 Module 2 - Organisation of living things

Year 11 biology

Duration: 7 Weeks

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Description of unit

Multicellular organisms typically consist of a number of interdependent transport systems that range in complexity and allow the organism to exchange nutrients, gases and wastes between the internal and external environments. Students examine the relationship between these transport systems and compare nutrient and gas requirements.

Models of transport systems and structures have been developed over time, based on evidence gathered from a variety of disciplines. The interrelatedness of these transport systems is critical in maintaining health and in solving problems related to sustainability in agriculture and ecology.

Inquiry questions

How are cells arranged in a multicellular organism? What is the difference in nutrient and gas requirements between autotrophs and heterotrophs? How does the composition of the transport medium change as it moves around an organism?

Working scientifically skills

In this module, students focus on collecting, processing and analysing data and information to: identify trends, patterns and relationships; solve problems; and communicate ideas about the organisation of living things.

Outcomes

A student:

* develops and evaluates questions and hypotheses for scientific investigation BIO11/12-1
* designs and evaluates investigations in order to obtain primary and secondary data and information BIO11/12-2
* conducts investigations to collect valid and reliable primary and secondary data and information BIO11/12-3
* selects and processes appropriate qualitative and quantitative data and information using a range of appropriate media BIO11/12-4
* analyses and evaluates primary and secondary data and information BIO11/12-5
* solves scientific problems using primary and secondary data, critical thinking skills and scientific processes BIO11/12-6
* communicates scientific understanding using suitable language and terminology for a specific audience or purpose BIO11/12-7
* explains the structure and function of multicellular organisms and describes how the coordinated activities of cells, tissues and organs contribute to macroscopic processes in organisms BIO11-9

While all Working Scientifically outcomes have been presented in this sample unit of work, teacher judgement should be used about which skill descriptors students will be working towards and engaging with.

In the sample unit of work, Working Scientifically outcomes are placed after content descriptors.

Assessment

Informal quizzes, feedback from peers and teachers, self-reflection

| Outcomes/content | Teaching and learning | Feedback |
| --- | --- | --- |
| **Inquiry question 1**How are cells arranged in a multicellular organism?* compare the differences between unicellular, colonial and multicellular organisms by:
	+ investigating structures at the level of the cell and organelle
	+ relating structure of cells and cell specialisation to function
 | * Quick quiz/Kahoot! revision on cell structure, function and organelles.
* Students are provided with various sources of electron micrographs, slides, microscopes and diagrams of unicellular, colonial and multicellular organisms. Working in groups they are expected to
	+ list similarities and differences between examples
	+ explain the cell structure and function.
* communicate findings back to the class informally.
* Student discuss the differences between microscope types and what they produce, including uses in scientific laboratories and research
* Students present cell structure and function and report back to class
 | * Use quiz results to provide student feedback
* Peer feedback for presentations
 |
| * investigate the structure and function of tissues, organs and systems and relate those functions to cell differentiation and specialisation (ACSBL055)
* justify the hierarchical structural organisation of organelles, cells, tissues, organs, systems and organisms (ACSBL054)

**Working Scientifically** – BIO11/12- 7 | * Students are provided with a scaffold for web search activity using ICT in small groups.
* Student role play/debate activity – Students a given a role in a multicellular organism– either an organelle, tissue, organ or system. Students must justify why they believe their role is more important to the overall health of the organism. Debate and discussion mediated by teacher.
	+ Teacher may allocate groups or ask all students to prepare for each organelle, tissue system etc and then randomly allocate.
 | * Students provide peer feedback on research findings
* Teacher feedback and informal discussion at key points in the debate. Teacher should facilitate discussions and guide arguments.
 |
| **Inquiry question 2**What is the difference in nutrient and gas requirements between autotrophs and heterotrophs?* investigate the structure of autotrophs through the examination of a variety of materials, for example: (ACSBL035)
	+ dissected plant materials (ACSBL032)
	+ microscopic structures
	+ using a range of imaging technologies to determine plant structure
 | * Students to work in groups to research structures of autotrophs and imaging technologies. Students to share findings informally with the class.
* Kahoot! - Review scientific methodology.
* Plant dissection and microscopy activity– Students must plan and conduct an experiment using plants in a dissection and mounting of samples on the microscope.
 | * Peer sharing between groups and discussion of findings with teacher’s feedback.
* Quiz
* Teacher feedback
 |
| * investigate the function of structures in a plant, including but not limited to:
	+ tracing the development and movement of the products of photosynthesis (ACSBL059, ACSBL060)

**Working Scientifically** – BIO11/12-1, BIO11/12-3* investigate the gas exchange structures in animals and plants (ACSBL032, ACSBL056) through the collection of primary and secondary data and information, for example:
	+ microscopic structures: alveoli in mammals and leaf structure in plants
	+ macroscopic structures: respiratory systems in a range of animals

**Working Scientifically** – BIO11/12-2 BIO11/12-3 | * Watch YouTube clip that explains the function of plant structures. (E.g. Vascular Plants = Winning! - Crash Course Biology #37)
* Students are to research, plan and conduct an experiment that traces the development and movement of products of photosynthesis.
* Students to research, plan and conduct an experiment to investigate gas exchange structures either microscopic or macroscopic structures, then share findings as a class. (Guide student choice to ensure all content is covered)
 | * Students to write summary notes / outline from clip. Students and teacher to provide feedback – 1 good thing, 1 improvement, 1 way to improve (or other feedback strategy)
* Experimental record to be handed in for teacher feedback.
* Peer feedback.
 |
| * interpret a range of secondary-sourced information to evaluate processes, claims and conclusions that have led scientists to develop hypotheses, theories and models about the structure and function of plants, including but not limited to: (ACSBL034)
	+ photosynthesis
	+ transpiration-cohesion-tension theory

**Working Scientifically** – BIO11/12-1. | * Computer research activity – students work individually to evaluate claims on hypothesis, theories and models regarding photosynthesis and the transpiration-cohesion-tension theory using texts / internet research. Students will then participate in a think pair share activity in small groups. Teacher to monitor student understanding.
 | * Teacher feedback
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| * trace the digestion of foods in a mammalian digestive system, including:
	+ physical digestion
	+ chemical digestion
	+ absorption of nutrients, minerals and water
	+ elimination of solid waste

**Working Scientifically** – BIO11/12-5, BIO11/12- 7. | * Students to create a tracing of their body onto butcher’s paper. Groups to work together using support from texts and websites to create a “body map / flow chart” of how digestion occurs in sequence from the mouth to elimination. Alternatively, students can explain by designing their own demonstration experiment (e.g. YouTube - Digestive System Demo)
 | * Peer feedback
 |
| Inquiry question 3 - How does the composition of the transport medium change as it moves around an organism?* investigate transport systems in animals and plants by comparing structures and components using physical and digital models, including but not limited to: (ACSBL032, ACSBL058, ACSBL059, ACSBL060)
	+ macroscopic structures in plants and animals
	+ microscopic samples of blood, the cardiovascular system and plant vascular systems

**Working Scientifically** – BIO11/12-4 | * Students are given samples of plants and taken on an informal field trip around the school to inspire inquiry direction on how plants and animals transport substances (from large trees to a blade of grass).
* Students are to research using texts and / or the internet. Discussion, drawing and labelling of microscopic and macroscopic structures.
 | * Teacher feedback
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| * investigate the exchange of gases between the internal and external environments of plants and animals
 | * Students to develop an experimental method using texts / worksheets provided or research on the internet to help them to investigate gaseous exchange. Students will then perform experiments and create their own notes to support their understanding and give each other feedback for improvements in experimental design.
 | * Peer feedback.
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| * compare the structures and function of transport systems in animals and plants, including but not limited to: (ACSBL033)
	+ vascular systems in plants and animals
	+ open and closed transport systems in animals

**Working Scientifically** – BIO11/12-6, BIO11/12- 7 | * Students to create a comparison table to compare structures and functions of transport systems. Students are to then work in groups to create a 3D model from recycled materials to illustrate transport systems (Teacher guided) and present to the class.
 | * Teacher feedback
 |
| * compare the changes in the composition of the transport medium as it moves around an organism

**Working scientifically** – BIO11/12-6. | * Teacher guided notes and discussion, quick quiz e.g. Kahoot to check for student understanding. Students to use research skills to create their own flow chart that summarises composition changes.
 | * Quiz, teacher feedback.
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| End of module review**Working Scientifically** – BIO11/12- 7 | * Summative informal assessment. Open book test to assess prior learning. Post-test discussion of answers and suggestions for improvement. (Collaborative learning)
 | * Informal assessment
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Reflection and evaluation: