in a given environment**distribution** where particular types of organisms are found within an environment**quadrat** a sample area used for measuring the abundance and distribution of organisms in the field**sample size** the size of a sample in an investigation**mean** the arithmetical average of a series of numbers**quantitative sampling** records the numbers of organisms rather than just the type**range** the maximum and minimum values for the independent or dependent variables – important in ensuring that any patterns are detected**sample size** the size of a sample in an investigation**transect** a measured line or area along which ecological measurements are made**median** the middle value in a list of numbers **mode** the number which occurs most often in a set of data | **Aiming for Grade 4 LOs:*** Describe the function of a quadrat and a transect.
* Follow a method to estimate a population using a sampling technique.
* Calculate the mean of a set of results.

**Aiming for Grade 6 LOs:*** Explain how to use a quadrat and a transect to estimate population sizes.
* Design a method to estimate a population using a sampling technique.
* Calculate range, mean, median, and mode in order to analyse results.

**Aiming for Grade 8 LOs:*** Discuss what factors determine the size of the quadrat used.
* Design independently an investigation based around a question or hypothesis.
* Evaluate in detail the use of sampling to estimate population size.
 | A range of experimental methods using transects and quadrats is used by ecologists to determine the distribution and abundance of species in an ecosystem. | B15.3 Distribution and abundance HWB15.3 HW answers |  |  | B15.3 Measuring the distribution of organismsB15.3 Calculating biodiversityB15.3 Mean, median, and modeB15.3 Use of significant figures**15.3 Extension**Measuring the population of daisies in an area of grassland |
| **B15 Adaptations, interdependence, competition** | B15.4 Competition in animals | **Aiming for Grade 4 LOs:*** Recognise that animals compete with each other for resources.
* List resources that animals compete with each other for.
* Describe what will happen to an animal if it cannot compete for resources.

**Aiming for Grade 6 LOs:*** Use information to suggest factors that animals are competing for in a given habitat.
* Explain tactics that help an animal compete for a resource.
* Describe how the distribution of a species has changed because of competition.

**Aiming for Grade 8 LOs:*** Evaluate a model of competition between organisms.
* Use the terms inter-specific and intra-specific competition, and give examples of each.
* Suggest and explain how animals are adapted to compete for resources.
 | Animals compete with each other for food, territories, and mates.Animals have adaptations that make them successful competitors. | B15.4 Competition in animals HWB1.5.4 HW answers |  |  | **Survival rivals****Name the resource** |
| **B15 Adaptations, interdependence, competition** | B15.5 Competition in plants | **Aiming for Grade 4 LOs:*** List resources that plants compete with each other for.
* Describe what seed dispersal is and give some ways in which plants carry it out.
* Make measurements of seedlings.

**Aiming for Grade 6 LOs:*** Suggest factors that plants are competing for in a given habitat.
* Explain why plants use seed dispersal.
* Describe the methods plants use to outcompete others or avoid competition.

**Aiming for Grade 8 LOs:*** Plan a method to investigate competition between cress seeds.
* Analyse data to explain the effects of overcrowding.
* Suggest the problems caused by plants that can easily outcompete others.
 | Plants often compete with each other for light, space, water, and mineral ions from the soil.Plants have many adaptations that make them good competitors. | B15.5 Competition in plants HWB15.5: HW answers |  |  |  |
| **B15 Adaptations, interdependence, competition** | B15.6 Adapt and survive | **Aiming for Grade 4 LOs:*** Describe one example of how an organism is adapted.
* Define an extremophile.

**Aiming for Grade 6 LOs:*** Suggest features that an organism may have in order to survive in a given habitat.
* Explain how adaptations allow an organism to survive in its habitat.

**Aiming for Grade 8 LOs:*** Suggest and explain in detail how an organism in an extreme location might evolve to become better adapted to its habitat.
* Apply knowledge of extremophiles to discuss why scientists believe there could be life on other planets (or moons).
 | To survive and reproduce, organisms need a supply of materials from their surroundings and from the other living organisms in their habitat.Organisms, including microorganisms, have features (adaptations) that enable them to survive in the conditions in which they normally live.Extremophiles have adaptations that enable them to live in environments with extreme conditions of salt, temperature, or pressure. | B15.6 Adapt and survive HWB15.6 HW answers |  |  |  |
| **B15 Adaptations, interdependence, competition** | B15.7 Adaptation in animals | **Aiming for Grade 4 LOs:*** Describe one example of an animal adaptation.
* Describe why it is important that most animals maintain the correct body temperature.
* Describe why fur or feathers can be used to maintain a warm body temperature.

**Aiming for Grade 6 LOs:*** Classify adaptations as structural, behavioural, or functional.
* Calculate surface area to volume ratio.
* Describe how animals are adapted to live in hot, dry, and cold habitats.

**Aiming for Grade 8 LOs:*** Suggest structural, behavioural, or functional adaptations.
* Explain and illustrate how surface area to volume ratio is linked to maintaining the correct body temperature.
* Discuss how and why climate change is affecting the distribution of animals.
 | Organisms, including animals, have features (adaptations) that enable them to survive in the conditions in which they normally live. These adaptations may be structural, behavioural, or functional. | B15.7 Adaptation in animals HWB15.7 HW answers |  |  |  |
| **B15 Adaptations, interdependence, competition** | B15.8 Adaptations in plants | **Aiming for Grade 4 LOs:*** Describe one example of a plant adaptation.
* Describe why plants need a constant supply of water.
* Draw a graph to display data, with guidance.

**Aiming for Grade 6 LOs:*** Explain how a plant adaptation allows it to survive in its habitat.
* Explain why plants need to reduce water loss by transpiration.
* Display data using a graph and describe what it shows.

**Aiming for Grade 8 LOs:*** Explain how an unfamiliar plant is adapted and give reasons for its adaptations.
* Link and explain rate of transpiration to leaf structure.
* Suggest and explain why a cactus would not survive in a cold climate.
 | Organisms, including plants, have features (adaptations) that enable them to survive in the conditions in which they normally live. These adaptations may be structural, behavioural, or functional. | B15.8 Adaptations in plants HWB15.8 HW answers |  |  |  |
| **B15 Adaptations, interdependence, competition** | B15.10 Revision  |  | 1 What is a community of organisms? [2 marks]2 Organisms within a community are interdependent. In the three communities listed below, explain one way in which some of the organisms are interdependent:i an ancient oak woodland [2 marks]ii a desert [2 marks]iii a pond [2 marks]3 Organisms within a community often compete with each other. Describe three ways in which organisms of the same species might compete against each other. [3 marks]4 Describe three ways in which organisms of different species might compete against each other. [3 marks] | B15 Adaptations, interdependence, and competition practice questions. |  |  |  |
| **B15 Adaptations, interdependence, competition** | B15.11 Assessment |  |  |  |  |  |  |
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Recall questions

1. What is a population?

2. What is a community?

3. What is an ecosystem?

4. What is competition?

5. What is interdependence?

6. What do animals often compete for?

7. What do plants often compete for?

8. What is an abiotic factor?

9. List the abiotic factors that can affect a community.

10. What is a biotic factor?

11. List the biotic factors that can affect a community.

12. What is a stable community?

13. How do adaptations help an organism?

14. What are the three types of adaptations?

1 a Describe a community.

**[2 marks]**

b Explain how an ecosystem differs from a community.

**[3 marks]**

2 Give five examples of how animals and plants can interact in an ecosystem.

**[5 marks]**

3 Describe an example of a stable community, and state why it is so important that it is stable. Your answer should include examples of at least one plant and animal that live in this community.

**[6 marks]**

B15.1 The importance of communities exam questions

Higher

Foundation