
Interactive Learning Objects

Biology

Predicting Heredity Lesson Plan

TVOntario



Predicting Heredity

Learning object description

This learning object provides a comprehensive overview of the process of meiosis. Through animation and interactive activities, students discover how meiosis maintains chromosome number and provides genetic variation through crossing over and random assortment. Students learn the difference between dominant and recessive traits, and infer whether a trait is dominant or recessive by examining pedigrees. They are introduced to the Punnett square and are instructed in how to use it to predict the outcome of various crosses.

Learning objective

The students will be able to:

- Explain how meiosis leads to genetic variation
- Describe the processes through which meiosis conserves chromosome number in sexual reproduction
- Infer whether a trait is dominant or recessive from a pedigree
- Predict the outcomes of crosses, using a Punnett square

Correlation to the Ontario Curriculum

Grade 11 Biology – SBI3U Academic:

- Demonstrate an understanding of the necessity of meiosis and describe the importance of genes in transmitting hereditary characteristics according to Mendel's model of inheritance
- Explain the process of meiosis in terms of the replication and movement of chromosomes
- Predict the outcome of various genetic crosses
- Explain the process of meiosis, with reference to a computer simulation or to

their own investigations with a microscope (e.g., using slides of grasshopper testis, explain what happens in the first and second stages of prophase and metaphase and anaphase 2 in meiosis);

- Solve basic genetic problems involving monohybrid crosses, incomplete dominance, co-dominance, dihybrid crosses, and sex-linked genes using the Punnett method.

Vocabulary

- Meiosis
- Crossing over
- Random assortment
- Dominant
- Recessive
- Punnett square

Pre-viewing

- Students will have likely learned the basics of cell division in Grade 9; however, since they typically find meiosis a rather challenging concept to master, it is a good idea before working with the learning object for students to list what they think they already know about meiosis.
- This is a good opportunity for the teacher to catch major misconceptions that students may harbour.

While viewing

- Have the class work either individually or in pairs, depending on your and their preference and access to computers.
- Have students take notes to summarize what they learn as they explore the three segments of the learning object: Meiosis, Dominant and Recessive Traits, Predicting Heredity.

Post viewing

- Have students create a concept map from the notes they have taken. In a concept map, key ideas are connected each other with the use of a linking word that demonstrates the relationship between concepts.

Follow-up activity

- Invite students to collect information about the genetic makeup of their class. Have students design a data collection table in which to record the results of a survey of the following human traits:
 - Hitchhiker's thumb – more properly known as distal hyperextensibility of the thumb; thumb bends all the way back to an almost 90° angle (recessive)
 - Widow's peak – hairline comes to a point in middle of forehead (dominant)
 - Mid-digital hair – complete absence of hair in middle digit of fingers (recessive)
 - Blue eyes – lack of pigmentation in upper layer of iris as a result of a recessive allele
 - Attached earlobe – earlobe is attached to side of head (recessive)
 - Tongue rolling – rollers are dominant
 - Bent pinky – last joint of pinky bends in toward fourth finger (dominant)
 - PTC tasting – tasters of phenylthiocarbamide are dominant
 - Interlocking fingers – when fingers are interlocked left thumb sits over right thumb (dominant)
 - Freckles – freckles are dominant over no freckles

- Send students through the school to collect data from a minimum of 30 people each. When students return to class, they can find the percentage of the sample population displaying the dominant and recessive forms of each trait.

Assessment

- Concept maps can be assessed for Knowledge and Understanding (understanding of concepts, principles, laws, and theories, e.g., identifying assumptions; eliminating misconceptions; providing explanations) using the following marking scheme:

Key Words:

- 1 point - arrangement of words demonstrates understanding
- 2 points - arrangement of words demonstrates deep understanding

Links:

- 1 point - most relationships are labelled with a relevant linking word
- 2 points - all relationships are labelled with a relevant linking word

Cross Links:

- 1 point - cross links are used to reflect straightforward connections
 - 2 points - cross links show complex relationships between two or more distinct parts of the map
- Genetic trait surveys can be assessed for Inquiry: application of the skills and strategies of scientific inquiry (e.g., initiating and planning, performing and recording, analysing and interpreting, problem solving).