

Unit 02A: Inheritance and Variation of Traits - DNA

Content Area: **Science**
Course(s): **Generic Course**
Time Period: **Semester 2**
Length: **6 weeks**
Status: **Published**

Standards

LS1.A: Structure and Function (pp. 143-145, NRC, 2012)

- All cells contain genetic information in the form of DNA molecules. Genes are regions in the DNA that contain the instructions that code for the formation of proteins. (secondary to HS-LS3-1) (Note: This Disciplinary Core Idea is also addressed by HS-LS1-1.)

LS1.B: Growth and Development of Organisms (pp. 145-147, NRC, 2012)

- In multicellular organisms individual cells grow and then divide via a process called mitosis, thereby allowing the organism to grow. The organism begins as a single cell (fertilized egg) that divides successively to produce many cells, with each parent cell passing identical genetic material (two variants of each chromosome pair) to both daughter cells. Cellular division and differentiation produce and maintain a complex organism, composed of systems of tissues and organs that work together to meet the needs of the whole organism. (HS-LS1-4)

LS3.A: Inheritance of Traits (pp. 158-159, NRC, 2012)

- Each chromosome consists of a single very long DNA molecule, and each gene on the chromosome is a particular segment of that DNA. The instructions for forming species' characteristics are carried in DNA. All cells in an organism have the same genetic content, but the genes used (expressed) by the cell may be regulated in different ways. Not all DNA codes for a protein; some segments of DNA are involved in regulatory or structural functions, and some have no as-yet known function. (HS-LS3-1)

LS3.B: Variation of Traits (pp. 160-161, NRC, 2012)

- In sexual reproduction, chromosomes can sometimes swap sections during the process of meiosis (cell division), thereby creating new genetic combinations and thus more genetic variation. Although DNA replication is tightly regulated and remarkably accurate, errors do occur and result in mutations, which are also a source of genetic variation. Environmental factors can also cause mutations in genes, and viable mutations are inherited. (HS-LS3-2)
- Environmental factors also affect expression of traits, and hence affect the probability of occurrences of traits in a population. Thus the variation and distribution of traits observed depends on both genetic and environmental factors. (HS-LS3-2),(HS-LS3-3)

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| SCI.9-12.HS-LS1-4 | Use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms. |
| SCI.9-12.HS-LS3-3 | Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population. |
| SCI.9-12.HS-LS3-2 | Make and defend a claim based on evidence that inheritable genetic variations may result from (1) new genetic combinations through meiosis, (2) viable errors occurring during replication, and/or (3) mutations caused by environmental factors. |
| SCI.9-12.HS-LS3-1 | Ask questions to clarify relationships about the role of DNA and chromosomes in coding |

the instructions for characteristic traits passed from parents to offspring.

Essential Questions

- How is cellular information stored and transmitted throughout the cell?

Content / Skills

Content

- Function and structure of DNA
- Replicate DNA using Chargaff's base pairing rules

Skills

- DNA structure and function
- Replicate DNA using Chargaff's base pairing rules