



**SCIENCE  
CHAMPION**

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**3**  
Teacher Guide

Builds conceptual understanding, reasoning skills, and critical thinking through science learning



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# Preface



is a science learning book specially designed to help pupils acquire scientific knowledge and understanding, develop skills, values, and attitudes. The scope of topics discussed at each level is arranged according to the science syllabus at the elementary level.



uses a very systematic learning method through the Inquiry approach that has been tested and proven to be an effective approach at improving student's competences in mastering science. The inquiry approach is used by Singapore to improve students' competences which is proven through their consistency as the top rank at PISA (Program for International Student Assessment) and TIMSS (Trends in Mathematics & Science Studies). The development of material for each topic is arranged in stages, starting from the easiest material to more complex material (spiral progression).



gives special emphasis on developing conceptual understanding and critical thinking skills to build a firm foundation in science. After the introduction of new concepts, students are invited to apply what they have learned in collaborative science activities. This book is equipped with a number of activities that will stimulate students' interest in the topic and consolidate their knowledge and understanding.



makes science learning meaningful and fosters a love of science learning in children with the use of colorful and engaging visuals as well as age-appropriate language.

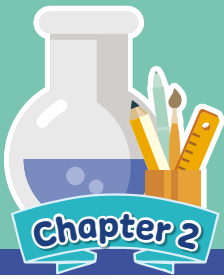
**Be a science champion!**

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# Heredity: Inheritance and Variation



## Overview

In this chapter, Grade 3 students will learn that living things reproduce, and certain traits are passed on to their offspring. Lesson 1 focuses on how people, animals, and plants produce their young, which look similar to their parents. Lesson 2 discusses the different characteristics that are passed on from parents to offspring. Students will learn concepts on heredity, inheritance, and variation through group discussions, cooperative learning activities, and games.



## Lessons

1. Living Things Reproduce
2. Inherited Physical Characteristics



## Learning Goals

1. Infer that people, animals, and plants reproduce.
2. Name the ways by which living things reproduce.
3. Infer that physical characteristics are passed on from parents to offspring.
4. Name observable physical characteristics that are passed on from parents to offspring.

# Living Things Reproduce

Textbook Page Numbers: 62–68

Time Allotment: 2 sessions

## Learning Goals

At the end of the lesson, the students should be able to:

1. infer that people, animals, and plants reproduce; and
2. name the ways by which living things reproduce.

## Teaching Notes

1. Reproduction is the process by which people, animals, and plants produce their young or offspring.
2. Animals that give birth to live young are called viviparous animals.
3. Animals that lay eggs are called oviparous animals.
4. Plants reproduce in different ways. Some plants reproduce by growing new plants from their body parts, such as leaves, stems, and roots. Some reproduce by producing seeds.
5. A seedling is a young plant.



## Vocabulary

bulbs, offspring, oviparous, rhizome, runners, seedling, tubers, viviparous

## Materials

worksheet 2.1; photos of animals; plant that grows from seeds; plants that grow from stems, leaves, or roots; clear plastic bag; soil; glass jar; mayana plant; pot; rubber band; gloves; scissors; water



## Engagement

1. Discuss with the students the chapter overview on page 61 of the textbook.
2. Have the students answer the questions in the chapter overview. Discuss their answers.
3. Distribute copies of worksheet 2.1 to the students. Have the students fill in the *What I Know* column in the worksheet by answering the following questions:
  - (a) What is reproduction?
  - (b) What animals give birth to live young?
  - (c) What animals lay eggs?
  - (d) What plants produce seeds?
  - (e) What plants grow from buds?
4. Have some students share their answers in class. Discuss their answers.
5. Explain the lesson objectives in *Learning Goals* on page 62 of the textbook.
6. Have the students fill in the *What I Want to Know* column in worksheet 2.1.

## Exploration

7. Ask the students to answer the question in *Explore!* on page 62 of the textbook. Discuss their answers.
8. Organize the students into groups of four. Have the groups do the *Science at Work* activity on pages 66–67. Give the groups time to complete the activity.
9. Have the groups answer the questions at the end of the activity.
10. Have each group share their answers in class. Discuss their answers.

## Explanation

11. Write the word reproduction on the board. Call on some students and ask them to explain the meaning of the term. Discuss their explanations.
12. Organize the students into pairs. Provide each pair with photos of animals that they have to sort based on their mode of reproduction.
13. Ask the students: Do the animals lay eggs or do they give birth to live young? Discuss their answers.

14. Have each pair sort the animals. Discuss the classification of animals using the photos.
15. Explain the difference between viviparous and oviparous animals.
16. Have the students examine on pages 64–65 of the textbook the different ways plants reproduce.
17. Discuss the different ways plants reproduce.
18. Organize the students into two groups. Have the first group grow a plant from a body part, and the second group grow a plant from seeds.
19. Have each group discuss what plant should they grow and how they should take care of it. Provide time for them to discuss and grow their plants.

### **Elaboration**

20. Discuss the information in *Science Bank* on page 65 of the textbook.
21. Let the students review the concepts summarized in *Looking Over* on page 67 of the textbook.
22. Give each student three square cutouts. In each cutout, have them write one vocabulary word related to the concepts discussed (e.g., reproduction, oviparous, viviparous, etc.).
23. After everyone has filled out their cards, have each student discuss each vocabulary word with a classmate and have that classmate sign on the card. The student finishes the activity when he or she can explain each of the signed vocabulary words.

Note that the same person cannot sign on a student's cards twice.

### **Evaluation**

24. Test the students' understanding of the lesson. Have them do the *Enhance Your Skills* exercise on page 68 of the textbook. Discuss their answers.
25. Ask the students to answer the question in *Everyday Science* on page 68 of the textbook.
26. Organize the students into pairs. Have each pair discuss their answers to the question in *Everyday Science*.
27. Have some pairs share their answers in class. Discuss their answers.
28. Have the students fill in the *What I Learned* column in worksheet 2.1.

## Suggested Activities

1. Provide the students with fertile eggs from hatcheries or poultry farms. Make sure the eggs came from well developed, mature, and healthy breeding hens. Have the students create a mini incubator where they will place the eggs. Note that the temperature of the incubator must be between 36–39 degrees Celsius. Have the students place the eggs carefully into the incubator and observe the eggs on a daily basis. They also need to turn the eggs daily, but they have to make sure their hands are clean and disinfected. Chicken eggs normally take 21 days to hatch when incubated at optimal temperature.
2. Have the students find in the internet a photo of an interesting plant. Tell them to research on how this plant reproduces. Organize the students into groups of three. Have the students share their research findings with their group mates.



### Quiz

Name : \_\_\_\_\_ Date : \_\_\_\_\_

Grade : \_\_\_\_\_ Score : \_\_\_\_\_

Directions: Write O on the line before the number if the animal is oviparous. Write V if the animal is viviparous.

- \_\_\_ 1. cat
- \_\_\_ 2. sparrow
- \_\_\_ 3. ostrich
- \_\_\_ 4. tiger
- \_\_\_ 5. cow
- \_\_\_ 6. rat
- \_\_\_ 7. turtle
- \_\_\_ 8. cobra
- \_\_\_ 9. spider
- \_\_\_ 10. kangaroo



## Worksheet 2.1

Name : \_\_\_\_\_ Grade : \_\_\_\_\_

Topic : \_\_\_\_\_ Date : \_\_\_\_\_

### K-W-L Chart

Directions: Write in the first two columns what you think you already know (K) and what you want to know (W) about the topic. After completing the lesson, write in the third column what you learned (L).

What I Know	What I Want to Know	What I Learned

# Inherited Physical Characteristics

Textbook Page Numbers: 69–78

Time Allotment: 2 sessions

## Learning Goals

At the end of the lesson, the students should be able to:

1. infer that physical characteristics are passed on from parents to offspring; and
2. name observable physical characteristics that are passed on from parents to offspring.

## Teaching Notes

1. Genetics is the study of heredity.
2. Variation is the set of differences and similarities in characteristics among individuals.
3. Heredity is the process by which characteristics are passed on from the parents to the offspring.
4. Hereditary characteristics include cleft chin, dimples, earlobes, hand clasping, and tongue rolling.

## Vocabulary



genetics, heredity, variation

## Materials

worksheet 2.2; students' photos; photos of their mother, father, and siblings; mirror; paper; and pencil

# Learning Instruction

## Engagement

1. Discuss with the students the lesson overview on page 69 of the textbook.
2. Distribute copies of worksheet 2.2 to the students. Have the students fill in the *What I Know* column in the worksheet by answering the following questions:
  - (a) What is heredity?
  - (b) What are the characteristics that can be inherited from parents?
3. Have some students share their answers in class. Discuss their answers.
4. Have the students think about beliefs and traditions in their family that have been passed on to generations (e.g., they celebrate holidays together, they believe that people should not sweep the floor at night). Tell the students that like beliefs and traditions, certain physical characteristics also get passed on from one generation to the next.
5. Explain the lesson objectives in *Learning Goals* on page 69 of the textbook.
6. Have the students fill in the *What I Want to Know* column in worksheet 2.2.

## Exploration

7. Have the students answer the question in *Explore!* on page 69 of the textbook. Discuss their answers.
8. Have each student paste pictures of them, their parents, and siblings on pages 70–71 of the textbook. Then have them do the exercises on page 70 of their textbook.
9. Have them share their outputs in class. Discuss their outputs.
10. Organize the students into pairs. Have the pairs do the *Science at Work* activity on pages 75–77. Give the pairs time to complete the activity.
11. Have the pairs answer the questions at the end of the activity.
12. Have each pair share their answers in class. Discuss their answers.

## Explanation

13. Write the words: variation and heredity on the board. Call on some students and ask them to explain the meaning of the terms. Discuss their explanations. Correct misconceptions if there are any.

14. Explain that there are certain physical characteristics that are hereditary. Have them examine the pictures on pages 72–74. Using the pictures, discuss heritable characteristics.

### **Elaboration**

15. Discuss the information in *Science Bank* on pages 70, 71, and 74 of the textbook.
16. Let the students review the concepts summarized in *Looking Over* on page 77 of the textbook.
17. Have the students write a paragraph summarizing the concept map in *Linking Together* on page 79 of the textbook.
18. Have the students read the article in *Making Connections* on page 82 of the textbook. Discuss with the students the concept of genetically modified organisms.

### **Evaluation**

19. Test the students' understanding of the lesson. Have them do the *Enhance Your Skills* exercise on page 78 of the textbook. Discuss their outputs.
20. Organize the students into pairs. Have each pair answer the question in *Everyday Science* on page 78 of the textbook.
21. Have some pairs share their answers in class. Discuss their answers.
22. Test the students' understanding of the lessons in the chapter. Have the students answer *Chapter Test* on pages 80–81 of the textbook. Discuss their answers.
23. Have the students fill in the *What I Learned* column in worksheet 2.2.

## Suggested Activities

1. Organize the students into pairs. Provide the students the following list of characteristics. Tell the students to draw the possible offspring given the characteristics of the parents.

Characteristics	Parent Cats	
	Mother	Father
body shape	medium-sized, muscular, short	large-sized, muscular, straight
ears	big, pointy	big, droopy
legs	long, thin	stocky, muscular
eyes	light blue	light green
tail	long with short hair	short nub
color of fur	white	brown
fur type	wavy, long	straight, long



2. Distribute bingo cards to the students. Have the students roam around the classroom, and have each of the heritable characteristics on the bingo card signed by their classmate who has such a characteristic. The person who finishes the bingo card with all the traits signed wins the game.

Possible entries in the bingo cards:

B	I	N	G	O
I cross my right thumb over my left hand when I clasp my hands.	curly hair	brown skin	short	pointed ears
cleft chin	has dimples	brown iris	round ears	attached earlobe
tall	brown hair	F R E E	oval face	heartshaped face
without dimples	slim	unattached earlobe	can roll tongue	black iris
cannot roll tongue	straight hair	fair skin	I cross my left thumb over my right hand when I clasp my hands.	black hair



## Quiz

Name : \_\_\_\_\_ Date : \_\_\_\_\_

Grade : \_\_\_\_\_ Score : \_\_\_\_\_

Directions: Write *True* on the line before the number, if the statement is correct. Write *False*, if the statement is incorrect.

- \_\_\_\_\_ 1. Genes carry the information that determines the traits of an individual.
- \_\_\_\_\_ 2. Heredity is the process by which characteristics are passed on from parents to children.
- \_\_\_\_\_ 3. Variation is the study of heredity.
- \_\_\_\_\_ 4. Genetics is the set of differences and similarities in characteristics among individuals.
- \_\_\_\_\_ 5. Gregor Mendel was the first person to use genetics to describe the study of heredity.
- \_\_\_\_\_ 6. William Bateson is considered the Father of the Science of Genetics.
- \_\_\_\_\_ 7. The indentations on the cheeks called dimples are hereditary.
- \_\_\_\_\_ 8. The earlobe is the soft, lower part of the external ear.
- \_\_\_\_\_ 9. Organisms have the same characteristics due to heredity.
- \_\_\_\_\_ 10. How you look depends on the combined characteristics of your parents.



## Worksheet 2.2

Name : \_\_\_\_\_ Grade : \_\_\_\_\_

Topic : \_\_\_\_\_ Date : \_\_\_\_\_

### K-W-L Chart

Directions: Write in the first two columns what you think you already know (K) and what you want to know (W) about the topic. After completing the lesson, write in the third column what you learned (L).

What I Know	What I Want to Know	What I Learned

## A. Textbook

### Explore!

page 62

Living things reproduce in different ways. Humans and some animals reproduce by giving birth to live young. Other animals reproduce by laying eggs that hatch into young animals. Plants reproduce by either growing new plants from their body parts or by producing seeds that grow into new plants.

page 69

The physical characteristics of parents are passed on to their children or offspring.

### Science at Work

pages 66–67

1. Answers depend on the results of the activity.  
Sample answer: Yes, the cutting grew into a new plant.
2. Answers depend on the results of the activity.  
Sample answer: About 2 to 3 weeks.

pages 75–77

1. Answers depend on the results of the activity.
2. Answers depend on the results of the activity.
3. The similarities and differences between offspring depend on the similarities and differences between the parents.

### Enhance Your Skills

page 68

1. cat—kitten
2. chicken—chicks
3. cow—calf
4. rabbit—bunnies
5. mother—baby

page 78

Answers may vary.

### Everyday Science

page 68

If living things stop reproducing, there would no longer be succeeding generations. Therefore, there will come a time when there are no more people, animals, and plants on Earth.

page 78

No, they do not always look exactly the same. Fraternal twins are twins that do not look alike.

### Chapter Test

pages 80–81

- |      |       |
|------|-------|
| 1. C | 6. A  |
| 2. C | 7. D  |
| 3. D | 8. B  |
| 4. C | 9. C  |
| 5. B | 10. B |

## B Teacher's Manual

### Quiz

#### Lesson 1

1. V
2. O
3. O
4. V
5. V
6. V
7. O
8. O
9. O
10. V

## Lesson 2

1. True
2. True
3. False
4. False
5. False
6. False
7. True
8. True
9. False
10. True



## Test Item Bank

Circle the letter that corresponds to the correct answer.

1. Which of the following refers to the process by which people, animals, and plants produce their young?  
a. reproduction  
b. fertilization  
c. development  
d. growth
2. Which of the following refers to animals that lay eggs?  
a. viviparous  
b. oviparous  
c. hatchlings  
d. seedlings
3. Which animal lays eggs?  
a. bear  
b. mouse  
c. horse  
d. butterfly
4. Which animal is incorrectly grouped?

### Viviparous Animals

kangaroo

octopus

dolphin

### Oviparous Animals

cobra

ladybug

spider

- a. dolphin
- b. octopus
- c. kangaroo
- d. ladybug

5. Which of the following is a viviparous animal?
- a. cockroach
  - b. lizard
  - c. parrot
  - d. mouse**
6. Which of the following plants grows from the leaves of an adult plant?
- a. bryophyllum plant**
  - b. tomato
  - c. ginger
  - d. onion
7. Which of the following is the process by which a plant grows from a seed?
- a. germination**
  - b. fertilization
  - c. heredity
  - d. variation
8. Which of the following is the process by which characteristics are passed on from parents to offspring?
- a. variation
  - b. heredity**
  - c. genetics
  - d. genes
9. Which of the following carry the set of information that determines the characteristics of the offspring?
- a. traits
  - b. genes**
  - c. offspring
  - d. characters
10. Both parents have black and curly hair. Which of the following would be the most probable characteristic of their child's hair?
- a. blonde and straight
  - b. brown and straight
  - c. black and curly**
  - d. orange and curly