 Module 5: Heredity - Reproduction

Year 12 Biology

This document references the [Biology Stage 6 Syllabus](https://syllabus.nesa.nsw.edu.au/biology-stage6/) © 2017 [NSW Education Standards Authority (NESA)](http://syllabus.nesa.nsw.edu.au/copyright/) for and on behalf of the Crown in right of the State of New South Wales.

Inquiry Question

How does reproduction ensure the continuity of a species?

Description of unit

Life continues through the processes of reproduction and heredity. Students expand their knowledge of evolution by understanding the cellular processes involved in increasing genetic diversity. They investigate reproduction and inheritance patterns in both plants and animals as well as the role of DNA in polypeptide synthesis and the uses of technologies in the study of inheritance patterns. Students also learn about contemporary research and the work of geneticists across a variety of industries, including medical applications and agriculture. They explore the effects on society and the environment through the application of genetic research. Students focus on processing and representing data in appropriate formats to analyse and evaluate trends, relationships and patterns. Students derive and justify valid conclusions about the processes involved in heredity.

Outcomes

Working scientifically skills

* PH11-1 develops and evaluates questions and hypotheses for scientific investigation
* PH11-2 Designs and evaluates investigations in order to obtain primary and secondary data and information
* PH11-3 Conducts investigations to collect valid and reliable primary and secondary data and information
* PH11-4 Selects and processes appropriate qualitative and quantitative data and information using a range of appropriate media
* BIO11/12-5 analyses and evaluates primary and secondary data and information
* BIO11/12-6 solves scientific problems using primary and secondary data, critical thinking skills and scientific processes
* BIO11/12-7 communicates scientific understanding using suitable language and terminology for a specific audience or purpose

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.

Knowledge and understanding

BIO12-12 explains the structures of DNA and analyses the mechanisms of inheritance and how processes of reproduction ensure continuity of species

| Outcomes/content | Learning Experiences and instructions | Evidence of learning |
| --- | --- | --- |
| Explain the mechanisms of reproduction that ensure the continuity of a species, by analysing sexual and asexual methods of reproduction in a variety of organisms, including:   * Animals - advantages internal and external fertilisation | Question class on what they know of the difference between sexual and asexual reproduction. See facts below:   * + Sexual reproduction involves two parents (one male and one female) that each contribute half of the genetic information to the offspring. The offspring are genetically different to both parents. This creates greater variation which is an advantage if the environment changes.   + Asexual reproduction only involves one parent and offspring are identical to that parent.   Students watch Catalyst episode “A life without males” to about 14:15 minutes and then discuss the differences between sexual and asexual reproduction and the advantages of each.  Discussion on different phylum in animal Kingdom and that all reproduce sexually with some exceptions e.g. parthenogenesis such as Bynoe's gecko.  In pairs students research the difference between internal and external fertilisation, advantages and disadvantages of each and provide examples of each. Using pictures and student voice over, students present their findings in a simple Adobe Spark video and share to class. | * Distinguish between the terms sexual and asexual reproduction * Identify that all animals reproduce sexually * Distinguish between internal and external fertilisation and identify advantages of each |
| Explain the mechanisms of reproduction that ensure the continuity of a species, by analysing sexual and asexual methods of reproduction in a variety of organisms, including:   * Plants: asexual and sexual reproduction | Students dissect flowers to identify male and female parts especially stems containing pollen and pistil containing stigma and ovary.   * Students examine pollen grains underneath a microscope to explore their diversity.   Watch the YouTube video in resources column or David Attenborough’s Private Life of plants Pt 3 - Flowering. Discussion on: the difference between pollination and fertilisation: ways pollination can take place and how this relates the features of the flower.  In groups, students investigate asexual ways of plant reproduction. Each group does a different type and creates an A3 poster of their findings - Groups include: cuttings, runners, rhizomes, suckers, tubers, bulbs, producing plantlets on leaf margins (e.g. Kalanchoe). Students share their findings with the rest of the class  As a class, students brainstorm and collate ideas on the advantages and disadvantages for plant producing sexually and asexually | * Outline how plants reproduce sexually and asexually. * Using examples of Australian plants describe the different ways plants can reproduce asexually. * Tabulate the advantages and disadvantages of plant sexual and asexual reproduction |
| Explain the mechanisms of reproduction that ensure the continuity of a species, by analysing sexual and asexual methods of reproduction in a variety of organisms, including:   * fungi: budding, spores * bacteria: Binary fission * protists: binary fission, budding | Students use secondary source videos to gain an insight into the reproduction of protists, fungi and bacteria. They will then describe in writing and with diagrams the ways fungi, bacteria and protists reproduce asexually.   * For each one, students must emphasise how the mechanism contributes to the continuity of the species. | * Describe the ways that fungi, bacteria and protists reproduce asexually |
| Analyse the features of fertilisation, implantation and hormonal control of pregnancy and birth in mammals | Students define the term fertilization using the terms gametes and zygote and indicate on a diagram where this takes place. They then describe what happens to the zygote as it travels along the fallopian tube to the uterus where implantation occurs. Note: it is still a mass of undifferentiated cells.  Hormones change as the foetus develops. Students examine the graph on [physiology of pregnancy](https://www.khanacademy.org/test-prep/nclex-rn/rn-reproductive-system-physiology/rn-pregnancy/a/physiology-of-pregnancy) and describe in their own words the trend of the three main hormones that maintain pregnancy: oestrogen, progesterone and human chorionic gonadotropin.  Students analyse the flowchart diagram on [birth process](http://ib.bioninja.com.au/higher-level/topic-11-animal-physiology/114-sexual-reproduction/birth-process.html) to process the information it contains to explain the role of and interaction between hormones during the birth process to promote contractions. | * Define the terms fertilization and implantation and identify on a diagram where these take place. * Describe the changes in the three main hormones controlling pregnancy * Outline the role of hormones during birth and explain the interactions between them to promote contractions. |
| Evaluates the impact of scientific knowledge on the manipulation of plant and animal reproduction in agriculture | Class is divided into groups and each group researches one of the following. They present how the manipulation is done, why and what scientific knowledge about reproduction is needed to do the manipulation. Groups then present their ideas and provide a handout to other students. Each must be checked by the teacher before presentation for factual accuracy.   * Groups Select from: Artificial pollination, plant cuttings, plant tissue culture, Selective breeding, Artificial insemination, IVF, interbreeding between species e.g. Mule, Toast (Botswana) and crossbreeding for purpose between species to produce hybrids e.g. Braford cattle and Mulard Duck, plumcot. * Students take notes and summarise the impact of manipulation of plant and animal reproduction. | * Identify examples of ways in which plant and animal reproduction is manipulated in agriculture. * Students describe the scientific knowledge used to develop the ways to manipulate reproduction. * Write and evaluation response about the impact of manipulation of plant and animal reproduction. |

Resources

* [A Life without Males](http://www.abc.net.au/catalyst/stories/4353577.htm)
* [Pollination](https://australianmuseum.net.au/pollination)
* [Sexual reproduction in flowering plants](https://www.youtube.com/watch?v=2ycl2E9r-_o)
* [Types asexual reproduction](https://www.youtube.com/watch?v=LuQE7N2hGRQ)
* [Making Spore Prints](https://www.milkwood.net/2014/01/06/making-spore-prints/)
* [Spore rain - Mushroom reproduction](https://www.youtube.com/watch?v=Mrphn1zOWaE)
* [Life cycle of a mushroom](https://www.youtube.com/watch?v=xocJ8jTriZM)
* [Budding yeast-Time Lapse](https://www.youtube.com/watch?v=iOvrq6ssy2Y)
* [Budding in Hydra](https://www.youtube.com/watch?v=wfbhwq95Duc)
* [Types of protist reproduction](http://study.com/academy/lesson/types-of-protist-reproduction.html)
* [Ovulation, fertilization and implantation](https://www.youtube.com/watch?v=-qif9-b0HNc)
* [From fertilization to implantation](https://www.youtube.com/watch?v=ARERGD0neMI)
* [Physiology of pregnancy](https://www.khanacademy.org/test-prep/nclex-rn/rn-reproductive-system-physiology/rn-pregnancy/a/physiology-of-pregnancy)
* [Birth process](http://ib.bioninja.com.au/higher-level/topic-11-animal-physiology/114-sexual-reproduction/birth-process.html)