

CBL BIOLOGY: LIFE SCIENCE OPTION
BSCS Green Version 10th edition
Biology An Ecological Approach
Lesson Plan Quarter 2, Week 6, Day 1



Outcomes for Today

Standards Focus: 1dh 2acefg 3abc 4abcef 5abcde 7bc

PREPARE

1. Background knowledge necessary for today's reading.

What is the difference between chance and probability? Spend a little time with the class setting the stage for the concept of probability. There are many misconceptions in the minds of young adolescents about such concepts. "If it is my time, it is my time" and similar attitudes are held by young people. What does it mean to have one chance in four of survival? This can be helpful as you begin to move into genetic probability and understanding of the idea of variation and heredity.

2. Vocabulary Word Wall.

Introduce five important, useful words from today's reading.

heredity genes geneticist DNA probability

- Show, say, explain, expand, explode or buzz about the word briefly.
- Show, say and define the word quickly and add to the word wall.

READ

3. Review the vocabulary and concepts previously covered in this chapter.

Start at the beginning and review the concepts and vocabulary covered so far.

- Mention the setting and main ideas.
- Point to concept chart as you quickly review it.

In previous chapters, we have studied DNA, genes, and the arrangement of nucleotide bases.

We have learned that it is the sequence of these bases that form the genetic code.

This code (unique to each organism) directs the growth and functioning process of each individual organism and this is what accounts for the diversity of life.

The genes are replicated in each organism and thus, “the code” is passed from generation to generation.

4. Read directions for investigation/activity.

5. Read text. Ch 8, Heredity and Genetic Variation, pp. 192-194 (Section 8.1)

- Shared Reading RRP: Read, React, Predict every 2-3 pages
 Tape Partner Choral Silent Round Robin Reading

Setting	Characters	Pages
all living things	DNA genes nucleotides	194

RESPOND

6. Fix the facts. Clarify what’s important.

Discuss the reading and add 3-5 events to the billboard.

- Discuss the text. Clarify the most important facts, concepts, ideas and vocabulary.
- Decide on the 3-5 most important **concepts** and post these on the billboard.

Students might mention:

Heredity is why we look like our parents.
 Genes control all the stuff that happens in living things.
 Information (codes) for the genes is stored in DNA strings.
 We can predict things about how future generations will look based upon the characteristics of the current generation.

7. Post information on the billboard. Add new information to ongoing class projects on the wall.

- New concept information can be added to the billboard.
- An answer can be added to a question from the KWL Chart.
- New information can be added to ongoing charts and investigations.

EXPLORE

8. Explore today’s investigation with inquiry activities.

9. Explore today’s simulation with inquiry activities.

10. Collect data and post.

One possible activity:

Investigation 8.1

This is the classic probability lesson making use of a coin toss. Please read the details on pages 221-224 in the text. Briefly outlined:

Introduction

Talk about probability as a mathematical formula. Questions such as, “What is the chance (probability) that the next baby born in X Hospital will be a boy?” or “What is the probability that the moon will be full tomorrow?” can raise interest.

Procedure

Tossing a coin is a simple probability exercise. Of course, heads or tails is a simple one out of two or one in two chance. In the exercise outlined on page 222, the exercise is designed with more complication by making use of a shiny penny and a dull penny. Have students follow the directions beginning on the bottom of page 222 in the text.

Other possible activities for a class group or individual

- Bookmark Open Mind Portrait g6 Graphic Organizer
g7 Main Idea Graphic Organizer c1-12 Cubing Postcard Prop
Poster Ad Map Retelling Reader’s Theatre Cartoon Rap

Key Questions

1. What are the chances that a set of parents will have one daughter?, one son?, two daughters?, one daughter and one son?
2. In the coin tossing activity, how many heads are possible in ten tosses? How many heads are probable?
3. What does all this have to do with heredity?
4. With regard to how long one will live, the comment, “It’s in the genes” is often used as an answer. What does this mean?

Remember to ask literal structural idea craft author literature life
evaluate and inference questions every day.

Key Paragraph

Heredity is the transmission of genetic information from one generation to another. Genes are the basic units of genetic information, and they also control the basic functions of the cell. Geneticists study heredity and the actions of genes together. By studying genes in individuals and populations, geneticists learn what genes are present in an organism of a population and how they work.

EXTEND

11. Prompt every student to write a short product tied to today's reading

Students in this age group often have conflicting ideas in the area of probability and so-called fate. Have them write a paragraph responding to the following prompt:

“How might things in your family be different if you were born a boy (or girl)?”

Or maybe even deeper with this one:

“How would things be different if you were never born?”

(If you need a thought-provoking movie, show *It's A Wonderful Life*.)

Here is a link to get a lesson plan:

<http://www.teachwithmovies.org/guides/its-a-wonderful-life.html>

Note: **Teach with Movies** is an excellent resource for the use of character building movies. The cost is minimal.

12. Close with a short summary.

Extend the reading to the students' lives or to the world.

CBL BIOLOGY: LIFE SCIENCE OPTION
BSCS Green Version 10th edition
Biology An Ecological Approach
Lesson Plan Quarter 2, Week 6, Day 2



Outcomes for Today

Standards Focus: 1dh 2acefg 3abc 4abcef 5abcde 7bc

PREPARE

1. Background knowledge necessary for today's reading.

In this lesson, we will be looking at the work of Gregor Mendel and his work with peas. Introduce this topic by stimulating a discussion on the inquisitive nature of the human animal. Call attention to the inquisitive and exploratory nature of a toddler. Ask students if they have observed young children and get them to try and look at the world through a child's eyes. It is this unbiased observational ability that allows for good scientific research. Point out how we all wear many "lenses" through which we view the world.

2. Vocabulary Word Wall.

Introduce five important, useful words from today's reading.

synthesis **cross-pollination** **trait** **dominant** **recessive**

- Show, say, explain, expand, explode or buzz about the word briefly.
- Show, say and define the word quickly and add to the word wall.

READ

3. Review the vocabulary and concepts previously covered in this chapter.

Start at the beginning and review the concepts and vocabulary covered so far.

- Mention the setting and main ideas.
- Point to concept chart as you quickly review it.

To date, we have learned that genes bring about the formation of proteins. Proteins combine to form such things as muscles, nerves, pigments, and many other components of living things.

The "blueprints" of this process are stored in DNA strings called nucleotides. Genes are stored in the chromosomes of each cell.

4. Read directions for investigation/activity.

5. Read text. Ch 8, Heredity and Genetic Variation, pp. 194-196 (Section 8.2)

See supplemental investigation attached to this lesson plan.

- Shared Reading RRP: Read, React, Predict every 2-3 pages
 Tape Partner Choral Silent Round Robin Reading

Setting	Characters	Pages
monastery	monk	194-195
monastery	Gregor Mendel	
monastery garden	peas	

RESPOND

6. Fix the facts. Clarify what's important.

Discuss the reading and add 3-5 events to the billboard.

- Discuss the text. Clarify the most important facts, concepts, ideas and vocabulary.
- Decide on the 3-5 most important **concepts** and post these on the billboard.

Students might mention:

It has taken a long time to figure some of these genetic concepts out and there is still more to discover.

Gregor Mendel was a monk who spent a great deal of time experimenting with garden peas. He described, for the first time, some of the basic genetic principles.

Mendel used this process:

1. He concentrated on one trait of the pea plant at a time.
2. He used a large sample.
3. He completed the same experiment many times, over and over again.
4. He used the mathematical principles of probability to make sense of the results he found with his experiments.

7. Post information on the billboard. Add new information to ongoing class projects on the wall.

- New concept information can be added to the billboard.
- An answer can be added to a question from the KWL Chart.
- New information can be added to ongoing charts and investigations.

EXPLORE

8. Explore today's investigation with inquiry activities.

9. Explore today's simulation with inquiry activities.

10. Collect data and post.

One possible activity:

Human Traits - Nature and Nurture

(See attached supplemental Investigation at the end of this lesson.)

Note: As a follow up to this activity, locate a pair of identical twins and invite them to class for a discussion on this topic.

Other possible activities for a class group or individual

Bookmark Open Mind Portrait g6 Graphic Organizer

g7 Main Idea Graphic Organizer c1-12 Cubing Postcard Prop

Poster Ad Map Retelling Reader's Theatre Cartoon Rap

Key Questions

What is a trait? Give examples?

What are some of your genetic traits? Be specific.

What is the difference between dominant and recessive traits?

What is pollination? Give some examples.

How long did Mendel's experiments last?

Why do you think Mendel used such large numbers of experimental plants (peas)?

Remember to ask literal structural idea craft author literature life
evaluate and inference questions every day.

Key Paragraph

Mendel's work, which we now call Mendelian genetics, is the basis for the modern study of heredity and variation. His experiments were unique in four important ways. First, he concentrated on one trait at a time. Second, he used large numbers of organisms to minimize the influence of chance on his data. Third, he combined the results of many identical experiments. Fourth, he used the rules of probability to analyze the results. By using these methods, Mendel was able to recognize distinctive patterns of inheritance.

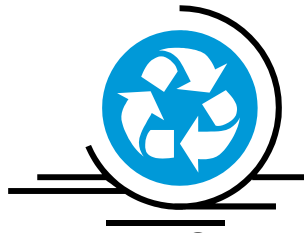
EXTEND**11.** Prompt every student to write a short product tied to today's reading

Ask students to write a short paragraph addressing this prompt:

Why do you think one man would spend so much time methodically working on the genetics of peas? Ask the students what they believe he would say if he were here in the classroom today.

12. Close with a short summary.

Extend the reading to the students' lives or to the world.



Supplemental Student Investigation Human Traits - Nature and Nurture

Objective

Students will understand the following:

1. Many human characteristics—all physical traits and possibly many personality traits—are determined by our genetic makeup.
2. Whereas all physical traits are genetically determined, some evidence shows that certain personality traits are determined by conditions and events that occur after a person's birth.
3. Because of their identical genetic makeup, identical twins who have been raised separately are ideal subjects for experiments that evaluate the effects of genes versus the effects of environment on human personality development.

Materials

No special materials needed.

Introduction

Begin a conversation with your students by asking, "Which is a more important factor in how your personality develops—nature or nurture?" Explain that by *nature* you mean hereditary genetic makeup and that by *nurture* you mean the things that happen to a person after birth, including treatment by parents, peers, community, and society. Let students know that another name for the nature-nurture controversy is the heredity-versus-environment controversy. Then encourage students to express their views on the issue and give reasons for their views.

Procedure

Ask students if they can think of a way to construct an experiment, in a scientifically valid way, that will shed light on the controversy they have been discussing. Guide the discussion toward twin studies, or the study of pairs of identical twins that have been raised apart.

Ask students to explain why identical twins raised apart would be ideal subjects for an experiment. Make sure students understand that identical twins have exactly the same genetic makeup, so any inherited traits, including all physical traits, would be exactly the same, but if raised separately, the twins would grow up with different environmental influences.

Divide the class into groups, and assign each group to come up with a design for an experiment that would cast light on the nature-nurture controversy. All experimental designs should involve a pair of twins raised apart from each other.

Before groups meet, go over the scientific method with the class, explaining to students the requirements for a scientifically valid experiment:

1. The experiment should begin with a question to be answered (e.g., “Is musical ability determined by nature or nurture?”).
2. The experimenters should form a hypothesis, or educated guess, based on knowledge and/or experience (e.g., “Musical ability is determined by nature.”).
3. The experiment should be set up so that there is only one variable; that is, all conditions must be the same except for the one the experiment is designed to test. (In the case of twins, we know that each twin has the exact same genetic makeup, or “nature”; therefore, the only variable is environment, or “nurture.”)
4. The experiment should have a control. (In the case of a twin study, the “experiment” might be a musically talented twin who was raised by musically talented parents; the “control” might be the other twin, raised by parents who are not musically talented.)

You should also mention to the class that the results of just one experiment are rarely considered sufficient. An experiment must be repeated many times before the results can be taken seriously.

Allow time for groups to design their experiments.

Have each group present its experimental design to the class.

Invite class members to critique each experiment with regard to the validity of its design and use of scientific method.

CBL BIOLOGY: LIFE SCIENCE OPTION

BSCS Green Version 10th edition

Biology An Ecological Approach

Lesson Plan Quarter 2, Week 6, Day 3



Outcomes for Today

Standards Focus: 1dh 2acefg 3abc 4abcef 5abcde 7bc

PREPARE

1. Background knowledge necessary for today's reading.

How was it that an Austrian monk living over one-hundred years ago figured out many of the basic scientific principles of genetics before modern biologists had the tools for identifying genes and related genetic chemical principles? One answer to this question is discipline. Talk about how discipline is necessary to achieve long-term goals. This may be a good time to ask students about their goals. Relate this to their world. Remember the Birdman of Alcatraz? Even he had a disciplined routine to do his research. Of course, he was also locked up!

2. Vocabulary Word Wall.

Introduce five important, useful words from today's reading.

genotype phenotype heterozygous homozygous hybrid

- Show, say, explain, expand, explode or buzz about the word briefly.
- Show, say and define the word quickly and add to the word wall.

READ

3. Review the vocabulary and concepts previously covered in this chapter.

Start at the beginning and review the concepts and vocabulary covered so far.

- Mention the setting and main ideas.
- Point to concept chart as you quickly review it.

So far in this chapter, we have learned the following:

Heredity is the passing down of genetic traits from one generation to the next.

Genes determine biological traits.

Probability is a term for predicted chance of something happening.

Genetic codes are formed by the arrangement of molecules in DNA

Gregor Mendel, an Austrian Monk, is known as the “father of modern genetic principles.

4. Read directions for investigation/activity.

5. Read text. Ch 8, Heredity and Genetic Variation, pp. 196-198 (Section 8.3)

- Shared Reading RRP: Read, React, Predict every 2-3 pages
 Tape Partner Choral Silent Round Robin Reading

Setting	Characters	Pages
Mendel’s pea garden	round and wrinkled peas yellow and green peas green and yellow pea pods long and short pea stems	196

RESPOND

6. Fix the facts. Clarify what’s important.

Discuss the reading and add 3-5 events to the billboard.

- Discuss the text. Clarify the most important facts, concepts, ideas and vocabulary.
- Decide on the 3-5 most important **concepts** and post these on the billboard.

Students might mention:

Mendel believed that there were two factors for a particular pea characteristic (trait) such as round vs. wrinkled.

He also believed that when the sex cells were formed, each cell contained only one “factor” for this trait. In other words, each parent contributed only one factor (of two possible) for the trait.

The trait that is visible is called the phenotype while the genetic makeup is called the genotype.

A true breeding plant has the same genetic factors or genes (alleles).

A hybrid has different genetic factors.

7. Post information on the billboard. Add new information to ongoing class projects on the wall.

- New concept information can be added to the billboard.
- An answer can be added to a question from the KWL Chart.
- New information can be added to ongoing charts and investigations.

EXPLORE

8. Explore today's investigation with inquiry activities.

9. Explore today's simulation with inquiry activities.

10. Collect data and post.

One possible activity:

Physical Characteristics of Plants

Note: (This is a two-day activity. Day One is a classroom lab activity and Day Two is a field exercise.)

Objective

Students will make observations of local plants as a first step towards identification of genetic characteristics.

Materials Needed

Several potted plants (for the classroom)
Access to nearby gardens or horticultural displays

Procedures

This activity will take a little planning and reconnaissance work. Before beginning this activity, engage students in a discussion and review of Mendel's work and identify the various characteristics of peas that he studied.

Classroom Lab Day 1

Bring several different species of potted plants (marigolds, geraniums or similar plants with flowers work well) into the classroom and place each different one with a designated small group of students. Have students (by group) carry out these procedures:

1. List all the possible observable characteristics of their plant.
2. Look for variation in each listed characteristic (for example, wrinkled leaves-smooth leaves, color variations, etc. on the same plant).
3. Have students list and diagram their findings on poster paper for posting.

Note: The next lesson will take students outside for a discovery walk.

Other possible activities for a class group or individual

- Bookmark Open Mind Portrait g6 Graphic Organizer
 g7 Main Idea Graphic Organizer c1-12 Cubing Postcard Prop
 Poster Ad Map Retelling Reader's Theatre Cartoon Rap

Key Questions

1. What is the difference between a gene and an allele?
2. Give examples of phenotype characteristics in Mendel's peas.
3. What is a genotype? Give several examples.
4. Use a Venn diagram to explain the concepts of heterozygous and homozygous.
5. Why did it take more than 100 years for many of the principles described by Gregor Mendel to be proven?

Remember to ask literal structural idea craft author literature life evaluate and inference questions every day.

Key Paragraph

Mendel's experiments defined the basic unit of inheritance, but he could provide no information about its physical or chemical nature. Unable to see such a unit in his studies, he inferred its existence from his experiments. The answer to the riddle of what genes are and how they work could not be known until nearly 100 years later, when techniques for studying biological molecules were developed.

EXTEND

11. Prompt every student to write a short product tied to today's reading.

What is Inference?

Inference is a belief that something is true without absolute proof. Through his careful studies and experiments, Mendel inferred many principals that were later proven to be true.

Have students write a short paragraph about a situation they believed to be true without proof. Make sure they include evidence in their writing. Perhaps they could write about something that was inferred and was later proven to be wrong.

12. Close with a short summary.

Extend the reading to the students' lives or to the world.

CBL BIOLOGY: LIFE SCIENCE OPTION

BSCS Green Version 10th edition

Biology An Ecological Approach

Lesson Plan Quarter 2, Week 6, Day 4



Outcomes for Today

Standards Focus: 1dh 2acefg 3abc 4abcef 5abcde 7bc

PREPARE

1. Background knowledge necessary for today's reading.

Things are about to get more complicated in the genetic biology world. Remember the simple coin toss investigation? This was a one variable experiment. Now is the time to begin the discussion of multiple variables. In our current "black or white" society of all or none, simplification is one way of coping with vast amounts of information. Begin this lesson with a discussion of the possible multiple variables that can influence an outcome. There is no end to possible examples. In this way, students will be more prepared to understand the complexity of the dihybrid cross.

PREPARE

1. Background knowledge necessary for today's reading.

Introduce five important, useful words from today's reading.

dihybrid independent assortment cystic fibrosis cross

- Show, say, explain, expand, explode or buzz about the word briefly.
- Show, say and define the word quickly and add to the word wall.

READ

3. Review the vocabulary and concepts previously covered in this chapter.

Start at the beginning and review the concepts and vocabulary covered so far.

- Mention the setting and main ideas.
- Point to concept chart as you quickly review it.

Understanding basic genetics to this point has to do with several basic principles covered in this chapter. They include but are not limited to:

Genes are where the “units of information” that determine characteristics (like blue eyes) are stored.

We have seen how Gregor Mendel used patience, perseverance, and scientific principles to discover and describe basic genetic principles. Mendel identified the principal that when sex cells are formed and the genetic material halved, that only one of the two alternative forms of each gene (an allele) was included (through the process of meiosis) in the resulting sex cell.

Most recently we studied a cross between plants and investigated only one trait. For example, we looked at peas that were either wrinkled or smooth.

4. Read directions for investigation/activity.

5. Read text. Ch 8, Heredity and Genetic Variation, pp. 198-200 (Section 8.4)

- Shared Reading RRP: Read, React, Predict every 2-3 pages
 Tape Partner Choral Silent Round Robin Reading

Setting	Characters	Pages
Gregor Mendel's pea garden	round yellow seeds, round green seeds, wrinkled yellow seeds, wrinkled green seeds	199

RESPOND

6. Fix the facts. Clarify what's important.

Discuss the reading and add 3-5 events to the billboard.

- Discuss the text. Clarify the most important facts, concepts, ideas and vocabulary.
- Decide on the 3-5 most important **concepts** and post these on the billboard.

Students might mention:

Mendel sure spent a great deal of time in his garden.

A phenotype is the characteristic that we can see in the organism. For example in Mendel's garden it could have been green smooth or green wrinkled peas.

Mendel figured out that that for any one trait, the genes would independently sort themselves into the various possibilities.

An understanding of these principles is important if there is a possibility of a genetic defect being passed on to a child from seemingly normal parents.

7. Post information on the billboard. Add new information to ongoing class projects on the wall.

- New concept information can be added to the billboard.
- An answer can be added to a question from the KWL Chart.
- New information can be added to ongoing charts and investigations.

EXPLORE

8. Explore today's investigation with inquiry activities.

9. Explore today's simulation with inquiry activities.

10. Collect data and post.

One possible activity:

Physical Characteristics of Plants Part II

Note: (This is part two of a two-day activity. Day One is a classroom lab activity and Day Two is a field exercise.)

Objective

Students will make observations of local plants as a first step towards identification of genetic characteristics.

Materials Needed

Access to nearby gardens or horticultural displays

Procedures

This activity will take a little planning and reconnaissance work. Before beginning this activity, review the discussions of Mendel's work and identify the various characteristics of peas that he studied. Locate possible plants outside for students to observe in locations where students will not cause a major distraction (always a challenge).

Walking Field Study Lab Day 2

Have students select several plants to observe. As in the classroom lab, have them note all of the possible characteristics that might be the result of genetic blueprints. Also have them make note of possible environmental influences such as light, water, interference (such as students walking on them, etc.) Instruct students to record the characteristics they have observed in the field.

Upon returning to the classroom, have students note this data in a graphic format on poster paper. Have them make educated guesses as to what characteristics might be genetic and what characteristics might be due to environmental influences.

Now is the time to discuss how some experiments could be devised to test their observations that certain characteristics are genetically controlled.

Other possible activities for a class group or individual

Bookmark Open Mind Portrait g6 Graphic Organizer
g7 Main Idea Graphic Organizer c1-12 Cubing Postcard Prop
Poster Ad Map Retelling Reader's Theatre Cartoon Rap

Key Questions

In describing and diagramming the possibilities of cross fertilization, what do the large and small letters represent?

If a cross between two plants with two different traits (dihybrid cross) produces 16 possible genotypes, how many genotypes are produced in a cross between two plants with three different traits? How did you figure this?

Why is it important to understand genetics and family history if a couple are planning on children?

Remember to ask literal structural idea craft author literature life
evaluate and inference questions every day.

Key Paragraph

Although Mendel used garden peas in his experiments, his findings apply to humans. For example, think of Lisa, the little girl with cystic fibrosis discussed in the introduction. Medical geneticists now know that cystic fibrosis is a recessive disorder. What hypothesis about the basis of the disorder does this knowledge suggest? Is Lisa homozygous for the cystic fibrosis allele? What are her parents?

EXTEND

11. Prompt every student to write a short product tied to today's reading

This might be a good time to talk more about genetic counseling and have students write a short paragraph based on a personal experience in this area.

A prompt could be something like this:

Do you know of anyone with a genetic disorder? How do you think their view of the world might be different from yours? For example, cystic fibrosis children often do not live much beyond adulthood.

12. Close with a short summary.

Extend the reading to the students' lives or to the world.

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Biology An Ecological Approach

Lesson Plan Quarter 2, Week 6, Day 5



Outcomes for Today

Standards Focus: 1dh 2acefg 3abc 4abcef 5abcde 7bc

PREPARE

1. Background knowledge necessary for today's reading.

Perhaps the best way to introduce this lesson is through the concept of the mixing of things. This lesson is all about the complex and multifaceted result of genetic traits. Mendel's pea experiments helped to describe some basic principles with organisms where there is a clear dominant and recessive characteristic pattern. Most genetic transmission from generation to generation is much more complex consisting of partial dominance.

2. Vocabulary Word Wall.

Introduce five important, useful words from today's reading.

**complete dominance incomplete dominance codominance multiple factors
multifactorial inheritance**

- Show, say, explain, expand, explode or buzz about the word briefly.
- Show, say and define the word quickly and add to the word wall.

READ

3. Review the vocabulary and concepts previously covered in this chapter.

Start at the beginning and review the concepts and vocabulary covered so far.

- Mention the setting and main ideas.
- Point to concept chart as you quickly review it.

Its all in the genes.

To date, we have learned that genes direct the formation of proteins.

Proteins combine to form components of all living things.

Genes are stored in the chromosomes of each cell.

Even though he didn't know about genes and chromosomes, Gregor Mendel formulated the basic principals of dominance in the study of genetics.

Character Education at the Markkula Center for Applied Ethics

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A cross between organisms is a process in which two different parents of a species contribute genetic material to the new organism. These parents may look the same (phenotype) but contain different genetic material (genotype).

4. Read directions for investigation/activity.

5. Read text. Ch 8, Heredity and Genetic Variation, pp. 200-201 (section 8.5)

- Shared Reading RRP: Read, React, Predict every 2-3 pages
 Tape Partner Choral Silent Round Robin Reading

Setting	Characters	Pages
human a garden	blood type morning glory plants	200

RESPOND

6. Fix the facts. Clarify what's important.

Discuss the reading and add 3-5 events to the billboard.

- Discuss the text. Clarify the most important facts, concepts, ideas and vocabulary.
- Decide on the 3-5 most important **concepts** and post these on the billboard.

Students might mention:

Some traits have clear dominance and recessive characteristics, or as Mendel found, the peas were either wrinkled or smooth, they weren't partly wrinkled. Most traits however are a combination of dominance and recessive characteristics such as the example of the flowers. Two parents, a red parent and a white parent, could produce several shades of colors ranging from red to white in the future generations.

7. Post information on the billboard. Add new information to ongoing class projects on the wall.

- New concept information can be added to the billboard.
- An answer can be added to a question from the KWL Chart.
- New information can be added to ongoing charts and investigations.

EXPLORE

8. Explore today's investigation with inquiry activities.

9. Explore today's simulation with inquiry activities.

10. Collect data and post.

One possible activity:

If you have a big nose, will your kid have one as well?

See supplemental activity on family inheritance (**Traits from Parents to Offspring**) attached to this lesson.

Other possible activities for a class group or individual

- Bookmark Open Mind Portrait g6 Graphic Organizer
g7 Main Idea Graphic Organizer c1-12 Cubing Postcard Prop
Poster Ad Map Retelling Reader's Theatre Cartoon Rap

Key Questions

1. What is an F₁ generation?
2. What is an F₂ generation?
3. Look at the morning glory flowers on page 200 of the text. Draw the next generation.
4. List several examples of inherited traits that are a combination of characteristics from both the mother and father.

Remember to ask literal structural idea craft author literature life
evaluate and inference questions every day.

Key Paragraph

Codominance, multiple alleles, and multifactorial inheritance do not display the same ratios as Mendel's simple crosses. But they are still considered a form of Mendelian inheritance. That is, they are the result of genes residing on chromosomes that are transmitted by meiosis during sexual reproduction. Not all genetic information is transmitted in this way

EXTEND

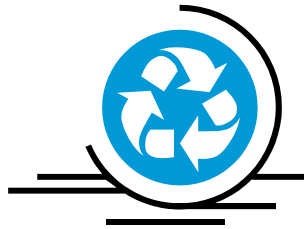
11. Prompt every student to write a short product tied to today's reading

Here is the situation:

Ms. Y claims that Mr. X is the father of her baby. Mr. X has blue eyes and Ms. Y also has blue eyes. The baby has brown eyes. Ask students to do a little research and see if Mr. X could be the father and write a short paragraph from Mr. X's lawyer explaining the situation.

12. Close with a short summary.

Extend the reading to the students' lives or to the world.



Supplemental Student Investigation Traits from Parents to Offspring

Introduction

In this activity, students create their own offspring and see how the traits they contribute may or may not show up in the offspring, depending on what genes the other parent contributes. In this way, students will learn the many possible combinations that can be achieved by combining a few simple traits in different ways.

The activity allows students to move around and interact with many other students. It includes writing and drawing, which highlight different student strengths. The drawings can provide artifacts to be posted in the classroom.

The best feature of this lesson is the built-in student self-evaluation that results from multiple student pairings. Any student with a shaky understanding of genetics will have over 10 opportunities to pair with other students and apply the principles for genetics in a fun activity. Students will have to teach each other and reach an agreement on the offspring's phenotype.

Objective

Students will be able to describe and apply the Mendelian principles of genetics, which include dominance and recessiveness of genes. Students will demonstrate how two parents contribute genes and how those genes appear in their offspring.

Procedure

Do Now (5 mins.): Ask students to consider the following: Do you have a gap in your front teeth? Can you roll your tongue? Do you have a widow's peak? Are your earlobes free or attached?

Revisit Mendelian principles of genetics (10 min): The basics of these principles should have been covered in an earlier class, using Mendel's pea-plant experiments as the core example. Students must understand the principles of dominance, recessiveness, what an allele is, and genotype and phenotype to do the activity. The class can review these principles through 10 minutes of whole-class discussion before doing a group activity (below).

Class activity (25 mins): Students will design their own chromosomes and then interact with other students (in pairs). Each pair will contribute a chromosome that has five traits on it. The offspring that would result from each chromosome pair is described in writing and by drawing. Because each student pairs with many other students in the class, a large variety of offspring will surface. See below for a full description of this activity.

Review & Summary (5 mins): Once each student has paired with every other student, the resulting drawing and description of the offspring should be pinned onto a wall for comparison. The class will be amused by the pictures and be able to check the accuracy of the phenotypes based on the combination of alleles. The teacher can randomly select five or so for the class to evaluate.

Activities

Ideally, students should be seated in rows, with two students per table, but other seating arrangements will work also. Each student must be numbered 1 or 2.

Each student is given an index card which will serve as a chromosome. Each chromosome has five traits pre-printed on it (or the kids can copy this off the board) as follows:

- 1 = Gene for eye color:
- 2 = Gene for hair color:
- 3 = Gene for hair texture:
- 4 = Gene for dimples:
- 5 = Gene for height:

At the teacher's instruction, each student will write in a chosen allele (a specific gene for each trait) for each of the five genes. For example, a student may choose:

- 1 = Gene for eye color: BLUE
- 2 = Gene for hair color: BROWN
- 3 = Gene for hair texture: CURLY... etc

The teacher should display on the board and point out that certain genes (alleles) are dominant over others. For example, brown eyes are dominant over blue eyes, so any offspring with a brown-eye gene will have brown eyes, even if the other gene contributed is for blue eyes.

Then, in two minute intervals each student numbered 2 must get up, move to the next table (where a number 1 is seated) and compare chromosomes. Based on the chromosome pair at that table, what will the offspring look like? Are there two dominant genes, one dominant and one recessive, or two recessive genes? Students must write the gene combination, describe the phenotype (physical characteristics) and draw the offspring.

Students should continue to move from table to table until every number 2 student has paired his or her chromosome with each number 1 student. The resulting drawings can be posted on the wall and compared (they will also provide a lot of amusement!).

Extension

The students' chromosomes and offspring can be kept for a future class in which other Mendelian principles are covered. For example, incomplete dominance or codominance can be taught, and students can use their chromosomes and resulting offspring as the basis for exploring these principles. An activity where more genes are added and new offspring are made is an option.