

Investigate how a chicken grows

How does a chicken grow and develop?

Standards

B.C.1: Cell structure and function

Introduction

How do cells grow and divide? In this lesson, students will learn that somatic cells grow and divide during the cell cycle, which includes mitosis and cytokinesis. This process is important for body cells in order for an organism to grow and repair itself through its lifetime. A cell spends most of its life in interphase, not dividing but performing normal body functions for organisms. The cell spends a small portion of its time in mitosis and cytokinesis dividing.

Student prior knowledge

In this lesson students will learn that somatic cells grow and divide during the cell cycle and process called mitosis. Students will observe cell growth and division laboratory investigation. The goal of mitosis is to produce a new cell that is identical to the parent cell. Mitosis occurs in somatic (body) cells for growth and repair. Somatic cells have a complete set of DNA, and they are capable of reproducing by themselves as often as needed. Knowledge of how to operate a foldscope is also helpful for this lesson.

Suggested timeline

1–2 class periods (50–100 minutes)

Materials

- Foldscopes
- Onion root tip slides
- Cell cycle inventory sheet (student copies)
- Mitosis song with images print out (or projected)
- Asexual cards
- Asexual note-taking chart

Teacher preparation

- Prepare a class set of foldscopes for student use along with onion root tip slides.
- Print off student worksheets and asexual cards
- Project song and images

Procedure

1. Ask the students how chickens reproduce (asexual or sexual?).
2. Investigate by what method chickens grow, develop, and heal from injuries they incur.
3. Pass out student mitosis song sheets and sing the song as a class while viewing the mitosis cell division chart.
4. Give each student or group of students onion root tip slides, foldscopes, and the cell cycle inventory sheet.
5. Have students identify the phase mitosis on the slides.
6. Each group should examine slides, searching for samples of dividing onion root tip slides.

7. Using foldscopes, students will locate any cells they believe to be in interphase, mitosis, or cytokinesis on the onion root tip slides.
8. Using the cell cycle inventory sheet, students record their data and answer the lab questions following data collection.
9. As a class, define asexual reproduction and its benefits.
10. Break students into groups and assign asexual reproduction types.
11. Groups of students will research different asexual reproduction types:
 - Binary fission (e.g., bacteria)
 - Budding (e.g., yeast, hydra)
 - Fragmentation (e.g., starfish, planaria)
 - Regeneration (e.g., spotted gecko)
 - Vegetative propagation (e.g., plants like potatoes and strawberries)
 - Parthenogenesis (e.g., aphid nymphs)
 - Spore formation (e.g., fungi, algae)
 - Other (come up with own form or organism)
12. Each group researches their assigned form and prepares a brief presentation.
 - Items to include in presentation: process steps, diagram, pros, cons, organism examples, and at least 2 interesting facts
13. Groups create a visual aid (poster, chart, or digital presentation) to accompany their explanation.
14. During the presentation, students will fill in the asexual chart with the characteristics of each form of asexual reproduction.

Suggested wrap-up activity

- Discuss the difference between asexual and sexual reproduction.
- Sing the mitosis song.
- Give the students some form of assessment (written, oral, drawing, etc.).

Differentiation

- Provide learning stations to have students learn more about each stages.
- Watch a video clip of mitosis process.
- Provide different levels of complexity in the content.
- Offer reading materials at varying reading levels. Use simpler texts or summaries for students who need more support, and provide more complex, in-depth articles for advanced learners.
- Allow students to demonstrate their understanding in different ways. Options could include writing a report, creating a PowerPoint presentation, making a video, drawing a comic strip, or designing a 3D model.
- Group students by mixed abilities for peer tutoring or by similar abilities for focused instruction.

More challenges

- Advanced research project: investigate how genetic variation occurs in organisms that reproduce asexually.
- Cross-curricular connection: explore the ethical implications and potential applications of cloning in agriculture and medicine.
- **Home connection:** Explore the following questions with relatives or friends: What if a chicken could reproduce asexually? How would this make a farmer's life easier? What complications could occur with chickens reproducing asexually? If you could engineer a chicken to reproduce sexually or asexually for your poultry business, which would you choose? Explain your answer.

Support information

- **Asexual reproduction:** a mode of reproduction in which a new offspring is produced by a single parent.
- **Sexual reproduction:** a type of reproduction that involves a complex life cycle in which a gamete with a single set of chromosomes combines with another gamete to produce a zygote that develops into an organism composed of cells with two sets of chromosomes.
- **Budding:** a form of asexual reproduction in which a new organism grows out of the body of the parent organism.
- **Fragmentation:** a form of asexual reproduction in which an organism breaks into pieces, each of which can grow into a new organism.
- **Regeneration:** a form of asexual reproduction in which an organism regrows a part of its body that has been lost or damaged.
- **Binary fission:** a form of asexual reproduction in which a single organism divides into two identical daughter cells.
- **Vegetative propagation:** a form of asexual reproduction in plants in which new plants grow from parts of the parent plant.
- **Parthenogenesis:** a natural form of asexual reproduction in which growth and development of an embryo occur directly from an egg, without need for fertilization.
- **Spores:** a form of asexual reproduction where organisms produce spores that develop into new individuals.
- Biological fitness is the ability for a species to reproduce, pass on heritable traits, and survive to the next generation. This lesson explores the variations in which organisms reproduce asexually. Asexual reproduction is expedient and does not require a mate. Asexual creates clones of the parent, unless there is a mutation. If organisms are well suited to their environment then that species' offspring will continue to survive.
- Amoeba Sisters' short mitosis poem <https://youtu.be/snKrKC9wYvw>
- Amoeba Sisters' "The Amazing Cell" video youtu.be/f-1dPgEfAHI
- Crash Course Biology mitosis video youtu.be/L0k-enzoe0M

Teaching suggestions

- Establish behavioral guidelines for presentations and group work.
- Establish safety procedures for using glass slides and foldscopes.

Career connections

Have you ever wondered what type of poultry careers help to make a healthy, safe environment for commercial birds? Let's take a look!

- **Geneticists** are biologists who study genetics, the science of genes, heredity, and variation of organisms.
- **Animal Scientists** apply principles of the biological, physical, and social sciences to the problems associated with poultry production and management. In other words, they study animal health and behavior in order to help design the perfect environment for commercial birds to live in and produce meat and eggs.
- **Veterinarians** care for the health of the poultry flock and work to protect public health. They diagnose, treat, and research medical conditions and diseases of pets, livestock, and other animals.
- **Entomologists** are scientists that specialize in studying insects and their importance to food production in our world.